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INITIAMENTA CONCHOLOGICA
OR
ELEMENTS OF CONCHOLOGY,
COMPRISING
THE PHYSIOLOGICAL HISTORY OF SHELLS
AND
THEIR MOLLUSCOUS INHABITANTS,
THEIR STRUCTURE, GEOGRAPHICAL DISTRIBUTION, HABITS, CHARACTERS,
AFFINITIES, ARRANGEMENT, AND ENUMERATION OF SPECIES.

BY
LOVELL REEVE, A.L.S. ETC.
AUTHOR OF THE 'CONCHOLOGIA ICONICA'.

“Thy desire which tends to know
The works of God, thereby to glorify
The great Work-master, leads to no excess
That reaches blame, but rather merits praise
The more it seems excess.”

“For wonderful indeed are all his works,
Pleasant to know, and worthiest to be all
Had in remembrance always with delight.”

MILTON, *Paradise Lost*, Book iii.

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P R E F A C E.

The object of the present work is to furnish the ‘Collector of Shells’ with a methodical arrangement and enumeration of species, accompanied by a popular summary of those grand truths in the physiological history of the Mollusca, which have been elicited from the investigations of recent travellers; to enunciate the habits and organic peculiarities of this mystic tribe of animals by a careful system of generalization; and to lead him to meditate, whilst pondering over the treasures of his cabinet, upon the nature and zoological affinity of those imperishable records of existence he so delights to contemplate.

It is not the author’s intention to treat of the anatomy of the Mollusca in detail, because he cannot boast of sufficient practical acquaintance with the dissecting-knife to enable him to undertake it with satisfaction; for that department of their natural history he must refer the student to the writings of those authors whose professional skill and education have better fitted them for the task. It is intended to treat of the external form, and of the more prominent features of organization; and especially such as tend to elucidate peculiarities of habit or the characters selected for their generic arrangement.

For drawings of the living mollusks the author will have recourse to those invaluable records of zoological discovery

PREFACE.

executed under the auspices of the French Government, which, on account of their enormous cost, are as sealed books to the naturalists of this country ; and he will be mainly indebted for information on their habits and circumstances of existence to the enterprising exertions of Hugh Cuming, Esq., whose free manner of communicating the different incidents which arrested his attention during fourteen years of indefatigable research, cannot be spoken of in too high terms. The numerous observations made by this eminent traveller both in the Eastern and Western Hemisphere, and his valuable collection of shells with the soft parts in spirits, furnish matter of much interest and importance.

It is somewhat difficult in a work treating only of "shells and the animals which produce them," to avoid referring occasionally to some of those allied genera of mollusks which are entirely naked ; the occasions however are few, and may be easily understood by referring to the writings of De Blainville, Deshayes, D'Orbigny, Alder and Hancock, or any other malacological author.

The ELEMENTS OF CONCHOLOGY are addressed exclusively to the 'Collector of Shells'; and the author desires the work to be simply recorded as an effort to induce a more legitimate tone of enquiry amongst amateur conchologists, into the nature and origin of those beautiful objects which afford them so much intellectual recreation, and proclaim

"The wisdom infinite
That brought them forth, but hid their causes deep."

ELEMENTS
OF
CONCHOLOGY.

Definition of the Science.

CONCHOLOGY is that science which treats of the natural history, and arrangement of Shells and their animal inhabitants :—not of Shells alone, but of Shells and the animals which produce them. The former are so beautiful and easy of preservation, the latter so unsightly and difficult of access, that the Conchologist has been greatly perplexed to know how to study the *Shell* and its *Mollusk* with equal regard to the characters of both, and with a proper estimation of their physiological connection. Drawings of many in their native condition have, however, been published by intelligent travellers*, and a sufficient number of typical kinds have been described and figured in the magnificent works of those naturalists to exhibit the true method of arranging shells according to their zoological affinity.

Many erroneous impressions have prevailed in regard to systematic arrangement, for want of duly considering the important relation that must necessarily exist between the shell and its fabricator. One classifies his shells according to their varieties of form and external aspect, forgetting that he has merely a collection of skeletons before him ;—the calcified portions of animals possessing an organization far superior to that of the Bee, and a thousand creatures, whose structure and sagacity of habits have so often excited his admiration. Another of more abstruse habits of investigation, competing with the incorrectness of these views, professes the study of the soft parts mainly, and he even needs to be reminded that the shell, on the other hand, is an integral portion of the animal,—an outer or exo-skeleton,

* Lesson, ‘Voyage de la Coquille’; Quoy and Gaimard, ‘Voyage de l’Astrolabe’; D’Orbigny, ‘Voyage dans l’Amerique Meridionale’; Deshayes, ‘Mollusques de l’Algerie’.

which though inferior in organic development to the inner or endo-skeleton of the higher orders, nevertheless exhibits certain characters and impressions indicative of peculiar structures, and affording good subsidiary characters for the distinction of groups.

The Conchologist must look upon his shells, in the absence of the living parts, as a portion of those imperishable “*Medals of Creation*”* whose history is suggested by their structure and animal impressions. The *Cowrey* shell may be known by its highly polished porcellaneous surface, to be more or less entirely enveloped by some appendage of the animal; the *Siphonaria* shell offers indications of a siphon; the *Venus* shell shows the form of the lobes of the mantle; and who that regards the *Haliotis* shell with a discerning eye, can fail to surmise that there must be some special design in its series of holes, which he may learn have been perforated by the animal in its progress of growth for the passage of the breathing organs. To show, too, that the most opposite forms may yet exhibit indications of zoological affinity, it may be observed that the *Siliquaria* shell possesses a structure similarly adapted, and of the same nature, as that first spoken of in the *Haliotis*. Here is an unlooked for affinity! An intimate zoological relation between shells exhibiting the two extremes of convoluted forms;—the depressed spire, and the tubular spire.

Comparative Rank in the Animal System.

A brief survey should now be taken of the Animal Kingdom in order to show the rank and comparative importance of the Mollusca in the general range. We are encompassed by a mass of living beings, of whom we ourselves constitute the grand type, whose nature and properties present a strange complication of affinities. For the sake of studying the several atoms of this complicated mass, and arranging them in order for reference, each individual is described and named according to what is called a binomial method; that is, a method of two names, one denoting its general or generic character, the other its particular or specific character. And that the nomenclature may be of universal application, and acknowledged by all tongues and countries, it is adopted in the Latin.

The modifications of nature are of that nice and delicate character, that we may trace a certain gradation of affinity from man to the animalcule. Although objects of extremely anomalous nature occur to disturb the subtle reasonings of the philosopher, yet, there is a wonderful link of relationship between the highest animal, man, in whom the beauty of organization is complete, and the lowest creature, the animalcule, in which organization is so simple as to present nothing more than a globule multiplying with com-

* Mantell.

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pound rapidity by the force of spontaneous fission. It was a favorite proverb with Linnaeus “*Natura non facit saltum*”—*Nature makes no leap*—and if the great author of the ‘*Systema Naturae*’ felt the force of this axiom in a time when the knowledge of species was extremely limited, how much stronger may the truth of it be now demonstrated when so many of the links then wanting in the chain of affinity have been revealed to observation. Every day we are invited to the contemplation of some new form, some new contribution to the general harmony of the series; and it is this inexhaustible source of novelty that imparts such a charm to the study. There is a modifying force in nature, that seems ever labouring to increase the participation of characters that were hitherto unapproachable. She delights in confounding the systematist;—she does not choose to be defined.

Linnaeus lived in a time when the researches into the comparative organization of the inferior animals were not very profound. The characters distinguished by the modern Aristotle exhibit, frequently, a violation of natural affinity; whilst they are too often artificial and void of equivalency. As soon as the immortal Cuvier began to look into the nervous and other complicated portions of the animal frame, the results proved to be such as to materially affect the prevailing method of classification. The physiological generalizations deduced from this new field of enquiry presented sounder combinations of character; and we are indebted to as great a comparative anatomist of our own day*, for having matured and added to the investigations of his illustrious predecessor.

Cuvier did not, however, enter so minutely into the discrimination of species, as did his contemporary Lamarck; the first distinction which the great author of the ‘*Histoire des animaux sans vertèbres*’ recognised in the primary distribution of the Animal Kingdom, was that of the higher orders, which include Mammals, Birds, Reptiles, and Fishes, being furnished with a vertebral column supporting an internal frame or skeleton, whilst the remainder are destitute of any; and he divided accordingly the *Vertebrate* from the *Invertebrate*. “Now it will be observed”, says Professor Owen, “that the invertebrate animals are here grouped together by a negative character, and I know not any instance where such a character has been employed in zoology in which very differently organized species have not been associated together. What indeed can be predicated in common of the Snail, the Bee, and the Polype, than that they are animals and have no vertebral columns, and the like negations?” †

Although Lamarck, therefore, may be followed in the detail of classification, it is necessary for the primary distribution to follow the method adopted by Cuvier and Owen, who divide the Animal Kingdom into four Sub-kingdoms, the VERTEBRATA, the MOLLUSCA, the ARTICULATA, and the RADIATA;

* Owen.

† Hunterian Lectures 1844.

the last three divisions of invertebrate animals occupying each an equal degree of rank with the vertebrate.

These four primary divisions of the ANIMAL KINGDOM may be subdivided into classes as follows :—

Sub-kingdom I. VERTEBRATA.

- Class 1. MAMMALIA Mammals.
- 2. AVES Birds.
- 3. REPTILIA Frogs, Lizards, Tortoises, Snakes &c.
- 4. PISCES Fishes.

Sub-kingdom II. MOLLUSCA.

- Class 1. CEPHALOPODA Mollusks that walk with their head downwards.
- 2. GASTEROPODA That acquire motion by the aid of a contractile and expansile disk.
- 3. PTEROPODA That swim by means of a pair of wing-like fins.
- 4. LAMELLIBRANCHIATA*. That have the branchiae, or breathing organs, in thin plates.
- 5. BRACHIOPODA That are provided with a pair of spirally twisted arms.

Sub-kingdom III. ARTICULATA.

- Class 1. LEPADES Barnacles.
- 2. ANELLIDES Leaches, Earth-worms, &c.
- 3. CRUSTACEA Crabs, Lobsters, Shrimps &c.
- 4. ARACHNIDA Spiders, Scorpions &c.
- 5. INSECTA Bees, Beetles, Butterflies, Centipedes &c.

Sub-kingdom IV. RADIATA.

- Class 1. RADIARIA Sea Eggs, Star Fishes &c.
- 2. POLYPI Polypes or coral insects.
- 3. ENTOZOA Intestinal Worms.
- 4. INFUSORIA Animalcules.

* In order to distinguish the classes of Mollusca by an equivalency of terms throughout, I introduced in my 'Conchologia Systematica' the word *Tropiopoda* in reference to this class, founded on the most prominent form of the foot—the narrow keel-shape; and it was adopted by Professor Macgillivray of Aberdeen in his Report of the Mollusca of that coast. It has, however, been since demonstrated by Professor Owen, in his Hunterian Lectures, that the foot whose modifications offer so excellent a character for the distinction of classes in the higher orders of Mollusca, is not only too variable in its formation and uses for that purpose in the Bivalves, but is sometimes altogether wanting. The lamellated character of the branchiae, or breathing organs, has been preferred, and I now readily adopt it. Although an equivalency of terms is a great assistance to the memory, Nature is so variable in her characters that it cannot be embraced to any extent with accuracy.

Growth and Structure of Shells.

It will be seen by the foregoing arrangement that the Mollusca occupy the second grand division of the Animal Kingdom, and, ranging next in order to the Fishes, are the most highly organized of the invertebrate series. They are termed Mollusks, from the Latin word *mollis*, *soft*, on account of their fleshy unjointed nature, without bone, or, except in the Cephalopod, any internal cartilaginous skeleton; and are furnished with organs of motion, vision, muscular contraction &c. Their chief energies are, however, devoted to the formation of a shelly covering presenting great variety of form, colour, and sculpture. Some mollusks, as the *Aplysiæ*, have only a rudimentary shell, whilst others, as the *Eolidæ*, are entirely naked.

The shell is formed by the deposit of a slimy juice which exudes from the glands of a filmy cloak-like organ called the mantle, and thickening in successive layers, becomes hardened and moulded on the body, with the addition of such ornamental structure, as the various filamentous modifications of the organ promote.

This mucous exudation consists, not, as at one time supposed, of calcareous particles held together by a sort of animal glue, but of a membranous tissue, consolidated by an admixture of carbonate of lime. All shells are therefore composed of two distinct elements,—animal matter and calcareous matter. The animal matter constitutes a membranous basis which is either cellular or laminar; in some cases it is formed in cells of membranous walls, mostly hexagonal, into which the calcareous matter is infused; in others it is deposited in membranous laminæ, more or less wrinkled like morocco leather, with the calcareous matter in alternate layers, the lime in both cases imparting solidity to what would otherwise be a flexible stratum. These elements vary in their relative proportions according to circumstances;—in those shells which are of a fibrous laminar structure such as *Pinna*, and the whole of the margaritaceous group, there is a large proportion of the membranous constituent; whilst in the solid porcellaneous shells, such as the *Olives* and *Cowries*, the calcareous matter preponderates, the parts in immediate contact with the acetose juices of the mantle becoming vitrified, as it were, to a highly polished state of enamel. Great importance has been attached to the elementary structure of shells by the recent microscopical investigations of Dr. Carpenter*; his experiments have been most successfully conducted by grinding down a thin layer of shell, and placing it in dilute acid, the result being that the calcareous matter or lime decomposes, leaving a residuum of membranous tissue. On the other hand, he describes an instance of a mass in which the animal basis, a cellular tissue, had

* Report of the fourteenth Meeting of the British Association p. 1. pl. 1 to 20.

decayed, and left the calcareous portion standing in basaltiform columns, (casts of the cells) not in any way held together, and separable by the touch.

The optical irridescence of the nacreous portion of shells, commonly called mother-o-pearl, has been found by the same distinguished physiologist to be produced by the refraction of rays of light falling on the edges of the morocco-like wrinkles of laminary membranous substance. Under a high magnifying power, the nacreous surface exhibits a number of irregularly waved lines which Sir John Herschell has not unaptly likened to the appearance of the woody layers on the surface of a planed deal board. The brightest nacre is that with which the large *Avicula* of the Pacific lines its shell; and the round pearls so highly esteemed by ladies as articles of jewellery, are occasioned by its superabundant flow. Those which are most highly valued are found within and around the fleshy part of the adductor muscle, arising from disease or irritation. The proprietors of Pearl Fisheries are said to preserve these animals alive, for the sake of irritating them by the introduction of a stick or other sharp instrument, producing thereby a disorganization of the secreting gland, which causes the pearly nacre to accumulate in little pea-like balls in different parts of the body.

Reproduction and Habits.

The reproductive system of the Mollusca is in some viviparous, in others oviparous; and every kind has its allotted period and uniformity of growth. The shell in embryo, emerging either from the parent directly or from the egg, increases by the gradual deposition of mucus from the mantle in such varieties of form as are suitable to the habits and destiny of the animal. In the Cephalopods, as in the *Nautilus*, it assumes a discoidal growth, coiling upon itself on a plane with the point of the spire; in the Gastropods it either revolves obliquely round an axis in the form of an enlarging spiral, as in the *Turbo*, or it takes a simple conical structure of which the *Patella* and the *Dentalium* may be regarded as the extreme forms; in the Pteropods it presents the shape of a depressed sphere, as in the *Hyalaea*, or of a cylinder, as in the *Cuvieria*; whilst in the Bivalves (*Lamellibranchiates* and *Brachiopods*) the testaceous matter is deposited on a flat, simply convex, or concave surface, as in different species of *Pecten*, most of which modifications of structure are induced by some corresponding economy in the habits and organization of the subjects. Some shells, such as the *Cypraea*, *Mutilus*, *Pterocera* and a few others, present different appearances at different stages of growth.

The habits of the Mollusca are extremely varied and curious. In the sea they are found dwelling in zones of different depths, either free or attached to foreign substances. About the shore, and at the depth of a few fathoms, where they are most prolific, they are found in mud, among sand and gravel,

on coral reefs, under stones at low water, in the crevices of rocks, adhering to sea-weeds and other bodies, or imbedded in wood, coral, or limestone rocks. In ponds and marshes they are of a dull and stagnant nature, and live either floating on the surface or attached to weeds. In rivers they float up and down with the tide, or adhere to plants growing on the banks. And on hills and in forests they live upon the branches of trees, or creep about the roots of shrubs and amongst the decayed and fallen leaves scattered on the earth. The Mollusca, therefore, live both in and out of water; they swim, dive, float, bore, leap, climb, prey upon each other, and appear indeed to possess habits analogous in some way or other to all that have been noticed in the higher orders of animals, except that of flying.

One of the most remarkable features in the natural history of the Mollusca is the solvent property of their juices. By little or no expenditure of muscular power they are enabled to effect great changes in their condition. The *Cowrey*, after having arrived at maturity, has still the power of dissolving a great portion of its shell, and renewing it. The *Pholades* pierce the hardest limestone rocks, and increase in bulk without any apparent terebrating force, being found with the most delicate carving of their shell uninjured. Indentures are also produced by *Snails* in limestone walls, whilst in a state of quiescence. Many naturalists still adhere to the opinion that the perforations of shells are due to some mechanical action, some rotatory or oscillatory attrition; and Professor Owen attributes the formation of these cavities to the action of constant currents of water round the shells, produced by minute vibratile cilia or hairs, covering certain parts of the animal, which are in a constant state of activity in attracting the water necessary to its natural existence*. That there may be a constant current of water flowing around these imbedded mollusks for the promotion of vitality and nourishment is highly probable, but the extraordinary progress which is made, with so much apparent ease, into the hardest substances, could not be accomplished without the collateral agency of some powerful solvent. The Mollusca, as already shown in speaking of the *Cowrey*, possess extraordinary powers of partially dissolving their own shells; the inner spiral partitions of a *Cone* in an early stage of growth are thick and solid, but in an adult specimen they are mostly absorbed to a degree of tenuity which would not have given sufficient support to the primitive structure. In the varicose genera of Gastropods, such as *Murex*, the mollusk has the power of removing any portion of the varices presenting an obstacle to its revolution of growth. In the *Murex cornutus*, for example, this mode of operation may be traced, by observing, on the left side of the aperture, the base of a spine which has been removed for the purpose of paving the boundary of the aperture with the usual coating of enamel.

* Eleventh Report of the Meeting of the British Association for the Advancement of Science.

SYSTEMATIC ARRANGEMENT.

Sub-kingdom MOLLUSCA.

At the commencement of the Molluscous series we have a group of active voracious animals, the *Cephalopods**, whose physiological condition is not much inferior to the Fishes; and whose history is of especial interest, on account of their being the living representatives of a gigantic fossil race, the *Ammonites*, &c., belonging to an incalculably remote period of the world's history. They are all marine, inhabitants of deep water, and only a limited number produce a shell of any particular substance. The head and body have the appearance of an oblong bag, the upper portion of which is crowned with a number of arms or tentacles covered with suckers, and, as their name indicates, they walk with the head downwards. We now descend in the scale of organization to an extremely numerous class, the *Gastropods*† whose habits are of a more sluggish character, and whose powers of calcification are freely and multifariously exercised. They have a distinctly formed head and eyes, and, as their name indicates, acquire motion by the dilatation and contraction of an expanded gastric disc. They are marine, lacustral, and terrestrial; and all are locomotive. The next group in the order of arrangement is that of the *Pteropods*‡, a limited class of small twilight deep-water swimmers, which obtain their powers of locomotion, as their name indicates, by the aid of a pair of wing-like fins; these only produce a small brittle glass-like shell. The next class in the descending order is that of the *Lamellibranchiates*§, an extensive tribe whose mantle is divided into two lobes, each of which produces a separate piece of shell connected together by a horny ligament. None of this group have any head, and a large proportion of them are incapable of motion. The last of the Molluscous series, the *Brachiopods*|| have also a shell of two distinct pieces and are destitute of any head. Their peculiarity consists in being furnished with a pair of spiral arms, and they are differently placed within the shell. All live attached to foreign bodies.

* From κεφαλή (kephale) *head*, and πούς (pous) *foot*.

† From γαστήρ (gaster) *belly*, and πούς (pous) *foot*.

‡ From πτέρων (pteron) *wing*, and πούς (pous) *foot*.

§ From λαμέλλα, diminutive of *lamina*, from λάμνα (*lamna*) *a thin plate*, and βράγχια (*brachchia*) *gills*.

|| From βράχιον (brachion) *arm*, and πούς (pous) *foot*.

CLASS 1. CEPHALOPODA.

Animal ; abdominal portion of the body enveloped in an ample bag-like mantle, at the opening of which is the head with two conspicuous eyes and a pair of horny mandibles, the whole being crowned with arms and tentacles. Branchiæ two or four in number. Body furnished either with fins or with a shell.

Shell ; an involuted spire, open, or chambered.

The *Cephalopods* or Head-walking mollusks, so called from their manner of crawling upon their arms and tentacles with the head downwards, present an interesting link of affinity between the vertebrate and invertebrate divisions of the Animal Kingdom, between the Fishes on one side, and the operculated Gastropods on the other. Like the former, they have an internal cartilaginous skeleton, and by the aid of a caudal and pair of lateral fins, are endowed with great powers of locomotion ; like the latter, they possess the faculty of secreting a testaceous mucus, and, unprovided with fins, obtain their subaqueous powers of flight by the use of a calcareous apparatus consisting of an involuted shell.

The body presents exactly the appearance of an oblong bag crowned with arms and tentacles, provided with a number of suckers, with which they enlace their prey ; the suckers acting like cupping-glasses. The head at the opening of the bag is furnished with a strong pair of horny mandibles like the beak of a parrot, and on each side is a large conspicuous eye endowed with a strong power of vision. The sexes are separate, and in one species, the *Aryonant*, the female has the faculty of secreting a light papyraceous shell for the preservation of her eggs. They are most formidable enemies of the fishes ; their hard beaked mandibles are situated at the summit of the body, and by rising under a fish with their arms and tentacles uppermost, they are enabled to enlace and seize it in a moment. The tentacles in some instances are of immense length, and the animal throws them out like a hunting-noose to entangle its prey.*

We find mention of these remarkable animals in the earliest records of natural history, they were described by Aristotle, and have been the theme

* "Those alone," says Mr. Owen, "who have witnessed the persevering activity, power, and velocity of motion exercised by the *Octopus*, when engaged in its destructive practices amongst a shoal of fishes, and who have seen it with its beak buried in the flesh of a victim held fast in the irresistible embrace of its numerous arms, in an instant simultaneously dissolve the attachment of its thousand suckers, and disengaging itself from its prey, dart like an arrow from the net that has been cautiously moved towards it for its capture, can form an adequate idea of the acuteness of visual perception and powers of action with which this singular and unshapely Cephalopod is endowed."—*Trans. Zool. Soc. vol. ii. 1838.*

of naturalists and poets in all ages. Little was, however, known of their immediate relation with the testaceous mollusks until the appearance, during the last century, of the living Nautilus; the discovery of this well-known and remarkable shell with the soft parts was hailed with peculiar interest by the scientific world, because it opened a clue to the history of those extraordinary concremated fossils which are found imbedded in the crust of our globe. The connection between this Cephalopod and its chambered engine, at once demonstrated that the hideous Calamary and Cuttle Fish are the living types of the lost race of Ammonites, Belemnites, Scaphites, Turrilites, and others, whose many-chambered shells remain to us, in a fossil state, in such abundance and variety of forms.

Some of the naked Cephalopods afford a transition between the two kinds by the formation of an internal rudimentary shell; the Cuttle Fish (*Sepia*) produces an oval plate; the Calamary (*Loligo*) a long horny shell like a quill-pen, and the *Onychoteuthis* a thin oblong shell like a three-edged sword. The more highly organized, finned, Cephalopods naturally enjoy much more rapid powers of locomotion than those encumbered with a shell, but are less adapted to dwelling in very deep water. The Sepia is less protected against the attacks of enemies, but it is on the other hand provided with an ingenious mode of self-defence which the well-armed Nautilus does not possess. In the interior of the body is a small bag in which an intense black inky fluid is generated, and the animal has the faculty of discharging it under any alarm for the purpose of darkening the surrounding water. It is thus enabled to escape the vigilance of its pursuers by darting off in an opposite direction; and it is said to baffle its enemies by changing colour like the chameleon. The paint Sepia, so well known to artists, derives its name from the Cuttle Fish (*Sepia*); and the celebrated Chinese painting-ink is entirely made from the war-fluid of the Cephalopod. It is a curious feature, too, in the economy of these mollusks that the Nautilus with its protective shell should have no ink-bag, whilst the Belemnite whose shell is enveloped by the mantle is provided with one; a modification even ensues in the ink-bags of the shell-less kinds; those which wander defenceless on the bosom of the ocean having a more powerful and intense discharge of ink than those of more solitary habits which seek refuge in the cavities of rocks.

If any testimony were wanting beyond the only two living witnesses, the Nautilus and the Spirula, to establish the cephalopodic nature of the great fossil Ammonites and their multifarious congeners, we have it in the recent discovery of the soft parts of the Belemnite, an animal long since extinct. A specimen of Belemnite has been lately discovered in the Oxford-clay formation, a stratum of very ancient date, with not only the ink-bag, but the muscular mantle, the head, and its crown of arms, all preserved in connection with the Belemnitic shell.* It happened to be the peculiar property

* Owen, Hunterian Lectures, 1844.

of the earth in which this Cephalopod was imbedded to favour the preservation of the soft parts ; yet, from the very nature of the deposit in which it was found, it must have become imbedded during a period of our planet's existence long antecedent to all human history and tradition.

The fossil shells of the chambered Cephalopods, of which the Nautilus and Spirula are the solitary living remnants, are so peculiarly adapted to dwelling in very deep water, that they seem to tell, by their very construction, of an age in which marine must have greatly more preponderated over terrestrial space than at present ; as if, indeed, they had lived with the gigantic Saurians in the midst of the waters, "before the progressive course of the world, as we now see it, took its first departure" *.

An extensive tribe of very minute chambered bodies called the *Foraminifera* was referred to this class until very recently, on account of the relation which they were thought to exhibit with the Nautilus shell ; and the structure of the Spirula, on its discovery by Pèron and Lesueur, was regarded as an undeniable proof of their cephalopodic nature. M. D'Orbigny investigated their extraordinary varieties of formation with the most patient ingenuity ; and divided them into upwards of fifty genera. "An important service has been rendered to science by the discovery of the Spirula," said Lamarck, and M. Deshayes, amongst others, exclaimed, "it is without contradiction one of the most important facts with which science has been enriched." It has, however, been fully demonstrated by M. Dujardin, on the shores of the Mediterranean, that these many-shaped microscopic bodies are nothing more than the cells of an inferior group of Zoophytes called *Rhizopoda*.†

The class of Cephalopods is divided by Mr. Owen and M. Deshayes into two orders, according to the number of their branchiæ or gills ; one group, in which the Argonaut and Spirula occur, having only one pair of breathing organs, *Dibranchiata* ‡, the other of which the Nautilus is the only living example having two pairs, *Tetrabranchiata* §. I shall not, however, avail myself of this arrangement, because a difference in the number of the branchiæ seems scarcely of sufficient importance to warrant the association of the Spirula with the Argonaut, separate from the Nautilus. Lamarck associated the Spirula with the Nautilus, separate from the Argonaut, by reason of their many-chambered shells, but a subsequent investigation of the soft parts has shown that arrangement to be still more open to objection. Are not these mollusks sufficiently distinct to constitute the types of three respective Orders ? The Argonaut has eight arms, each having two rows of suckers, the shell being simply involuted and not chambered ;—the Spirula has eight short arms, with minute promiscuous suckers, and two tentacles with a club at the end, the shell being involuted, tubular, chambered, and

* Whewell, Hist. Induct. Sci.

‡ Two-gilled.

† Deshayes, Anim. sans vert., vol. xi. p. 177.

§ Four-gilled.

enclosed within the lower part of the mantle;—the Nautilus has no arms, but a mass of some thirty or forty sheathed tentacles, a hood or covering, an additional pair of gills, and a chambered shell with the whorls involuted one upon the other, containing the animal in its outer porch. I proceed at once, therefore, to the consideration of them as genera.

ARGONAUTA. SPIRULA. NAUTILUS.

GENUS 1. ARGONAUTA, *Linnæus.*

Animal; body subglobose, crowned with eight long arms, each having two rows of suckers, the two front arms furnished with minute secretive vessels and developed at the extremity into an elastic membranous web. Two branchiae.

Shell; very thin, elastic and permeable to light, boat-shaped, not chambered, slightly convoluted into a discoid spire, which is double-keeled and partially immersed within the aperture; keels more or less tuberculated.

The Paper Nautilus and the Pearly Nautilus Shells, though both of cephalopodic origin, are of very different composition and design. The Pearly Nautilus is a shell of rather elaborate structure, presenting a formidable protection to the soft parts, partitioned off into chambers by the aid of which a vacuum is produced of sufficient buoyancy to sustain the great pressure of water to which the animal is exposed in its deep region of habitation. The Paper Nautilus, or Argonaut, is merely a light elastic case, constructed by the female of a naked Cephalopod, for the preservation of her eggs; a sexual provision subservient to the generative economy. No Argonaut shell has been discovered with a male inhabitant, although many have been taken in the Mediterranean with the female, in company with the well-known octopod of the Neapolitan market.

Assuming the Argonaut to be really the mate of the Octopus, I scarcely know a more beautiful adaptation of means to an end than is to be found in this hideous-looking animal. The two front arms with its suckers are furnished with minute secretive glands and each extremity is modified into an expansile membranous web, endowed with a feeble power of calcification, similar to that in the mantle of other mollusks. They are capable of very considerable expansion, and deposit a thin wavy layer of shell matter forming a symmetrical boat or ear, the discoid portion of which serves as a receptacle for the eggs. According to the observations of M. Rang, who relates the circumstance of his having seen several living Argonauts whilst rowing in a boat in the Port of Algiers, the velamentous arms are extended

to the top of the keel, so as to form a bridge * over the cavity which contains the eggs, the suckers corresponding to the tubercles, with the membranes expanded over the shell and the arms floating in a horizontal mass, as represented in Plate *B*. He describes the Argonaut as obtaining its progress through the element, shell foremost, not by any exertion of the arms, but by the successive injection and ejection of water in and out of the branchial cavity, the shell being firmly sustained within the embrace of the velamentous membranes.

The Argonaut shell, it may be observed, is not moulded on the body, but is secreted from without, with little or no attachment to the animal; and, on this account, it was a long time before naturalists could bring their minds to believe that the animal usually found in this shell was any other than a parasite; a naked octopod which took up its dwelling, like the Crabs, in this particular kind of shell, of which the fabricator and lawful owner had escaped detection. The matter has, however, been entirely set at rest by the observations of M. Rang, above quoted, and by the praiseworthy exertions of a lady, Madame Jeanette Power, resident at the port of Messina. She captured a number of Argonauts on the coast, and, keeping them alive in a large cistern, performed such a course of experiments as left no doubt of their relationship. It was noticed, for example, that the animal, exactly at the moment of sexual stimulus, withdrew its body from the discoid portion of the shell which it had hitherto filled, and there deposited its eggs;—that in twenty-five days after oviposition the young Argonaut came forth from the egg, a naked octopod:—and that in twelve days more the two front arms became dilated at the extremity into a pair of membranous webs, and commenced forming a thin filmy shell.

These experiments were not, however, conducted without great perseverance on account of the difficulty of preserving the animals alive. The cephalopodic nature of the Argonaut has been so fully established by the enterprising researches of Madame Power, that it is quite unnecessary to repeat the numerous arguments that have been since adduced in support of her conclusions. The most remarkable is that recently put forth by M. Deshayes, and derives additional interest from the circumstance of that illustrious naturalist, together with M. De Blainville, having been for more than fifteen years a supporter of the parasitic theory. “I have found,” says M. Deshayes, “a special system of secretion throughout the whole of the anterior portion of the brachial membranes,” and he goes on to relate that the shell, upon being subject to a chemical analysis, proves to be composed of two distinct laminæ, different from that of the Gastropods; and that the calcareous portion being removed by acid, the parenchymatous residuum

* La partie inférieure des deux grands bras, bien tendue, formait comme un pont sur la cavité laissée entre le dos du mollusque et la portion rentrante de la spire ou flottait l’extrémité d’une grappe d’œufs.”—Rang, *Documents pour servir à l’hist. nat. des Céphalopodes*, p. 21.

consists of a number of vesicles, such as are presented in the microscopic structure of the Cuttle-bone, agreeing both in size and number with the minute organs of secretion dispersed throughout the calcifying membranes*.

The membranous webs are not, therefore, expanded aloft as sails to catch the breeze, as represented, not only by Pope † and Byron ‡, but by Cuvier §; I cannot, indeed, learn upon what authority the animal has ever been seen to uplift its membranes at all ||; on the contrary, the structure of these pseudo-sails has been shown to be incompatible with the notion ¶. The Rev. L. B. Larking, a most enthusiastic lover of natural history, to whom my thanks are due for much valuable information on the habits and economy of this animal, happened to be on a visit at Messina some two or three years since during a tempestuous season, peculiarly favourable to the observation of the deep-water inhabitants of the ocean. In the space of a few months he collected more than twelve hundred Argonaut shells of all sizes, many of which with the animals preserved in spirits I have had the pleasure of examining. He never saw one floating on the sea; they were thrown up from deep water, and such as retained the animals were brought to him alive in pails. The velamentous arms were not stretched over the keel of the shell, as described by M. Rang, but were merely expanded, from fright probably, through the nick on each side; the animals protruded considerably from their shell and endeavoured to make their escape by performing a

* Animaux sans vertèbres, vol. xi. p. 354.

† "For thus to man the voice of Nature spake,
Go, from the creatures thy instruction take,
Learn of the little Nautilus to sail,
Spread the thin oar, and catch the driving gale."

‡ "The tender Nautilus who steers his prow,
The sea-born sailor of this shell-canoe,
The Ocean-Mab, the fairy of the sea
Seems far more fragile, and, alas, more free;
He, when the lightning-winged tornadoes sweep
The surf, is free, his post is in the deep,
And triumphs o'er the armadas of mankind,
Which shake the world, yet crumble in the wind."

§ Quand la mer est calme on en voit des troupes naviguer à la surface, employant six de leurs tentacules au lieu de rames, et relevant, dit-on, les deux qui sont élargis pour en faire des voiles; si les vagues s'agitent ou qu'il paraisse quelque danger, l'argonaute retire tous ses bras dans sa coquille, s'y concentre et redescend au fond de l'eau."—Cuvier, *Le Règne Animal, nouv. edit.* 1830. p. 13.

|| Ce que l'on a débité depuis Aristote, mais surtout dans ces derniers temps, sur la manœuvre habile du poulpe de l'Argonaute voguant à l'aide de voiles et de rames à la surface de l'eau, est faux. Nous le déclarons, nous n'avons rien vu, dans les habitudes et les manœuvres de ces animaux, qui ressemblât à choses qui en ont été dites, véritables fables qui n'ont été conservées, chez quelques auteurs, que par leur amour du merveilleux.—Rang, *Doc. Nat. Hist. Ceph.* p. 18 and 14.

¶ "These membranes have been described by naturalists and poets, from Aristotle and Callimachus down to Cuvier and Byron, as serving the office of sails; the animal being supposed to have the power of rigidly extending the soft fleshy arms which support the membranes, and maintaining the latter tensely outstretched to meet the breeze. It is scarcely necessary to observe, that the structure of the parts in question is incompatible with this hypothesis of the use of the *vela* in navigating the frail boat of the Argonaut. It has been ascertained, indeed, by direct observation, that these *vela*, or rather *velamenta*, have not only a relation of co-existence, but one of direct physiological import to the development of the shell, serving as the organs both of secreting and of retaining this part."—Owen, *Observations on the Argonaut.*

constant succession of muscular jerks, driving the keel of the shell with great violence against the side of the pail. They rarely lived more than a day or two, and by shaking them out of the shell they died in a few hours.

From the delightful intercourse and correspondence which I have enjoyed with my excellent friend on the subject of this *verax animalia*, I should suppose the Argonaut to be an animal exceedingly sensitive of danger; that under any alarm the velamentous arms are partially, if not altogether, withdrawn through the lateral nicks of the shell, and that under these circumstances it has great difficulty in maintaining its attachment. It has, moreover, been established beyond the possibility of contradiction, that the animal being disengaged from its shell has not the power of re-entering it; and that being liberated, it languishes and dies in the course of a few hours.

The geographical distribution of the Argonaut is confined, as far as we know at present, to the old world; the *A. argo* is an inhabitant chiefly of the Mediterranean, and the *A. tuberculosa* of the Cape of Good Hope, New Holland, and the Molluccas. I have not seen the animal of the latter species; it was, however, figured more than a hundred years ago by Rumphius*, and Dr. Hooker, the learned author of the 'Flora Antarctica', informs me that several living specimens were seen during the Antarctic Expedition off the Cape of Good Hope.

ARGONAUTA ARGO. Plate *A*.—View of the animal having relaxed its prehensile embrace of the shell and about to die, showing the eight arms with two rows of suckers on each, the two front of which are represented with the membranous webs contracting, to the left; the mouth and horny mandibles, in the centre; and the funnel or organ of secretion, to the right; *a* a sucker, enlarged. *From a specimen taken alive at Messina by the Rev. L. B. Larking.*

Plate *B*.—View of the animal in full health and vigour under water, showing the manner in which it swims with the shell, keel foremost, held within the embrace of its velamentous arms. *From the figure of a specimen observed at Algiers by M. Rang, slightly altered from observations made by the Rev. L. B. Larking at Messina.*

Species.†

- | | | |
|----------------------------------|-------------------------------------|--------------------------------------|
| 1. <i>argo</i> , <i>Linn.</i> | 3. <i>haustum</i> , <i>E. Méth.</i> | 5. <i>raricosta</i> , <i>Blainv.</i> |
| 2. <i>cymbium</i> , <i>Linn.</i> | 4. <i>nitida</i> , <i>Lam.</i> | 6. <i>tuberculosa</i> , <i>Lam.</i> |

* Thesaurus imaginum, &c., pl. xviii. f. 1 to 3. The Hague, 1739.

† For references to where the species throughout the work are described and figured, synomyms, &c., see 'The CONCHOLOGIST'S NOMENCLATOR' by Agnes Catlow.

GENUS 2. SPIRULA, *Lamarch.*

Animal; body contained in an oblong mantle, entirely free at the opening, and terminating at the edge in three short festooned processes, two behind, between which the funnel protrudes, and one in front; lower half of the mantle enclosing a tubular shell convoluting over towards the front, with the narrow portion at the back; base of the mantle furnished underneath with a dark leathery gland, having a round cavity or orifice in the centre and a short semicircular fin on either side; head prominently rising out of the opening of the mantle, entirely free from it, crowned with eight short acuminate arms and two rather long tentacles; arms promiscuously furnished on the inner surface with minute granular suckers; tentacles terminated by a small rounded indented club.

Shell; a thin transparent diminishing tube convoluted into a discoid spire of which the whorls are not contiguous, and partitioned into chambers by concave septa, with a continuous siphon passing through the inner side.

The history of the Spirula is one of especial interest from the circumstance of its shell, as in the case of the Nautilus, having been collected in great abundance long antecedent to any discovery of the soft parts. The shell was figured during the latter part of the seventeenth century by our countryman Lister, but we find no vestiges of the animal until the appearance in Paris of a somewhat mutilated specimen, collected by an eminent French voyager, M. Pèron. In M. Pèron's example of the Spirula the tentacles were broken off to about the length of the surrounding arms, but it was sufficiently perfect in other respects to assist Lamarck in establishing the cephalopodic relation which the chambered construction of its shell had suggested with the Nautilus. An important difference, however, presented itself in the relative position of the animal and its shell as compared with the Nautilus. Instead of the lower portion of the body being capable of fitting into an aperture or outer chamber, as Rumphius' figure of the Nautilus indicated by its size and the appearance of a ligament fitting to the siphonic tube, it was found to contain the shell, or chief portion of it, within,—a decapodous Cephalopod having the well-known little spiral shell enflanked within the lower part of the mantle. No other example of the Spirula presented itself for upwards of thirty years, when a

decapitated specimen was brought to Paris by M. M. Robert and Léclancher, which enabled M. De Blainville to declare, in addition to the observations of Lamarck, that the animal has a pair of terminal fins, and that the branchial cavity contains only one pair of gills.* Another specimen was brought home by Mr. Cranch, in the Congo Expedition, still more mutilated; indeed, Mr. Gray informs us that it had only a fragment of the mantle remaining attached to the shell, but sufficient to show that the microscopic structure of the skin is similar to that of the Cuttle-fish. Nothing is added to the foregoing account in the eleventh volume of M. Deshayes' edition of the 'Animaux sans vertèbres', recently published in Paris; and it is, therefore, with peculiar satisfaction that I am enabled, through the kindness of Mr. Cuming, to present my readers with the description of a magnificent specimen, now before me, perfect in all its parts except in the termination of one of the tentacles; and considerably larger than that found floating on the sea by M. Pèreon, represented in the Encyclopédie Méthodique. Mr. Cuming's specimen, figured in plate A, was obtained about a twelvemonth since in New Zealand by an intelligent traveller and lover of natural history, Mr. Percy Earl; he was standing one day on the beach at Port Nicholson when the animal was washed ashore in his presence, and he immediately secured it and put it in spirits. A notice of it was published on its arrival by Mr. Gray in the 'Annals of Natural History', for April, 1845.

This interesting little Cephalopod partakes in very slight degree of the character of the proximate genera. It has the same number of arms as the Argonaut, but there are two tentacles in addition as in the Cuttle-fish, about five or six times the length of the arms, and terminated by a small rounded indented club. The suckers are not arranged in a double row, as in the Argonaut, but are sprinkled in a somewhat irregular manner over the inner surface of the arms; they are, moreover, exceedingly small, and have more the appearance of a sprinkling of coarse sand. Like the Nautilus the Spirula has a chambered siphonated shell, but instead of it being external and serving as a protective shield to the soft parts, it is internal, imbedded within the lower part of the mantle, and the siphon instead of passing through the centre of the chambers, is on the inner side. It is somewhat difficult, under these circumstances, to account for the shell being found in such abundance†, whilst the animal has so long evaded the pursuit of naturalists. The shell is not dependent on the attachment of a muscle as in the Nautilus, nor on the prehensile embrace of a pair of arms as in the Argonaut; the soft parts must apparently decompose before the shell can be

* Annales francaises et étrangères d'Anatomie et de Physiologie pour l'année 1837, vol. 1, p. 369.

† Dr. Hooker, the enterprising Botanist of the Antarctic Expedition, informs me that at Paroal Bay, New Zealand, he saw thousands of the Spirula shell scattered on the shore; and M. Menke describes it as being frequent on the coast of New Holland.

released. In the specimen before me, the shell is exposed to view on each side as represented in the plate; but I quite agree with Mr. Gray, in believing that it is entirely concealed during the life of the animal; from the ragged edges of the skin it has all the appearance of having contracted and burst, either in drying, or from its contact with the spirits in which it was plunged.

In perusing the Memoirs above alluded to of M. De Blainville, in 1837, and Mr. Gray, in 1845, it may be observed that the second proposition established by the former in reference to the Spirula, is, that it has a pair of terminal lateral fins “*2° il a une paire de nageoires laterales et tout-à-fait terminales*”; whilst the latter author affirms on the other hand “it differs from the Cuttle-fish in being entirely destitute of any fins.” The terminal fins are so much contracted in this specimen that Mr. Gray appears to have overlooked them; they are clearly definable, one at each lateral extremity, on either side of the terminal gland, so that I am fully able to confirm the observation made by M. De Blainville.

The use and connection between the shell of Spirula and the soft parts still remain to be explained*; a curious vignette is given by Martini, Conch. Cab. vol. i. p. 260, representing a fossil slab, in which the shell is elongated into a straight tube, but nothing certain can be ascertained until the animal is fairly dissected. At present Mr. Cuming is desirous of preserving the specimen under consideration entire, fully anticipating that with the instructions forwarded to some gentlemen in New Zealand, it will not be long before others are obtained.

SPIRULA PERONII. Plate A.—Fig. *a*, Back view of the animal showing the funnel protruding from the upper part of the mantle, the narrow end of the shell, with the terminal fins very much contracted. *b*. Side view showing the eye, rather obscured, and the lateral extent of the shell. *c*. Front view showing the broad end of the shell the terminal fins at the base, &c. *d*. Under view of the basal gland. *e*. Back view of the shell, showing the siphon in the outer chamber. *f*. Lateral view of the shell. *From a specimen in the possession of Mr. Cuming, collected by Mr. Percy Earl at Port Nicholson, New Zealand.*

No other species known at present.

* Mr. Gray says on this head, in his Memoir in the ‘Annals Nat. Hist.’, “I am informed by M. Clausen that he had several specimens of this animal alive, and kept them some time in a vessel filled with sea-water, and that they had the power of ascending and descending at pleasure.” This assertion, though highly probable, should, however, be received with caution; it seems difficult to imagine how any one with the observation displayed by M. Clausen, in keeping several of the Spirulae alive in sea-water, could have failed to communicate specimens accompanied with that intelligence of their structure and habits which naturalists have so long desired to receive.

GENUS 3. NAUTILUS, Aristotle.

Animal; body forming an oblong mass a little compressed at the sides, the upper half enclosing the head and muscular portion, the lower half the soft and visceral portion, contained in a thin bag-like mantle, rounded at the base in a manner adapted to the cavity of the shell, encircled by a horny girdle by which it is attached to the inner wall of the shell, and terminating with a central tubular membranous process or artery which passes throughout the siphon of the shell to the nucleus of the innermost chamber. Head at the upper opening of the mantle furnished (according to Owen^{*}) with ninety tentacles, thirty-eight digital, four ophthalmic, and forty-eight labial. No arms or suckers. Back of the mantle extending into a broad fold, falling back on the black involuted convexity of the shell. Front of the mantle with an opening through which passes the funnel or vent-tube consisting of a thin fleshy substance the lateral edges of which overlap one another. Back of the head surmounted by a dense leathery lid or hood, which being hollow behind appears to fall backwards on the shell, and forwards over the head, closing in the tentacles and all the delicate structures after the manner of the operculum in the Gastropods. Four branchiæ. No ink-bladder.

Shell; orbicular, consisting of a compressed cone, convoluted, in symmetrical order, in close spiral whorls one over the other upon the same plane; more or less umbilicated externally at the axis of convolution. Three-fourths of the shell partitioned into chambers, about thirty-five to thirty-eight in number, by thin internally convex septa, in the centre of each of which is a short siphon or spouted appendage. Inner surface of the shell pearly, outer surface dull white, the involuted portion being painted with conspicuous chesnut-brown flames striking out of the umbilicus, which is sometimes overlaid with matter deposited by the hind fold of the mantle.

The Pearly Nautilus, as observed in treating of the Cephalopods generally, is an object of especial interest to the Conchologist, on account of it being

* Hunterian Lectures, 1843.

the chief living remnant of a vast tribe of mollusks which must have existed at a very early period of the world's history ; and whose shells exhibit a structure peculiarly indicative of their being inhabitants of very deep water. The archetype of this fossil race is itself an animal of comparatively ancient date, for it is mentioned with brief but marvellous accuracy in the oldest record extant on the subject of Natural History. The first scientific Expedition of which we have any account, is one in which the philosopher Aristotle was sent by Alexander the Great, more than three hundred years before Christ, for the purpose of collecting subjects for a History of Animals. In this enterprise he appears to have met with both the Paper and the Pearly Nautili ; for in Scaliger's translation of the 'Historia Animalium', he says, after describing the different forms of naked Cephalopods which no doubt abounded in the Asiatic seas, "there are also two other kinds of Polypes which are in shells, the one (meaning the Paper Nautilus) has a shell which is not naturally adherent to it, it feeds very frequently near the land, and being cast by the waves on the sand, the shell slips, and it dies ; but the other (the Pearly Nautilus) is in a shell in which it exists after the manner of a Snail, and outwardly extends its arms."* Nothing was added to this account during the dark ages that succeeded Aristotle, nor till some time after the revival of letters. No further information respecting the Nautilus was obtained until the discovery of a living specimen about the commencement of the eighteenth century, by a Dutch merchant and naturalist, resident at Amboyna, of the name of Rumphius. His drawing of the soft parts separated from the shell† was greatly valued ; for more than a century elapsed before another specimen was found, although the shells were cast ashore in comparative abundance. This specimen, which was transmitted to Professor Owen of the Royal College of Surgeons, formed the subject of an elaborate Memoir‡, and may be said to have been the first to confirm the history of this remarkable animal given more than 2000 years before by Aristotle.

The great Cuvier, who achieved so much for the natural history of the Animal Kingdom, looked with anxious solicitude, no doubt, for the soft and living portion of the Nautilus, but the dessection was reserved, for a no less skilful operator of the present day. A female Nautilus was captured in 1828 by Mr. George Bennett in Marekini Bay, at the Island of Erromanga, New Hebrides ; it was seen floating alive on the surface of the water, and was just about to sink when a sailor caught hold of it with a boat-hook. The right eye was almost shattered in the struggle to secure it, and the shell being much broken it was injudiciously removed. Two years unfortunately

* Aristot. de Animal, Scaliger, 1619.

† Thesaurus imaginum, &c., Pl. xvii. f. B.; The Hague, 1739. Reproduced by Martini, Conch. Cab. vol. 1. p. 222. vign., Nurnberg, 1769.

‡ Owen, Memoir on the Pearly Nautilus, 1832.

elapsed before the soft parts, preserved in spirits, reached England; they were presented to Professor Owen; and although a minute portion of shell adhering to one of the lateral expansions of the belt was all that remained of the original framework, he succeeded by a train of analogy to establish the relation of the whole. His celebrated 'Mémoire', which was the result of this investigation, appeared in 1832, and to the severe disappointment of the author, the illustrious Cuvier, who would have hailed the discovery with so much real delight, died only a few days before it issued from the press.

The soft parts of the Nautilus, of which, as in the case of the Argonaut, no male has been found, form a kind of oblong mass such as may be supposed capable of fitting into the porch or aperture of the well-known shell. The outer portion encloses a well-developed head furnished with a pair of strong horny mandibles, a number of sheathed tentacles, a pair of large eyes, and a number of delicate structures including the organs of hearing, smelling, &c., and over all there is a capacious leathery hood which has been likened by Professor Owen to the operculum in the Gastropods. The lower portion of the body contains the viscera from which proceed a funnel or vent-tube beneath the tentacles. The back part of the mantle is produced into a fold which overlaps the convexity of the shell, and at the lower extremity of the body is a central tubular membrane which passes into the siphonic aperture. The animal is attached to the shell by this flexible membrane which passes through all the whorls to the inner wall of the first-formed chamber, and by a broad muscular belt around the circumference of the abdominal sack. At the back of the hood is a concavity fitting to the convexity of the shell, so that it appears to have a hinge-like movement like the lid of a box, and is adapted to close over the tentacles and all the delicate parts of the head. There is no ink-bag in the Nautilus*. The growth of the shell may be supposed as follows:—the animal in embryo constructs a simple hollow

* In mentioning the circumstance (p. 15) of the paint Sepia, so well known to artists, having derived its name from the Cuttle-fish (*Sepia officinalis*), I most inadvertently gave currency to a popular error that the celebrated Chinese ink is manufactured from the ink-fluid of the Cephalopod. I am enabled, however, thus early, to correct this absurd notion, through the kindness of a most zealous patron of the natural sciences, John Reeves, Esq., F.R.S., &c.; a gentleman whose life and energies have been so intimately associated with all that concerns the physical history of China, that I am sure the following extract from his communication will be read with much interest.

"With whom the idea originated that the China ink was made from the liquor of a *Loligo* I do not know, it has been handed down from book to book for a very long time; but I am sure you would not intentionally continue the error, especially in such a work as you have commenced.

"The Jesuits, who were permitted free access in China during the reign of the Emperor Kang He, and who then made many proselytes, had opportunities which none other had of acquiring an insight into the various manufactures; and the result of their enquiries is given in Du Halde's 'History of China,' fol., Paris, 1735.

"The English folio edition of this was published in two volumes, London, 1738; and, in the first volume, p. 370–2, you will find a full account of the manufacture of ink. I have the means of knowing from the manufacturers themselves that his account is correct;—that the basis is the soot from the smoke of oil-lamps, a sample of which I brought from China, and of which I send you a specimen.

"J. R.

shell, forming the nucleus of a spiral coil, in which it produces a vacuum by the secretion of a transverse septum, in order to meet the increasing pressure of the surrounding element consequent on its increase of bulk. This operation is repeated between thirty and forty times during the growth of the animal by a periodical slipping of the muscular girdle from the shell, precaution having been first taken to secure itself to the first-formed chamber by the flexible tubular membrane which passes through a short spouted pipe or siphon in the centre of each. The marks of attachment of the girdle may be seen in every chamber. The Nautilus thus chambers in the vacated portion of the shell in order to assist its specific gravity under the different variations of pressure to which it is liable in its passage through the ocean. The natural position of the animal when crawling at the bottom of the ocean being, as in other Cephalopods, with the head downwards, the shell is uppermost and buoys it up, and the periodical slip of the muscle of attachment most probably takes place when in this supine position. With every relaxation of the membrane and muscle the shell must naturally rise and coil upon itself; and I think the use which I here venture to assign to the membrane, the remains of which may be found in shells, extending throughout the entire length of the siphon, admits of very reasonable construction.

Little is known of the habits of the Nautilus beyond the circumstance of Mr. Bennett's specimen having been seen floating alive on the water and preparing on alarm to descend, and that contained in the curious narrative of Rumphius quoted by Owen*. The accounts are, however, considered by

The following extracts relating to the manufacture of China Ink are from the work alluded to.

"The ink the Chinese use is made of lampblack, which they get by burning several sorts of matter, but chiefly pine-wood or oil. They mix perfumes with it, to correct the strong and disagreeable smell of the oil. They incorporate together these ingredients till they come to the consistence of a paste, which they put into divers wooden moulds. These moulds are well and variously wrought in order to print upon the paste what figures they please. The usual impressions are of men, dragons, birds, trees, flowers, and the like."

"The best ink is made at *Whey chew*, a town in the province *Kyang nan*. There are many things to be observed in the making of it, and it has several degrees of goodness; according to which it is dearer or cheaper.

"They put five or six lighted wicks in a vessel full of oil, and lay upon this vessel an iron cover made in the shape of a funnel, which must be set at a certain distance so as to receive all the smoke. When it has received enough they take it off, and with a goose's feather gently brush the bottom, letting the soot fall upon a dry sheet of strong paper; it is this which makes their fine and shining ink. When they have in this manner taken off the lampblack, they beat it in a mortar and mix with it some odoriferous water, with a thin size to unite the particles.

"We are assured that in the city of *Whey chew*, where the ink is made which is most esteemed, the merchants have great numbers of little rooms, where they keep lighted lamps all day; and that every room is distinguished by the oil which is burnt in it, and consequently by the ink which is made therein."—DU HALDE, *History of China*, fol. ed. 1738, vol. i. p. 370–1

* "When he thus floats on the water, he puts out his head and all his barbs (tentacles), and spreads them upon the water, with the poop (of the shell) above water; but at the bottom he creeps in the reverse position, with his boat above him, and with his head and barbs upon the ground, making a tolerably quick progress. He keeps himself chiefly upon the ground, creeping sometimes also into the nets of the fishermen, but after a storm, as the weather becomes calm, they are seen in troops floating on the water, being driven up by the agitation of the waves. Whence one may infer, that they congregate in troops at the bottom. This sailing, however, is not of long continuance; for having taken in all their tentacles, they upset their boat and so return to the bottom."—D'Amboinsche Rariteit-kamer, p. 91. fol. Amsterdam, 1741.

the same author sufficient to state that the animal "makes his way along the sand with a moderate degree of rapidity, with his house above him; and though in general dwelling in the deep, has the power of rising and floating on the surface."* And M. Valenciennes considers that its motion in swimming may be attributed to the same force as that ascribed by M. Rang to the Argonaut; namely the injection and ejection of water in and out of the branchial cavity.† It now only remains to be ascertained whether the different mutations of pressure which the Nautilus must have to sustain in its passage through the element, are not counteracted by the alternate production of vacua and introduction of water in the chambers of the shell. Certain it is that the Nautilus in its floating position has neither arms capable of rowing nor membranes adapted for sailing, as so prettily described by a poetical philosopher of the present day.‡

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**NAUTILUS POMPILIIUS.** Plate C.—Lower figure, lateral view of the shell.

Upper figure, lateral section of the shell showing the chambers, siphon, and full extent of the animal; *a*, the funnel; *b*, the tentacles; *c*, the hood; *d*, the hind fold of the mantle. *Reduced from Professor Owen's figure of the specimen captured by Mr. Bennett in Marekini Bay.*

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Species.

1. *Pompilius*, Linn. 2. *scrobiculator*, Gray. 2. *umbilicatus*, Linn.

* "In whatever degree the shell is developed in the Cephalopodous Mollusks, we find it invariably characterized by the symmetry so peculiar to the disposition and general form of their soft parts: but the extent to which the Pearly Nautilus is covered by its shell, and its close attachment to it, indicated the affinity to the Gasteropods in too strong a manner to escape the penetration of Aristotle, who directly compares it in this respect to a snail; and the general resemblance must be sufficiently striking when, with his house above him and in the supine position, he makes his way along the sand with a moderate degree of rapidity."

"Respecting the economy of the fossil genera, we may infer from *Nautilus* that they were chiefly confined by the limitation of their locomotive faculties to creeping at the bottom of the sea, and that one of the offices assigned to them in the scheme of nature was to restrain within due limits the crustaceous and testaceous tribes around them. Granting them, indeed, the power of rising and floating on the surface, yet their navigation was in all probability of a passive kind, or influenced only by the re-action of the respiratory currents when expelled by the funnel upon the surrounding medium; and at all events it can no longer be supposed to have been aided by the fabled sails and oars of the Argonaut."—OWEN, *Memoir on the Pearly Nautilus*, p. 52–3.

† Il nage avec facilité dans le sein des eaux en faisant sortir avec force la grande quantité d'eau contenue dans sa cavité branchiale.—VALENCIENNES, *Archives du Muséum d'Hist. Nat.*, 1839.

‡ "The Nautilus and the Ammonite
Were launched in storm and strife;
Each sent to float, in its tiny boat,
On the wild, wild sea of life.
And each could swim on the ocean's brim,
And anon, its sails could furl;
And sink to sleep in the great sea deep,
In a palace all of pearl."

RICHARDSON; *Sketches in Prose and Verse.*

Erratum. In speaking of the geographical distribution of the Argonaut at p. 15, it is described as being confined, as far as we know at present, to the old world. Mr. Cuming has since informed me that he has received specimens of that genus from Valparaiso, Bahia, and Panama, as well as from Curacao, one of the Caribbean Islands.

CLASS 2. GASTEROPODA.

Animal ; body elongated, anterior extremity furnished with a more or less prominent head, posterior extremity mostly developed into an attenuating spiral, invested with a lubricous mantle, producing a shell of varied structure and solidity ; head mostly furnished with tentacles, varying from two to six in number, with a pair of eyes situated at different parts of the tentacles ; mouth furnished with hard parts, or with a flexible retractile trunk of various length, armed at the extremity with small teeth. Branchiae respiring air or water, either concealed or exposed.

Shell ; calcareous, in some instances horny, either simply conical, or convoluted into an enlarging spire, mostly enclosing the animal, but sometimes internal, or covering only a limited portion of it.

The Gastropods comprise that extensive series of mollusks which acquire motion by the alternate dilatation and contraction of a gastric or ventral disc. Their typical structure is that of a long drawn out conical mass, of which the attenuated portion, contained in an enlarging spiral shell, is occupied by the soft and visceral parts, whilst the broad extremity, protruding from the aperture of the shell, comprises the head, mantle, nerves, muscles, gills, &c., and also a broad fleshy muscular expansile disc, mostly attached to the neck, called the foot, by which they acquire motion.

By far the greater portion of the class are of this structure ; those inhabiting a spiral shell are, indeed, necessarily so. In the spiral Gastropods, the abdominal portion of the mollusk is contained within the shell, whilst the fleshy disk, attached to the neck, is exserted for the purpose of locomotion ; but in the non-spiral Gastropods, such as the Chitons, Limpets, and Slugs, the abdominal parts are all of a mass, and not separated from the disk. Lamarck confined the term *Gasteropoda* to the latter division ; the former section he distinguished by the title of *Trachelipoda** or neck-moving Mollusks, but the affinity between the Snail (*Helix*) and the Slug (*Limax*) is of too intimate a character to allow of so important a separation.

The Gastropods are extremely numerous in species, and of considerable interest, both on account of their extraordinary varieties of form, colour, and sculpture, and of their curious diversity of habit. Most of them are marine, some are fluviatile, some dwell in lakes and stagnant pools, whilst a large proportion are terrestrial, or arboreal ; and as their breathing appa-

* From *τράχηλος* (trachelos) neck, and *πούς* (pous) foot.

ratus is necessarily adapted to the different media they inhabit, the corresponding conditions of the respiratory organs, together with certain modifications in their arrangement, have been selected as characters for the primary distribution of the class into Orders; before speaking, however, of the systematic arrangement of the Gastropods, a brief account should be given of their structure and general economy.

The *head*, as in the higher orders of animals, forms the anterior extremity of the body, and is mostly rounded and prominent. It is furnished with from two to six *tentacles*, or feelers, and the *eyes*, never exceeding two in number, are situated sometimes at the base of the tentacles, in some instances at the summit, and often at some intermediate part. The tentacles are rather sensitive to the touch, and in some genera the mollusk possesses the faculty of withdrawing them by inversion, an action which Lamarck describes as being accomplished by the aid of a nerve reaching internally to the summit.

The *nervous* system of the Gastropods is represented by three ranges of cords or ganglions, termed the cerebral, as relating to the head, the pallial, as relating to the mantle, and the branchial, as relating to the gills; the principal of these, the cerebral ganglions, seated in the head and vicinity of the oesophagus, or gullet, and called on that account by M. Deshayes the oesophageal circle, was termed by Lamarck the brain; but their relation with that organ in the vertebrate animals is one of very remote analogy.

The *respiratory* apparatus of the class consists, in the water-breathing kinds, of two or more *branchiae* or gills, sometimes exposed, but mostly concealed; in the air-breathing kinds it consists of a net-bag or lung; and in those which are amphibious it presents a modification of both.

As the breathing organs of the Gastropods are necessarily modified to the different media they respire, so are the *mouth* and *alimentary* organs adapted to the diversified nature of the food they devour. Most of the terrestrial kinds are herbivorous, feeding upon leaves; of the large proportion of marine species some few are fucivorous, feeding upon seed-weed, whilst the rest are carnivorous, devouring many of their own nature and other living organized matter, besides offal in all stages of putrifaction. The mouth of the herbivorous kind is furnished with a horny armature on the upper lip only; in the carnivorous species, the mouth is furnished with a rasping plate or tongue, or a pair of dentated jaws, or a flexible retractile trunk, susceptible of elongation or concealment within the body, the extremity of which is cleft and supplied with numerous small recurved teeth capable of considerable execution. The common Whelk of our market has a retractile trunk; and the circular hole which is sometimes found drilled in bivalve shells is supposed to be due to the agency of this destructive organ.

Of the *muscles* it is only necessary for the present purpose to speak of such as serve for the attachment of the shell. In the simple univalves, the

muscle of adhesion sometimes encircles the back in the form of a horse-shoe, as in *Siphonaria*, whilst in the cup-and-saucer Limpets (*Calyptrea*) it is attached to the cup-shaped appendage by which that group is characterized. In the spiral Gastropods the shell is connected by a thin riband-like muscle which has its point of attachment on the axial pillar or columella; and it is by the elasticity of this muscle that the animal advances its head and foot and again retires within the last whorl. There are, however, instances in which the spiral Gastropod, desirous of evacuating a portion of its shell, has the power of sliding the attachment of the columellar muscle, without relaxing it, independent of the requirements of its increase of growth, in a manner similar to the periodical slipping of the muscular girdle in the growing *Nautilus*. In the *Helix decollatus* and many species of *Pupa*, the early portion of the shell is allowed to fall away, and the whorls of occupation are roofed in by a new concentric layer; in many species of *Melania*, and other inhabitants of fresh and stagnant water, the apical extremity of the shell becomes eroded and consumed; whilst that singular tenant of the coral rock, the *Magilus*, fills up the evacuated portion of its shell, to a considerable extent, with solid testaceous matter; an operation which would produce an incumbrance incompatible with the locomotive faculties of a free agent. There is also an additional muscle in those species which are operculated for the purpose of drawing the operculum within the aperture.

The *operculum* is a shelly or horny plate adapted in most species to close over the soft parts when retracted within the shell; it is, however, often represented by merely a small thin horny plate, in no wise fitting the aperture of the shell, and not apparently answering any purpose in the life and economy of the mollusk. The variations in the growth and substance of the operculum, moreover, afford characters of very secondary importance; as we find it sometimes shelly, and sometimes horny, in the same natural group. The genus *Trochus*, for example, offers some species with the former, some with the latter; and among the *Cones* and *Volutes* the operculum, though a rudimentary one, is present in some species and not in others.

The Gastropods evince a very low degree of sensibility; in many species the tentacles, and with the tentacles the eyes, and even some parts of the head are reproduced after amputation, provided there is no displacement of the cerebral ganglions.* Some are also capable of suspending all signs of vitality for a very considerable period. I remember an instance of some *Helices* having been received from a distant locality and kept in a dry lumber box for two years in a state of torpor, from which they were fully released upon being placed on a moist fresh leaf. All the Gastropods exhibit great skill in the repair of any injuries done to their shell, and considerable economy is exercised in absorbing or smoothing down any spines or

* Baron Férussac states that he has seen the terrestrial Gastropods or Slugs allow their skins to be eaten by others, and in spite of large wounds thus produced show no sign of pain.—OWEN.

irregularities that obstruct their progress of growth; they are, however, constantly liable to distortion, disease of the calcifying glands, and all "the numerous ills that flesh is heir to."

The *sexes* in the highest order of Gastropods, (*Pectinibranchiata*) are separate, male and female; the remainder are hermaphrodite, both sexes combined in the same individual. The oviparous species have various modes of producing their young. The Whelk (*Buccinum undatum*) deposits her eggs in masses of thin bladder-like capsules; the *Turbinella* in a long chambered nidus, in each compartment of which are from twenty to thirty embryos completely calcified; and the *Ianthina* encloses her ova in a delicate film of albumen attached to her curious float.* In the early development of the *Aplysia* the shell is of a distinctly turbinated form, containing the embryo closed in by an operculum; a curious metamorphosis then ensues; the shell assumes an entirely internal position, which in the adult forms little more than a protective shield over the branchiæ, a flattened or slightly convex horny plate, with only the remotest trace of its primitive nucleus. A somewhat similar phenomenon has also been noticed in the *Tritonia* and *Doris*, which, though destitute of any horny or testaceous parts, either external or internal, in the adult state, are provided in an early stage of their development with a delicate little horny nautiloid shell. The eggs of the fresh-water species mostly consist of a transparent mucus†; and of the terrestrial species, the *Helices* deposit their eggs in the earth, whilst the arboreal *Bulimi* cement together a little nest of leaves for their beautifully white eggs, which are sometimes nearly as large as those of a pigeon.

In taking a general review of the habits of the Gastropods, many interesting phenomena present themselves to our contemplation. The greater portion of them live attached to masses of stone, in concealed situations, such as the under surfaces, and in cavities and crevices; also in coral sand and mud, not, however, imbedded in such a state of torpor generally as the acephalous or head-less tribes (the Bivalves), unless in the curious instance of the *Magilus*. It is the peculiar property of this mollusk to become the

* To this float the parent *Ianthina* commits her little progeny, and having securely fastened their several cradles or nursery cells, she detaches the float, which bears the ova to the surface, and sustains them where they may best receive the full influence of solar light and heat.—OWEN.

† In relating some experiments made by M. Jacquemin on the development of the *Planorbis*, Professor Owen continues, "The rudiments of the head and foot are sufficiently obvious on the sixth day; the respiratory organs are formed on the sixth or eighth day, according to the warmth of the weather. On the eighth day the characteristic tentacles begin to sprout from the rudimentary head. On the tenth day all that part of the vitellus or embryo which is not occupied by the head, the foot, and the breathing organ, is covered by a thin and transparent pellicle, which is the rudiment of the shell. On the eleventh day one of the large central globules of the yolk begins to distinguish itself from the alimentary mass by feeble contractions and dilatations, of which about sixty may be counted in a minute; this is the heart. The mouth can now be discerned, and the small eye-specks appear like black granules at the base of the tentacula. On the twelfth day the embryo moves by its own contractions independently of the rotation produced by the cilia. On the thirteenth day acts of deglutition are discernible; the embryo swallows the remaining albumen, the anus is completed, and the genital organs begin to be formed. On the fourteenth day the young *Planorbis* ruptures by more violent contractions the chorion, and escapes into the water, protected by its own flexible shell."—*Hunterian Lectures*, 1844.

fixed tenant of growing masses of white coral, but requiring at the same time to be in relation with the surrounding element, it alters its spiral plan of growth upon the increase of the coral, and pursues a nearly straight course, in order to keep pace with the advancing surface of its rocky bed. The *Ianthina* or Sea-Snail, is also an animal of peculiar habits, floating on the bosom of the ocean by means of a number of albuminous air-bladders attached to the foot, after the manner of a float; and the parasitic habit of the *Stylifer*, living on the juices of the Star-Fish, is curious.

The shell of the Gastropods is either of a spiral, or of a simple conical structure; the spiral series is by far the more numerous in species, but it does not include any of such weight or dimensions as the Giant Clam (*Tridacna gigas*) among the Bivalves. Neither among the fossil shells of the extinct species are there any so large as in the preceding class. The form of the non-spiral gastropods varies from the depressly flattened cone of the *Umbrella* to the extreme conical elevation of *Dentalium*; in one genus, *Chiton*, the shell consists of eight distinct pieces moving upon each other within a cartilaginous frame, like plate armour; and in other genera, such as *Aplysia*, the shell is merely represented by a concealed horny plate, deposited by an internal fold of the mantle. In this group is also contained an interesting series called *Nudibranchiata*, or naked-gilled mollusks, in which the gills are exposed in the most beautiful varieties of tufted and ramified structure along the back: these have no shell.* The Limpet tribe afford a curious phenomenon in the peculiarity of two of the genera, *Lithedaphus* and *Hippomyx*, depositing a shelly plate at their base of attachment.

In treating of the parts of the spiral univalve shell it may be observed, in the first place, that the typical structure, of which all the different generic forms are modifications, is that of an enlarging conical tube, winding obliquely from left to right (viewing the mollusk as moving forward from the observer) by reason, probably, of some peculiar winding tendency in the vital organs of the animal. The axis upon which the tube winds, is called the axial pillar or columella; every turn around this axis is called a whorl; and when the columella is hollow, it is said to be umbilicated. Among the terrestrial Gastropods the most simple plan of convolution is exhibited in the *Cyclostoma giganteum*; for an elongated modification of this, the *Pupa Ruschenbergiana* may be quoted as a remarkable example, the diameter of the tube in this shell is very small, and the volutions are performed within a very limited area; and there being as many as five and twenty whorls the shell assumes the form of a peculiarly attenuated cylinder. For a depressed modification of the univalve, the *Caracolla parnula* may be regarded as a most characteristic example; in this shell the spiral tube is so depressly flattened as to present the form of a slightly convex lens. In the

* Although the Nudibranchial Mollusks furnish no ornaments for the cabinet and do not enter, therefore, into the category of animals treated of in this work, I cannot refrain from noticing Alder and Hancock's beautiful figures of them recently published by the Ray Society.

marine tribes, the *Turbo variabilis* might be selected as a specimen of simple convolution, the elongated modification being represented by the *Turritella* or *Terebra*, and the depressed by *Solarium* or *Rotella*. The land species offer the most extreme modifications of depressed growth, because the visceral parts of the herbivorous tribes may very possibly be restrained within a more limited area than the carnivorous kinds; they have no occasion for the armature of teeth and rasped plates required for the assimilation of animal food, nor is the digestive apparatus of so complicated a character.

The carnivorous tribes have no such limitation of growth as is found in the *Caracolla*, their range of habits furnishes them with more vigour, and their calcifying energies are exercised in many instances to an excess which is truly astonishing. A ponderous massive shell is often found to be the production of an animal occupying but a very limited portion of it. The shells of the terrestrial species have no external ramifications and very little variety of sculpture, whilst those of the marine kinds are ornamented with ribs, tubercles, laminae, spines, and fronds. The first departure from the fluted *Dentalium*, or the smooth tube of *Turritella*, is presented in the *Scalaria*, where the lip of the aperture is reflexed in its earliest stage of development; the course of the tube proceeds with the reflexed margin remaining on its circumference; and this operation is continued at intervals until the shell and its inhabitant arrive at maturity. This is the simple plan upon which the ornamental structure of all shells is developed. To take a more complicated example, let us examine the growth of the *Murex*. Not only is there a periodical reflexion and thickening of the edge of the tube, which in this genus has an ovate or pyriform area, but certain calcifying filaments or processes are exserted from the edge of the mantle, capable of producing most elegantly formed spines and fronds. As soon as this architectural border is finished the filaments are withdrawn, and the tube pursues its regular growth until they are again exserted for a similar purpose. These borders, technically called *varices*, thus encircle the tube at intervals, and are supposed to indicate seasons of rest; the lip of the shell being probably thickened in this manner for protection during a period of relaxation. The varices are formed at various intervals; in *Triton* only two or three occur during the entire growth of the shell, in *Ranella* one is deposited on every half whorl, in such a manner as to range obliquely one under the other, and in *Murex* they occur three or more times on every whorl. In *Harpa* and other genera of the family Purpurifera, the entire shell is formed of a close succession of marginal borders like the varices of the Canalifera.

There are many varieties in the tubular growth of the shell besides those above enumerated; in the *Cone*, for example, the tube is of a longitudinally compressed form, winding upon itself almost on the same vertical plane, but as the different modifications of form and sculpture will be treated of under the different genera, it only remains to notice the varieties of the res-

piratory organs selected to characterize the subdivision of the class into seven Orders, as follows :—the first group, *Pectinibranchiata*, have a pair of pectinated gills of the shape of a comb ; the second, *Pulmibranchiata*, which includes the terrestrial and lacustral species perform the functions of respiration by a pulmoniferous net-bag ; the third, *Pleurobranchiata*, are distinguished by the gills being situated on the right side only ; the fourth, *Cervico-branchiata*, have their gills situated in a special cavity in the neck ; in the fifth, *Cyclobranchiata*, the gills are placed in a circle round the edge of the body ; in the sixth they are cirrous or hair-like ; and in the *Nucleobranchiata*, which are the most aberrant form of the class and afford a link to that of the Pteropods, the branchiæ, together with the visceral mass, are concentrated within a nucleus protruding from the ventral part of the body which is almost wholly gelatinous. Numerous modifications of the breathing organs of minor importance have been selected for the distinction of orders ; those which have the gills ranged around the lower part of the body, between the disc and the mantle, have been associated under the term *Inferobranchiata*, those in which the gills and entire body are contained in a strictly tubular shell, *Tubulibranchiata*, and those in which they are protected by a shield-like shell under that of *Scutibranchiata* ; all these are, however, comprehended in the seven Orders here adopted.

Order 1. PECTINIBRANCHIATA.

Branchiæ ; pectinated, contained within a cavity in the upper part of the neck, into which the water is sometimes conveyed by a siphon or siphonal appendage.

Having already spoken of the nature and habits of the pectinibranchial Gastropods in treating of the class, I have only to remark under this head that the branchiæ or gills of the present order, which includes a very numerous series, are arranged for the most part in parallel laminæ, like the teeth of a comb, and are contained within a cavity in the upper part of the neck. Some of the pectinibranchial tribe are carnivorous, and some are herbivorous ; and the former are distinguished from the latter by a siphon or siphonal appendage passing out at the basal channel of the shell, for the purpose of conveying the water to the branchial cavity.

Carnivora.

| | |
|-------------|------------|
| CONVOLUTA | ALATA |
| COLUMELLATA | CANALIFERA |
| PURPURIFERA | PARASITICA |

Herbivora.

| | |
|------------|-------------|
| TURBINACEA | NERITACEA |
| PLICACEA | PERISTOMATA |
| IANTHINEA | MELANIANA |

Family 1. CONVOLUTA.

Shell ; with the whorls convoluted upon nearly a vertical plane.

In this family is associated an interesting series in which the whorls of the shell are convoluted one over the other, without obliquely descending, so that the sutural extremity remains almost upon a plane with the top of the spire. It is grouped upon rather an artificial basis, because the *Olivs* which exhibit a nearly similar arrangement of the whorls are referred by their affinities to the family *Purpurifera*. The *Cones* have likewise been removed to various situations in the natural order, Mr. Gray places them next to *Pleurotoma*, M. De Blainville in the immediate vicinity of *Strombus*, and M. Deshayes refers them to his family of *Buccinidæ*. The Cowrey with its enveloping mantle, is certainly very different in appearance from the Cone, in which the mantle is of very limited proportions ; but the *Ovulum* and the Cowrey are very closely allied. The following are the genera referred to this family :—

| | | |
|----------|-------------|---------|
| CONUS. | TEREBELLUM. | OVULUM. |
| CYPRAEA. | ERATO. | |

Genus 1. CONUS.

Animal ; disc oblong, rather thin, double-edged, oval behind, abruptly truncated in front ; head obtusely cylindrical, with a rather short trunk ; tentacles short and stout, with the eyes placed upon them at a distance of about one fourth of their length from the summit. Operculum very small, horny, sometimes wanting.

Shell ; conical, slightly emarginated at the base, spire sometimes flat and obtuse, sometimes sharply acuminated ; aperture longitudinal, mostly narrow ; lip simple.

The Cones constitute one of the most natural and best defined generic groups throughout the class ; they present a great similarity of structure, and the species are remarkable for the elaborate design and brilliancy of their colours. The differences of form consist chiefly in the depression or elevation of the spire, the attenuation or inflation of the whorls, and in their spiral edges being plain or coronated ; there are, however, many striking variations, which though apparently of marked specific importance are yet common to different individuals of the same species. Some, for example, are found with the spire at one time plain, at another coronated ;

and many, in like manner, have the surface sometimes smooth and sometimes granulated, but never punctured. Granulated specimens are invariably of smaller size than smooth examples of the same species; the same observation does not, however, hold good in reference to those which are coronated. The beautiful Admiral Cone (*C. ammiralis*) is found either smooth, or granulated, or coronated; and there are many species whose specific character is almost solely maintained, through different modifications of form, by the general affinity of their colour and markings. The *C. magus*, on the contrary, is mostly variable in colour, yet its specific integrity is preserved throughout by the unity of design in its markings.

The Cones are mostly inhabitants of deep water, and nearly all are tropical; one or two are found as far north as the Mediterranean, but they essentially require a warmer region. Like all tropical fauna they present a most vivid display of colours, and the mechanism of their calcifying filaments must be of very exquisite workmanship. In order to produce the wondrous detail of pattern portrayed in the *C. gloria-maris*, or in the banded net-work of the *C. ammiralis*, which is scarcely discernible without the aid of a lens, the mollusk must be endowed with an astonishing ingenuity of design; and for the simultaneous production of so many colours as are exhibited in the *C. aurisiacus* or *imperialis*, its molecular fluid must have many more sources of colouring matter than a weaver at his loom. Where, indeed, do we find so rich a brocade of gold as in the *C. textile*, or a web of such elaborate meshes as in the *C. abbas* or *Victoriæ*?

The genus *Conus* is very numerous in species, and many of them, particularly the *C. magus*, *omaria*, *venulatus*, *princeps*, *thalassiarchus*, *cedo-nulli*, *spectrum* *Mozambicus*, *Guinaicus*, and one or two others, are extremely variable, both in form and colour; they may, nevertheless, be readily discriminated by attentive study.

Species.

- | | | |
|---|--|---------------------------------------|
| 1. <i>abbas</i> , <i>Hwass.</i> | 14. <i>ambiguus</i> , <i>Reeve.</i> | 27. <i>aurantius</i> , <i>Hwass.</i> |
| 2. <i>abbreviatus</i> , <i>Nuttall.</i> | 15. <i>ammiralis</i> , <i>Linn.</i> | 28. <i>auratus</i> , <i>Lam.</i> |
| 3. <i>achatinus</i> , <i>Chenn.</i> | 16. <i>anemone</i> , <i>Lam.</i> | 29. <i>aureus</i> , <i>Hwass.</i> |
| 4. <i>aculeiformis</i> , <i>Reeve.</i> | 17. <i>aplustre</i> , <i>Reeve.</i> | 30. <i>aurisiacus</i> , <i>Linn.</i> |
| 5. <i>acuminatus</i> , <i>Hwass.</i> | 18. <i>araneosus</i> , <i>Hwass.</i> | 31. <i>aurora</i> , <i>Lam.</i> |
| 6. <i>acutangulus</i> , <i>Chenn.</i> | 19. <i>archiepiscopus</i> , <i>Hw.</i> | 32. <i>australis</i> , <i>Chenn.</i> |
| 7. <i>Adamsoni</i> , <i>Gray.</i> | 20. <i>archon</i> , <i>Brod.</i> | 33. <i>bæticus</i> , <i>Reeve.</i> |
| 8. <i>Adansonii</i> , <i>Lam.</i> | 21. <i>arcuatus</i> , <i>Brod.</i> | 34. <i>balteatus</i> , <i>Sow.</i> |
| 9. <i>aemulus</i> , <i>Reeve.</i> | 22. <i>arenatus</i> , <i>Hwass.</i> | 35. <i>Bandanus</i> , <i>Hwass.</i> |
| 10. <i>albimaculatus</i> , <i>Sow.</i> | 23. <i>artoptus</i> , <i>Sow.</i> | 36. <i>Barbadensis</i> , <i>Hw.</i> |
| 11. <i>Algoensis</i> , <i>Sow.</i> | 24. <i>attenuatus</i> , <i>Reeve.</i> | 37. <i>betulinus</i> , <i>Linn.</i> |
| 12. <i>amabilis</i> , <i>Lam.</i> | 25. <i>augur</i> , <i>Hwass.</i> | 38. <i>Broderipii</i> , <i>Reeve.</i> |
| 13. <i>Amadis</i> , <i>Martini.</i> | 26. <i>aulicus</i> , <i>Linn.</i> | 39. <i>brunneus</i> , <i>Wood.</i> |

40. bulbus, *Reeve.*
 41. bullatus, *Linn.*
 42. buxeus, *Reeve.*
 43. Caledonicus, *Hwass.*
 44. Californicus, *Hinds.*
 45. cancellatus, *Lam.*
 46. canonicus, *Hwass.*
 47. capitaneus, *Linn.*
 48. cardinalis, *Hwass.*
 49. carinatus, *Swain.*
 50. *castrensis, *Gould.*
 51. castus, *Reeve.*
 52. catus, *Hwass.*
 53. cedo-nulli, *Klein.*
 54. centurio, *Born.*
 55. cervus, *Lam.*
 56. Ceylanensis, *Hwass.*
 57. characteristicus, *Ch.*
 58. cinereus, *Hwass.*
 59. cingulatus, *Lam.*
 60. classiarius, *Hwass.*
 61. clavus, *Linn.*
 62. Clerii, *Reeve.*
 63. cocceus, *Reeve.*
 64. colubrinus, *Lam.*
 65. columba, *Hwass.*
 66. concinnus, *Brod.*
 67. concolor, *Sow.*
 68. consors, *Sow.*
 69. conspersus, *Reeve.*
 70. crepusculum, *Reeve.*
 71. crocatus, *Lam.*
 72. cuneolus, *Reeve.*
 73. cylindraceus, *Brod.*
 74. daucus, *Hwass.*
 75. Delessertianus, *Recl.*
 76. Deshayesii, *Reeve.*
 77. *discrepans, *Sow.*
 78. *dispar, *Sow.*
 79. distans, *Hwass.*
 80. dux, *Hwass.*
 81. eburneus, *Hwass.*
 82. elongatus, *Reeve.*
 83. emarginatus, *Reeve.*
 84. episcopus, *Lam.*
 85. epistomium, *Reeve.*
 86. *eques, *Lam.*
 87. crythraensis, *Beck.*
 88. exaratus, *Reeve.*
 89. fabula, *Sow.*
 90. figulinus, *Linn.*
 91. flavescent, *Gray.*
 92. flavidus, *Lam.*
 93. floccatus, *Sow.*
 94. Franciscanus, *Hw.*
 95. *fulgorans, *Lam.*
 96. fulmen, *Reeve.*
 97. fumigatus, *Hwass.*
 98. furvus, *Reeve.*
 99. fuscatus, *Born.*
 100. *fusiformis, *Lam.*
 101. generalis, *Linn.*
 102. genuanus, *Linn.*
 103. geographus, *Linn.*
 104. gladiator, *Brod.*
 105. glans, *Hwass.*
 106. glaucus, *Linn.*
 107. gloria-maris, *Chemn.*
 108. gradatus, *Gray.*
 109. granulatus, *Linn.*
 110. Grayi, *Reeve.*
 111. Grunerii, *Reeve.*
 112. gubernator, *Hwass.*
 113. Guinaicus, *Hwass.*
 114. Hebraeus, *Linn.*
 115. hieroglyphicus, *Ducl.*
 116. imperialis, *Linn.*
 117. incarnatus, *Reeve.*
 118. *inflatus, *Sow.*
 119. informis, *Hwass.*
 120. inscriptus, *Reeve.*
 121. intermedius, *Reeve.*
 122. interruptus, *Brod.*
 123. iodostoma, *Reeve.*
 124. Janus, *Hwass.*
 125. *Japonicus, *Lam.*
 126. lacteus, *Lam.*
 127. *lamellosus, *Lam.*
 128. laetus, *Reeve.*
 129. legatus, *Lam.*
 130. lentiginosus, *Reeve.*
 131. leoninus, *Hwass.*
 132. lignarius, *Reeve.*
 133. lineatus, *Chemn.*
 134. liratus, *Reeve.*
 135. literatus, *Linn.*
 136. lithoglyhus, *Meusch.*
 137. lividus, *Hwass.*
 138. Lorenzianus, *Chemn.*
 139. luteus, *Brod.*
 140. *Luzonicus, *Lam.*
 141. maculiferus, *Sow.*
 142. Madurensis, *Hwass.*
 143. magnificus, *Reeve.*
 144. magus, *Linn.*
 145. mahogani, *Reeve.*
 146. Malaccanus, *Hwass.*
 147. Maldivus, *Hwass.*
 148. Marchionatus, *Hinds.*
 149. marmoreus, *Linn.*
 150. Martinianus, *Reeve.*
 151. *Mauritianus, *Hwass.*
 152. *maurus, *Gray.*
 153. Mediterraneus, *Hw.*
 154. melancholicus, *Lam.*
 155. mercator, *Linn.*
 156. Metcalfii, *Reeve.*
 157. miles, *Linn.*
 158. miliaris, *Hwass.*
 159. millepunctatus, *Lam.*
 160. Mindanus, *Hwass.*
 161. minimus, *Linn.*
 162. minutus, *Reeve.*
 163. mitratus, *Hwass.*
 164. monachus, *Linn.*
 165. monile, *Hwass.*
 166. monilifer, *Brod.*
 167. Mozambicus, *Hwass.*
 168. mueronatus, *Reeve.*
 169. muriculatus, *Sow.*
 170. mus, *Hwass.*
 171. musicus, *Hwass.*
 172. mustelinus, *Hwass.*
 173. mutabilis, *Chemn.*
 174. nanus, *Brod.*
 175. Narcissus, *Lam.*
 176. nebulosus, *Soland.*
 177. Nemocanus, *Hwass.*
 178. Neptunus, *Reeve.*
 179. Nicobaricus, *Hwass.*
 180. nimbosus, *Hwass.*
 181. nitidus, *Reeve.*
 182. nobilis, *Linn.*
 183. nocturnus, *Hwass.*

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|-----------------------------------|----------------------------------|-----------------------------------|
| 184. Nussatella, <i>Linn.</i> | 217. pygmæus, <i>Reeve.</i> | 250. Taheitensis, <i>Hwass.</i> |
| 185. nux, <i>Brod.</i> | 218. *pyramidalis, <i>Lam.</i> | 251. tendineus, <i>Hwass.</i> |
| 186. obesus, <i>Hwass.</i> | 219. pyriformis, <i>Reeve.</i> | 252. terebellum, <i>Mart.</i> |
| 187. obscurus, <i>Humph.</i> | 220. quercinus, <i>Hwass.</i> | 253. terminus, <i>Lam.</i> |
| 188. Omaicus, <i>Hwass.</i> | 221. regalitatis, <i>Sow.</i> | 254. tessellatus, <i>Born.</i> |
| 189. omaria, <i>Hwass.</i> | 222. regularis, <i>Sow.</i> | 255. testudinarius, <i>[Mart.</i> |
| 190. Orbignyi, <i>Ardouin.</i> | 223. reticulatus, <i>Sow.</i> | 256. textile, <i>Linn.</i> |
| 191. orbitatus, <i>Reeve.</i> | 224. roseus, <i>Lam.</i> | 257. thalassiarchus, <i>Gray.</i> |
| 192. Orion, <i>Brod.</i> | 225. rutilus, <i>Menke.</i> | 258. Timorensis, <i>Hwass.</i> |
| 193. panniculus, <i>Lam.</i> | 226. scalptus, <i>Reeve.</i> | 259. Timianus, <i>Hwass.</i> |
| 194. papilionaceus, <i>Hwass.</i> | 227. Senator, <i>Linn.</i> | 260. tornatus, <i>Brod.</i> |
| 195. Parius, <i>Reeve.</i> | 228. Siamensis, <i>Hwass.</i> | 261. tristis, <i>Reeve.</i> |
| 196. pastimaca, <i>Lam.</i> | 229. sindon, <i>Reeve.</i> | 262. troebulus, <i>Reeve.</i> |
| 197. patricius, <i>Hinds.</i> | 230. *Sinensis, <i>Chenu.</i> | 263. tulipa, <i>Lam.</i> |
| 198. pauperculus, <i>Sow.</i> | 231. Sinensis, <i>Sow.</i> | 264. *unicolor, <i>Sow.</i> |
| 199. pertusus, <i>Hwass.</i> | 232. Solandri, <i>Brod.</i> | 265. ustulatus, <i>Reeve.</i> |
| 200. pictus, <i>Reeve.</i> | 233. solidus, <i>Sow.</i> | 266. varius, <i>Linn.</i> |
| 201. piperatus, <i>Reeve.</i> | 234. spectrum, <i>Linn.</i> | 267. venulatus, <i>Hwass.</i> |
| 202. plumbeus, <i>Reeve.</i> | 235. sphacelatus, <i>Sow.</i> | 268. verriculum, <i>Reeve.</i> |
| 203. pontificalis, <i>Lam.</i> | 236. splendidulus, <i>Sow.</i> | 269. verrucosus, <i>Lam.</i> |
| 204. Porto-Ricanus, <i>Hw.</i> | 237. sponsalis, <i>Chenn.</i> | 270. vexillum, <i>Mart.</i> |
| 205. præfectus, <i>Hwass.</i> | 238. Stainforthii, <i>Reeve.</i> | 271. vicarius, <i>Lam.</i> |
| 206. prælatus, <i>Hwass.</i> | 239. stereus-muscarum, <i>L.</i> | 272. victor, <i>Brod.</i> |
| 207. princeps, <i>Linn.</i> | 240. stramineus, <i>Lam.</i> | 273. Victoriae, <i>Reeve.</i> |
| 208. Prometheus, <i>Hwass.</i> | 241. striatus, <i>Linn.</i> | 274. vidua, <i>Reeve.</i> |
| 209. Proteus, <i>Hwass.</i> | 242. strigatus, <i>Lam.</i> | 275. violaceus, <i>Reeve.</i> |
| 210. pulchellus, <i>Swain.</i> | 243. sugillatus, <i>Reeve.</i> | 276. virgo, <i>Linn.</i> |
| 211. pulicarius, <i>Hwass.</i> | 244. sulcatus, <i>Hwass.</i> | 277. viridulus, <i>Lam.</i> |
| 212. punctatus, <i>Chenn.</i> | 245. Sumatrensis, <i>Lam.</i> | 278. vittatus, <i>Lam.</i> |
| 213. puncticulatus, <i>Hwass.</i> | 246. Suratensis, <i>Hwass.</i> | 279. vitulinus, <i>Hwass.</i> |
| 214. puncturatus, <i>Hwass.</i> | 247. suturatus, <i>Reeve.</i> | 280. voluminalis, <i>Hinds.</i> |
| 215. purpurascens, <i>Brod.</i> | 248. tabidus, <i>Reeve.</i> | 281. zebra, <i>Lam.</i> |
| 216. pusillus, <i>Chenn.</i> | 249. tæniatus, <i>Hwass.</i> | 282. zonatus, <i>Hwass.</i> |

* * The species marked thus (*) are unknown to me, and may be considered doubtful, if not synonymous with others; for figures and a critical examination of the remainder see Monograph of the Genus in *Conchologia Iconica*.

F Figures.

CONUS TEXTILE. Plate E. Fig. 4.—Shell with the animal, showing its mottled disc, branchial siphon, head, tentacles and eyes. *From the Zoology of the Voyage de l'Astrolabe.*

CONUS VICTORIÆ. Plate 3. Fig. 14.—Shell. *From the collection of Dr. Knapp.*

Genus 2. TEREBELLUM, Lamarck.

Animal; *unknown*.

Shell; cylindrically elongated, spire acuminated, last whorl slightly inflated towards the base, where it is abruptly curtailed and emarginated; columella smooth, produced at the base; lip simple.

Although the *Terebellum* shell was known to Klein, Lister, and one or two other writers antecedent to Linnaeus, and is not unfrequently collected on the shores of the eastern seas, no specimen has yet been found with its molluscous inhabitant. It is of a very isolated form, intermediate, in a manner, between *Conus* and *Bulla*, to both of which genera Linnaeus at different times referred it in 'Systema Naturæ.' Sowerby in his 'Genera of Shells' considers the *Terebellum* most nearly allied to *Strombus*, I do not think, however, that will prove to be the case; there are certainly one or two species of the latter in which the shell bears a striking resemblance to the former, but there is a peculiarity in its light *Bulla*-like convolution which indicates the presence of a very different animal from that of *Strombus*; though probably one of equally remote affinity with either *Conus* or *Ovulum*.

TEREBELLUM SUBULATUM. Plate I. Fig. 6. *From Mr. Cuming's collection.*

Genus 3. OVULUM, Bruguière.

Animal; disc ample, oblong-ovate, somewhat acuminated at the ends, in slight folds; head somewhat obscure, with the siphonal appendage produced into a broad wrinkled fold; tentacles long and stout, eyes situated upon a prominent subramose thickening at about the middle; mantle extended on each side into a lobe, sprinkled with short spinous processes, enveloping the shell.

Shell; oval or oblong, smooth, more or less produced at the extremities; spire concealed; aperture longitudinal, columella smooth, lip mostly thickened and inflexed, sometimes wrinkled; pure white, sometimes pink or violet tinged.

There is so close an affinity between the animals of *Ovulum* and *Cypræa*, especially between the *O. ovum* and the *C. Mauritiana*, that it would be impossible to refer them to separate genera were it not for the marked difference in the shells. M. De Blainville proposed, in conformity with this resemblance of the soft parts, to regard the *Ovuli* as merely a section of the genus *Cypræa*; it is certain, however, that animals producing two such

obvious and characteristic assemblages of shells as refer to the genera in question, though differing in no other respect, are equally entitled to generic distinction. A system of arrangement based upon the characters of the soft parts of the mollusk alone, without reference to the shell or hard parts, is scarcely less objectionable than one founded upon the shell alone, without reference to the organic structure of the animal.

The shell of *Ovulum* differs from that of *Cypraea* in having the extremities more or less prolonged, and in the lip and columella being destitute of the prominent rows of teeth with which that genus is so remarkably characterized; the outer lip, as in the *O. ovum* and *imperialis* is in one or two instances a little wrinkled, but never toothed. Another distinction consists in the *Ovulum* not being provided with any pattern or design of colour, nor with colour in any form beyond a faint tinge of pink, violet, or yellow.

The genus *Ovulum* is somewhat limited in species, and they are mostly small; the *O. ovum* is the only one of large size, and the *O. imperialis* the only species of intermediate size; the well-known Chinese species, the *O. volva*, presents a remarkable example of prolongation of the extremities, and the *O. verrucosa*, the nearest approach to *Cypraea*, is characterized by the presence of two small wart-like callosities like those of the *C. bicallosa*.

Species.

| | | |
|------------------------------|---------------------------------|-----------------------------|
| 1. aciculare, <i>Sow.</i> | 13. frumentum, <i>Sow.</i> | 25. ovum, <i>Sow.</i> |
| 2. Adriaticum, <i>Sow.</i> | 14. gallinaceum, <i>Hinds.</i> | 26. patulum, <i>Sow.</i> |
| 3. æquale, <i>Sow.</i> | 15. gibbosum, <i>Lam.</i> | 27. pyriforme, <i>Sow.</i> |
| 4. album, <i>Duf.</i> | 16. hordeaceum, <i>Lam.</i> | 28. rufum, <i>Sow.</i> |
| 5. avena, <i>Sow.</i> | 17. inflexum, <i>Sow.</i> | 29. secale, <i>Sow.</i> |
| 6. biostre, <i>Lam.</i> | 18. intermedium, <i>Sow.</i> | 30. seminulum, <i>Sow.</i> |
| 7. breve, <i>Sow.</i> | 19. lacteum, <i>Lam.</i> | 31. spelta, <i>Lam.</i> |
| 8. carneum, <i>Lam.</i> | 20. longirostratum, <i>Sow.</i> | 32. striatulum, <i>Sow.</i> |
| 9. corrugatum, <i>Hinds.</i> | 21. margarita, <i>Sow.</i> | 33. tortile, <i>Des.</i> |
| 10. dorsosum, <i>Hinds.</i> | 22. marginatum, <i>Sow.</i> | 34. triticeum, <i>Lam.</i> |
| 11. emarginatum, <i>Sow.</i> | 23. nigerinum, <i>Duf.</i> | 35. verrucosa, <i>Sow.</i> |
| 12. formicarium, <i>Sow.</i> | 24. obtusum, <i>Sow.</i> | 36. volva, <i>Lam.</i> |

Figures.

OVULUM OVUM. Plate F.—Fig. 3. Shell with animal, showing the expanded disc, in slight folds; the right lobe of the mantle with its spinous processes partially extended; the broad wrinkled siphonal appendage; the tentacles proceeding from the concealed head; and the eyes on the thickened part of the tentacles. *From the Zoology of the Voyage de l'Astrolabe.*

OVULUM VOLVA. Plate 1. Fig. 5.—Shell. *From Mr. Cuming's collection.*

Genus 4. CYPRÆA, Linnæus.

Animal ; disc oblong-ovate, in ample folds, more or less acuminated at the extremities, front extremity sometimes truncated ; head obtuse, cylindrical, siphonal appendage broad, short, sometimes fringed at the edge, and disposed in the form of a fan ; tentacles long, stout, eyes situated on a subramose thickening at about one third distance from the base ; mantle produced into two lobes, capable of enveloping the shell, furnished with warts, spinous processes, forked tufted or ramified filaments, or tubular papillæ.

Shell ; ovate or oblong-ovate, ventricose, polished, sometimes nodiferous or ribbed, with the extremities emarginated ; spire very short, partially or entirely concealed ; aperture nearly central, longitudinal, narrow ; lip and columella toothed.

There is probably no group throughout the series which offers matter of so much beauty and interest as the genus *Cypraea*, whether we regard the animal or the shell. The Cowrey presents the most striking example of a mollusk forming its shell by the outward application of a number of successive layers of highly vitrified enamel, constituting a superb arch of as many strata, of different colours and design. The changes both of form and colour which the *Cypraea* shells exhibit at different periods of growth are so dissimilar, that writers of the last century have referred the same species, in different states, to genera widely separated in the system ; and there are instances of three and four species having been founded upon one under different phases of colour. It is, therefore, highly necessary that the collector should assemble specimens of each species of Cowrey characteristic of its different stages of growth, and observe the gradual variations of form and colour that present themselves between the embryo and the adult.

The first stage of advancement produces a simple convolution of shell around the columella axis in the form of a long drawn out *Bulla*, the columella being smooth, the outer lip thin, and the colour usually diffused in bands of waves. In the second epoch of growth the shell solidifies, the lip and columella begin to thicken, and present gradual indications of teeth, the teeth become more and more perfectly developed, and the dorsal surface is overlaid with a strong coat of livid colouring matter, also diffused in obscure bands or waves. The calcifying energies of the mantle, which, extending in two unequal lobes, one from either side of the shell's aperture, have been chiefly exercised during the second epoch of growth upon the back, or dorsal surface, are now more particularly directed to the base and sides. The teeth are strengthened, the sides become thickened with a rich

coating of enamel, and the growth of the shell is completed by a light fabric of colouring matter deposited in lines, blotches, waves, or reticulations, of various hues and patterns. These are not, however, the only physiological changes that take place in the Cowrey. From observations made by a gentleman who worthily employs the opportunities afforded him, as a Naval officer, in the pursuit of science, I have strong reasons for believing that there is some truth in the argument set forth many years since by Bruguière and Lamarck, relative to the *Cypraea* possessing the faculty of partially dissolving and renewing its shell after having arrived at maturity.*

Lamarck says in reference to the re-calcification of the *Cypraea* shell, "I possess observations which tend to prove that the Cowrey, arrived at the power of forming a complete shell, has still the faculty of enlarging its habitation, and is then obliged to quit the shell in order to form a new one. It results from this that the same individual has the power of forming a successive number of shells during both the second and third stages of growth; and which accounts for our often meeting with so many different sizes in the same species"!

M. Deshayes argues against the possibility of an entire re-modelling of the shell, and justly regards the statement of Lamarck as a theory opposed to the common laws of organization. To the supposition of Bruguière that the Cowries cast their shells after the manner of Crabs, M. Deshayes very properly replies that there can be no analogy between them. The new shell of the *Crustacea* is formed by a secretion of equal consistency from all parts of the body, whereas the *Mollusca* have a muscular attachment to the columella, and increase the growth of their shell by an exudation, not from the whole body, but from a particular organ; the mantle being the sole agent charged with that faculty. It is further argued by the same distinguished naturalist that the Cowrey must lose the power of forming the inner chambers of the columella anew, after having once passed that early process of development which induces their formation. "How is it possible," asks M. Deshayes, "that the animal can, under the circum-

* Lieut. J. B. Hankey, R.N., to Lovell Reeve.

Will you allow me to offer you a few remarks on the habits of the *Cypraea* as regards the fact of its making a new shell, at an advanced age, of which process I have been myself in more than one instance an eye-witness. I have seen the Cowrey crawl into some hollow or sheltered place, evidently for some predetermined purpose. The growth of the animal appears to increase too large for its cell; it gradually swells and cracks the shell, and I think that some powerful solvent or decomposing fluid is distributed over the outer surface by the mantle of the fish, for it gets thinner in substance, and the colours duller in appearance. The shell then entirely disappears, the Cowrey becomes, to all appearance, a naked mollusk, with no other covering than its membranous mantle, and in a short time secretes a thin layer of glutinous matter which in a few days obtains the fragile consistency of shell-lac. From this step its growth is more rapid, and it becomes more and more consolidated into the adult shell. When in the first stage of renewal it has the appearance of shell-lac it is always of the Cymba form, but I have never succeeded in preserving any specimens in this state on account of their extreme fragility.

H.M.S. Collingwood, August 6th, 1844.

J. B. H.

Conchologia Iconica, CYPRÆA Plate I.

stances of its nature, secrete a new shell from all parts of the body at once, and with all the different phases of colour exhibited in early growth, when it has reached to an advanced condition of its existence?"

The animal does not appear to quit the shell, as Lamarck supposed, but dissolves the outer portion with its acetose juices. All visible trace of the shell may be thus removed without weakening M. Deshayes' proposition founded on the circumstance of the mantle being the only organ charged with the secretive fluid. The mantle is always capable of extension over the shell; and the same power which furnishes the adult with its last coating of enamel can be exerted to the formation of as many superincumbent layers as may be necessary to replace all that has been decomposed. That a dissolution takes place there can be no doubt:—"the shell gradually swells," says Lieut. Hankey, "and cracks, becomes thinner, and duller in colour, and finally disappears;" a circumstance which may be easily credited when it is remembered that the *Murex* possesses the faculty of removing spines or any similar obstacles to its advancement of growth, and that the *Pholades*, and other terebrating mollusks, exercise a power of absorbing which enables them to penetrate the hardest limestone rock. The microscopical structure of the Cowrey shell is, moreover, of a nature peculiarly tenacious of absorption; it is composed of a large quantity of carbonate of lime in proportion to the amount of membranous substance; and this accounts for its surface becoming vitrified to so highly a polished state of enamel, when in contact with the acidity of the soft parts.

There is another circumstance in Lieut. Hankey's narrative to which attention should be given, respecting the formation of a new shell:—the glutinous matter which has the appearance of shell-lac, and is so fragile that it yields to the touch, does not assume the narrow cylindrical *Bulla* form, but is of the wide, ventricose shape of a *Cymba*, and rapidly consolidates into the adult shell.

With these generalizations I think it may be assumed that the Cowrey possesses, upon an emergency, the faculty of decomposing, during one or more periods of its existence, any portion of the shell that is liable to resist its advancement of growth; that the renewal of the shell is accomplished within a comparatively short space of time; and that the columella with its internal spiral partitions remains undisturbed. It may, however, be inferred that it is an operation of extremely rare occurrence, and one which only happens under peculiar conditions.

In most species of *Cypraea* three separate phases of colour may be defined at different periods of growth. In the *C. Mauritiana*, for example, the colour of its first state, or *Bulla* form, is a pale yellow, over which the fulvous brown spreads in bands of waves; in an intermediate state the waves become agglomerated, and leave the yellow in triangular flame-like spots; and when the teeth are fully developed, the sides become thickened with a

rich dark blackish-brown coating which is thinly spread over the dorsal surface, opening into irregular reticulations just as if its flow had been disturbed by the intermixture of some oily liquid. In the *C. Scottii* the first growth is a clear milky orange colour (Conch. Icon. *Cypraea*, Pl. XXVII. Fig. 10.), it then assumes a blueish tinge disposed in obscure bands, and begins to show a few bright tortoise-shell-brown blotches, which rapidly accumulate, as exhibited in the adult, long before there is any indication of teeth. This is an arrangement different to that of most Cowries, in which the teeth are chiefly developed before the last layer of colouring matter is deposited. The sides and base then become thickened with an extremely rich pitchy-brown coating of enamel, and the extremities compressed and turned upwards. The most striking change, however, takes place in the shell of *C. tigris*: first it is an uniform chesnut bay, the colour then breaks up, as it were, into bands of close-set waved blotches of a richer hue, a coating of white is then superimposed, and upon that is deposited a series of rather distant zigzag flames upon a white ground; the teeth are forming in the mean time, and a few spots of colour make their appearance round the outer side. In the next state of the shell, a second layer of white enamel is superimposed, a thinner and more delicate stratum than the preceding, through which the zigzag flames may be seen of a milky hue; and, upon this surface a number of dark spots are deposited. These are again overspread by a third white coating, intermixed with numerous rich black and brown spots, showing, for the first time, a narrow dorsal hiatus, mostly edged with reddish brown, with the first deposit of dark spots, thus overspread, of a milky hue.*

The ornamental character with which the dorsal surface of the Cowries is mostly painted, appears to be the last effort in the formation of the shell. The previous infusions of colour rarely exhibit anything more than a dull confusion of waves, clouds, or bands; no ornamental device appears until the shell is on the eve of maturity; the most richly variegated layers of enamel are reserved for the final decoration. The *C. mappa* presents, however, a curious exception to this order of arrangement; a layer of pale hieroglyphical painting, greatly resembling, except in colour, that of the *C. Arabica*, is deposited by the animal on the left side chiefly, while yet in a

* "Mr. Samuel Stutchbury, who had an opportunity of examining many individuals of *C. tigris* at the Pearl Islands, informed me that these Cowries lived there in very shallow water, and always under rolled masses of Madreporæ. They never were to be seen exposed to the sun's rays. On lifting one of these masses, a Tiger Cowrie was generally observed with its shell entirely covered by the large mantle which was mottled with dark colours, the intensity of which the animal seemed to have the power of changing; for the colour varied in the same light and in the same medium, after the manner of the spots on the Cephalopodous Mollusca, or, to use a more familiar instance, somewhat in the manner that the hues of a turkey-cock's wattle vary. On touching the mantle, it was immediately withdrawn within the shell, which became exposed in all its brilliancy. So firmly did the soft parts adhere to the shell, that, in no instance, (and the experiment was often made) did Mr. Stutchbury succeed in extracting them by force, either during life, or before decomposition took place. He was obliged to let the animal die, and suffer the soft parts to decay, in order to remove them."—BRODERIP, *Zool. Journal*, vol. iv. p. 153.

very immature state of growth, and on arriving at maturity, another and richer layer of the same pattern is superimposed upon the former, which in most specimens may be faintly seen beneath it. Another exception occurs in the *C. carneola*, *ventriculus*, *arenosa*, *sulcidentata*, and one or two others; in these species the dorsal surface has no ornamental layer of pattern on arriving at maturity; the calcifying energies of the mantle, at an advanced stage of growth, are directed exclusively, and with more than usual force, to the thickening of the sides of the shell, and it is mostly accompanied with a dull deposit of sand-like dots or striae.

The *Cyprææ* present two very distinct groups; the larger species in which the surface of the shell is highly enamelled, and the smaller species in which it is disposed in grooves and ridges, of a more opake character and more delicate texture. They offer little variety of form, but a diversity of colouring; and among them are several very distinct and characteristic species of unusual rarity, which our country can alone boast of possessing. Of these the *Cyprææ princeps* and *leucodon*, in our national collection, are perfectly unique; it seems curious that nature should not have exercised her accustomed prodigality in the perpetuation of these species, for instead of being the remnants of an extinct group, they appear to be the solitary instances of a creation possessing an exuberance of character quite unapproached by any other species. They are both in the finest possible condition, and may certainly be regarded as the most valuable shells yet discovered. The next in value are the *C. Broderipii* and *guttata*; of the former, three specimens are known, two of which are in this country; of the latter, five, of which we possess four. Of distinguished rarities of smaller size may be mentioned *C. Cumingii*, *Saulæ*, *xanthodon*, *similis*, *contaminata* and *fusco-dentata*, all in our collections.

There is little to be said on the geographical distribution of the Cowries except that they are mostly tropical. Only one or two very small grooved species are found on our own coast, and none larger than *C. lurida* in the Mediterranean. The *C. Scottii* may be quoted as a fine example of the New Holland region, and the *C. aurantium* (the orange Cowrey), of the Pacific. The *C. pantherina* is brought in great abundance from the Red Sea, but the greater portion of the species are from Mauritius, Ceylon, and other parts of the eastern world.

Species.

- | | | |
|-----------------------------|---------------------------|-----------------------------|
| 1. Adamsoni, <i>Gray.</i> | 5. annulata, <i>Gray.</i> | 9. arenosa, <i>Gray.</i> |
| 2. albuginosa, <i>Mawe.</i> | 6. annulus, <i>Linn.</i> | 10. Argus, <i>Linn.</i> |
| 3. Algoensis, <i>Gray.</i> | 7. Arabica, <i>Linn.</i> | 11. asellus, <i>Linn.</i> |
| 4. angustata, <i>Gray.</i> | 8. Arabicula, <i>Lam.</i> | 12. aurantium, <i>Mart.</i> |

13. australis, *Lam.*
 14. Beckii, *Gaskoin.*
 15. bicallosa, *Gray.*
 16. Broderipii, *Gray.*
 17. Californica, *Gray.*
 18. candidula, *Gaskoin.*
 19. Capensis, *Gray.*
 20. caput-serpentis, *Linn.*
 21. carneola, *Linn.*
 22. caurica, *Linn.*
 23. cervus, *Linn.*
 24. Childreni, *Gray.*
 25. cicercula, *Linn.*
 26. cinerea, *Gmelin.*
 27. citrina, *Gray.*
 28. clandestina, *Linn.*
 29. contaminata, *Gray.*
 30. costata, *Gmelin.*
 31. cribaria, *Linn.*
 32. cruenta, *Gmelin.*
 33. Cumingii, *Gray.*
 34. cylindrica, *Born.*
 35. depauperata, *Sow.*
 36. diluculum, *Reeve.*
 37. eburna, *Barnes.*
 38. edentula, *Sow.*
 39. erosa, *Linn.*
 40. errores, *Linn.*
 41. erythræensis, *Beck.*
 42. esontropia, *Duclos.*
 43. Europæa, *Mont.*
 44. exanthema, *Linn.*
 45. exusta, *Sow.*
 46. felina, *Gray.*
 47. fimbriata, *Gmelin.*
 48. flaveola, *Linn.*
 49. formosa, *Gaskoin.*
 50. fusca, *Gray.*
 51. fusco-dentata, *Gray.*
 52. gangrenosa, *Soland.*
 53. Gaskoinii, *Reeve.*
 54. globosa, *Gray.*
 55. globulus, *Linn.*
 56. Goodalli, *Gray.*
 57. guttata, *Gray.*
 58. helvola, *Linn.*
 59. hirundo, *Linn.*
 60. interrupta, *Gray.*
 61. irrorata, *Soland.*
 62. isabella, *Linn.*
 63. labiosa, *Gaskoin.*
 64. Lamarckii, *Gray.*
 65. lentiginosa, *Gray.*
 66. leucodon, *Brod.*
 67. leucostoma, *Gaskoin.*
 68. Listeri, *Gray.*
 69. lurida, *Linn.*
 70. lutea, *Gronov.*
 71. lynx, *Linn.*
 72. Madagascariensis, *Gm.*
 73. mappa, *Linn.*
 74. margarita, *Soland.*
 75. Maugeriæ, *Gray.*
 76. Mauritiiana, *Linn.*
 77. melanostoma, *Leath.*
 78. microdon, *Gray.*
 79. miliaris, *Gmelin.*
 80. moneta, *Linn.*
 81. mus, *Linn.*
 82. napolina, *Duclos.*
 83. neglecta, *Sow.*
 84. nigropunctata, *Gray.*
 85. nivea, *Gray.*
 86. nivosa, *Brod.*
 87. nucleus, *Linn.*
 88. obvallata, *Lam.*
 89. ocellata, *Linn.*
 90. omiscus, *Lam.*
 91. onyx, *Linn.*
 92. oryza, *Lam.*
 93. ovula, *Lam.*
 94. Pacifica, *Gray.*
 95. pallida, *Gray.*
 96. pantherina, *Soland.*
 97. pediculus, *Linn.*
 98. pellucidula, *Gaskoin.*
 99. physis, *Brocchi.*
 100. picta, *Gray.*
 101. piperata, *Soland.*
 102. pisum, *Gaskoin.*
 103. poraria, *Linn.*
 104. princeps, *Gray.*
 105. producta, *Gaskoin.*
 106. pulchella, *Swain.*
 107. pulchra, *Gray.*
 108. pulex, *Soland.*
 109. pulicaria, *Reeve.*
 110. pulla, *Gaskoin.*
 111. punctata, *Linn.*
 112. punctulata, *Gray.*
 113. pustulata, *Lam.*
 114. pyriformis, *Gray.*
 115. pyrum, *Gmelin.*
 116. quadrimaculata, *Gray.*
 117. quadripunctata, *Gray.*
 118. radians, *Lam.*
 119. Reevei, *Gray.*
 120. reticulata, *Mart.*
 121. rubescens, *Gray.*
 122. rubiniclor, *Gaskoin.*
 123. sanguinea, *Gray.*
 124. sanguinolenta, *Gmel.*
 125. Saulæ, *Gaskoin.*
 126. Scottii, *Brod.*
 127. seurra, *Chemn.*
 128. similis, *Gray.*
 129. Solandri, *Gray.*
 130. Sowerbyi, *Kiener.*
 131. spadicea, *Swain.*
 132. spurca, *Linn.*
 133. staphylæa, *Linn.*
 134. stercorearia, *Linn.*
 135. stolida, *Linn.*
 136. subrostrata, *Gray.*
 137. subviridis, *Reeve.*
 138. suffusa, *Gray.*
 139. sulcidentata, *Gray.*
 140. tabescens, *Soland.*
 141. talpa, *Linn.*
 142. teres, *Gmelin.*
 143. tessellata, *Swain.*
 144. testudinaria, *Linn.*
 145. tigris, *Linn.*
 146. tremenza, *Duclos.*
 147. turdus, *Lam.*
 148. ventriculus, *Lam.*
 149. vesicularis, *Gaskoin.*
 150. vitellus, *Linn.*
 151. Walkeri, *Gray.*
 152. xanthodon, *Gray.*
 153. zizac, *Linn.*
 154. zonata, *Chemn.*

Figures.

CYPRÆA TIGRIS. Plate *D.* Fig. 3.—Shell with the animal, showing its expanded green-spotted disk, cylindrical head surmounted by the fringed fan-shaped siphonal appendage, tentacles and prominent eyes, and left lobe of the mantle with its forked processes, partially expanded over the shell. *From the Zoology of the Voyage de l'Astrolabe.*

CYPRÆA LEUCOSTOMA. Plate. 2. Fig. 9, *a* and *b*.—Shell, showing, *a*, the dorsal, *b*, the under surface. *From Mr. Cuming's collection.*

Genus 5. ERATO, Risso.

Animal; similar to the *Cypræa*, with the lobes of the mantle very thin and speckled.

Shell; small, ovately oblong, smooth, emarginated at the base, spire rather prominent, last whorl a little inflated; aperture narrow, lip and columella more or less finely denticulated, lip thickened, generally swollen towards the middle.

The genus *Erato* was originally founded by M. Risso, a distinguished conchologist of Nice, with a small shell, chiefly inhabiting the Mediterranean, intermediate in its characters between *Cypræa* and *Marginella*, and forming a striking link between the families Columellata and Convoluta. It has the form and general aspect of *Marginella*, but the most important distinguishing character of that genus, the row of plaits which twine around the columella through the entire growth of the shell, is replaced by a minute series of denticulations, which only make their appearance on its arriving at maturity; and it is not surprising, therefore, under these circumstances, that one Linnaean author, Montagu, should have regarded the *E. laevis* as a *Voluta*, whilst another, Donovan, should have referred it to the genus *Cypræa*. Seven other interesting species have since been added.

Species.

- | | | |
|---------------------------|-------------------------------|------------------------------|
| 1. angistoma, <i>Sow.</i> | 4. laevis, <i>Gray.</i> | 7. sulcifera, <i>Gray.</i> |
| 2. guttata, <i>Sow.</i> | 5. Maugeriæ, <i>Gray.</i> | 8. vitellinum, <i>Hinds.</i> |
| 3. lachryma, <i>Gray.</i> | 6. scabriuscula, <i>Gray.</i> | |

Figure.

ERATO LÆVIS. Plate 1. Fig. 3. (magnified). *From Mr. Cuming's collection.*

Family 2. COLUMELLATA.

Shell; emarginated at the base, with the columella strongly obliquely plaited.

The genera of pectinibranchial gastropods constituting the family Columellata, all included by Linnaeus under the head of *Voluta*, are mainly characterized by the presence of four or five conspicuous plaits winding obliquely round the columella, with a notch at the base, or rather front edge of the shell, viewing it in its natural position upon the animal, for the passage of the respiratory siphon. A modification of this structure appears also in some genera of Canalifera, as in *Turbinella*, and *Cancellaria*; not only, however, are the plaits in that family more limited in number and more feebly developed, but the genera are allied by other characters of greater importance. The *Auricula* shells are, in like manner, characterized by a plaited columella, but they again are the production of animals dwelling in fresh and stagnant water, whose physical condition is necessarily adapted to the different medium they inhabit*.

In reviewing the soft parts of the Columellata it may be observed that they are very much larger and more expansile in some species than in others; the *Marginellæ* have the mantle expanded entirely over the shell, as in *Cypræa*; in *Cymbium* the disc is very large and muscular, the shell light and ventricose, whilst the mantle of that genus, as well as of *Voluta*, is in some instances partially expanded over the shell. The animal of *Mitra*, on the other hand, is small, the shell often solid and ponderous, with a thick fibrous epidermis, and there is no outward expansion of the mantle, whilst the proboscis is capable of extraordinary elongation.

The genera of this family are extremely rich in species, but of those referred to it by Lamarck and Deshayes, I remove *Columbella* to the family Purpurifera: first, on account of the absence of plaits on the columella, and, secondly, because of its nearer affinity with *Purpura* and *Ricinula*; in place of this a new and interesting genus has to be inserted after *Marginella*, founded by M. Deshayes upon a little inhabitant of the Mediterranean, under the name of *Ringicula*.

CYMBIUM.
VOLUTA.

MITRA.
MARGINELLA.

RINGICULA.

* Mr. Swainson had a notion that every character in Zoology, however unimportant, is represented in complete analogy throughout the different classes of animals, within very prescribed limits; he conceived, for example, that the *Volutes* and *Mitres* represent the *Rasorial* type among Birds, the *Ungulata* among Quadrupeds, and the *Thysanura* among Insects. These flights of analogy he proposed to exhibit in circles; and they revolved in his imagination in such mystical order as to reveal the most incomprehensible affinities.

Genus 1. CYMBIUM, *De Montford.*

Animal ; disc large and muscular capable of considerable expansion, head furnished with an obtuse trunk, tentacles short, broad, dilated at the base into two lobes ; respiratory siphon short, stout.

Shell ; oblong-ovate, very large, thin and ventricose, whorls elevated around the spire, which is papillary and sunken, with the summit sometimes coronated, sometimes concavely flattened ; plaits of the columella strongly developed, the lower being the larger.

The present genus was founded by De Montford, under the name of *Cymbium*, for the reception of that portion of the Volutae commonly known to collectors by the term ‘Melons’, and which Lamarck distinguished as a particular section of his genus *Voluta*, under the sub-title of ‘Les Gondolières.’ The generic arrangement of this group has, however, been a matter of some difference of opinion ; for whilst M. Deshayes considers the adoption of *Cymbium*, as a genus of the same rank with the *Volute* proper, quite uncalled for, on account of the similarity of the animals ; Mr. Broderip and Mr. Sowerby have still further divided it into *Cymba* and *Melo*, for the sake of observing a generic distinction between the coronated and the flattened species. After weighing the merits of these opinions, I propose to take the middle course, and return to the method originally introduced by De Montford, of including both varieties of ‘Melons’ under the same head.

The animal of *Cymbium* varies to a certain extent from that of *Voluta* in the size and extensive muscular expansion of the disk ; the shells are, moreover, distinguished by their light inflated growth, and sunken papillary spire, around which the whorls are elevated, with their summit sometimes concavely flattened, sometimes coronated with a diadem of vaulted scales.

One or two species of *Cymbium* are found in Australia, but the chief portion are from the coast of Africa ; they burrow in the sand at low water, and live mostly concealed from view.

Species.

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| 1. <i>Aethiopicum</i> , <i>Brod.</i> | 7. <i>Indicum</i> (<i>Vol.</i>), <i>Gmel.</i> | 13. <i>patulum</i> , <i>Brod.</i> |
| 2. <i>armatum</i> (<i>Vol.</i>), <i>Lam.</i> | 8. <i>Linnaei</i> , <i>Reeve.</i> | 14. <i>porcina</i> (<i>Vol.</i>), <i>Lam.</i> |
| 3. <i>Broderipii</i> , <i>Gray.</i> | 9. <i>Miltonis</i> (<i>Vol.</i>), <i>Kien.</i> | 15. <i>proboscidale</i> (<i>Vol.</i>), <i>L.</i> |
| 4. <i>diadema</i> (<i>Vol.</i>), <i>Lam.</i> | 10. <i>nauticum</i> (<i>Vol.</i>), <i>Lam.</i> | 16. <i>rubiginosum</i> (<i>Vol.</i>), <i>S.</i> |
| 5. <i>ducale</i> (<i>Vol.</i>), <i>Lam.</i> | 11. <i>Neptuni</i> (<i>Vol.</i>), <i>Lam.</i> | 17. <i>tessellatum</i> , <i>Brod.</i> |
| 6. <i>gracile</i> , <i>Brod.</i> | 12. <i>olla</i> (<i>Vol.</i>), <i>Linn.</i> | 18. <i>Tritonis</i> , <i>Brod.</i> |

Figures.

CYMBIUM LINNÆI. (*Voluta cymbium*, *Linn.*). Plate 2. Fig. 8.—Shell, showing the papillary spire, and the summit of the whorls flattened.

CYMBIUM BRODERIPPII. Plate 2. Fig. 10.—Shell, showing the papillary spire, and the summit of the whorls coronated with vaulted scales.

Genus 2. VOLUTA, *Linnæus.*

Animal; disc oval or oblong, head obtuse or rounded, tentacles short, eyes a little removed from the tentacles; respiratory siphon stout, curiform, dilated at the base into two lobes.

Shell; ovate or oblong, emarginated at the base, spire short and mostly papillary at the apex; whorls smooth or ribbed, sometimes tuberculated at the summit; aperture oblong, columella callous, lower plaits the larger; lip but slightly thickened.

Linnaeus included under the head of *Voluta* all shells having a row of plaits winding round the columella, without considering the nature or habits of their animal occupants; the *Tornatellæ*, whose shells are entire at the base, the *Auriculæ*, which inhabit the banks of stagnant waters and are amphibious, the *Turbinellæ*, which are canaliculated, and the *Marginellæ*, in which the shell is entirely enveloped by the animal, were all associated in the 'Systema Naturæ' under the same generic type. This heterogeneous group has, however, been gradually dismembered, until only those species remain which present the characters strictly typified in the well-known *V. scapha*, *musica*, or *vespertilio*. The ancient genus *Voluta* is, therefore, circumscribed within very narrow limits, and some of the species are of such rare occurrence, that only a few individuals of the shells of each have yet been discovered; the *V. Junonia*, *aulica*, *reticulata*, *megaspira*, *papillosa*, *Mitræformis*, *pulchra*, and *marmorata* are examples.

The animal of *Voluta* scarcely differs from that of *Cymbium* except in being smaller, less expansile, and more brilliantly coloured; it presents the same peculiar lobed dilation of the respiratory siphon, and the eyes, as in that genus, are quite removed from the tentacles. The species hitherto discovered in a living state, exhibit as brilliant a variation of colour in the soft parts as in the shell. The *V. vespertilio* is characterized by a bright yellow disc, marked with longitudinal interrupted black lines, the *V. angulata*, by a rusty orange tint, marked throughout with dark leopard spots, the *V. nivosa*, purple, marked with unequal black spots with white edges, and the

V. angulata with netted waved red-brown lines. The colours and markings of molluscous animals never correspond with those of their shells.

The *Volutæ* are strictly tropical, none inhabit the European seas, and not a single species has been found in any part of the Mediterranean, the richest, and most highly esteemed, are from Australia, New Guinea and New Zealand; there are one or two species from Brazil, and some from Ceylon, Timor, and Western Africa, but the well-known *V. musica*, of which the *V. lavigata*, *carneolata*, *Guinaica* and *thiarella* of Lamarck are varieties, is principally found in the West Indies.

The Volutes rarely inhabit localities where Mitres abound; at the Philippine Islands, for example, Mr. Cuming collected between two and three hundred species of that genus, whilst scarcely a Volute presented itself.

Species.

- | | | |
|----------------------------------|---|--------------------------------|
| 1. ancilla <i>Soland.</i> | 22. harpa, <i>Barnes.</i> | 43. pallida, <i>Gray.</i> |
| 2. angulata, <i>Soland.</i> | 23. Hebraea, <i>Linn.</i> | 44. papillosa, <i>Swain.</i> |
| 3. aulica, <i>Soland.</i> | 24. imperialis, <i>Lam.</i> | 45. piperita, <i>Sow.</i> |
| 4. Beckii, <i>Brod.</i> | 25. Junonia, <i>Chemn.</i> | 46. polyzonalis, <i>Lam.</i> |
| 5. Brasiliana, <i>Soland.</i> | 26. Lapponica, <i>Linn.</i> | 47. pulchra, <i>Sow.</i> |
| 6. bullata, <i>Swain.</i> | 27. Largilliertiana, <i>D'Orb.</i> | 48. punctata, <i>Swain.</i> |
| 7. chlorosina, <i>Lam.</i> | 28. luteostoma, <i>Chemn.</i> | 49. pusio, <i>Swain.</i> |
| 8. concinna, <i>Brod.</i> | 29. lyraformis (<i>Mitra</i>), <i>Sw.</i> | 50. reticulata, <i>Reeve.</i> |
| 9. costata, <i>Swain.</i> | 30. maculata, <i>Swain.</i> | 51. rupestris <i>Gmel.</i> |
| 10. Cuningii, <i>Brod.</i> | 31. Magellanica, <i>Chemn.</i> | 52. rutila, <i>Brod.</i> |
| 11. Cylleniformis, <i>Sow.</i> | 32. magnifica, <i>Chemn.</i> | 53. seapha, <i>Gmel.</i> |
| 12. cymbiola, <i>Chemn.</i> | 33. mamilla, <i>Gray.</i> | 54. subnodosa, <i>Leach.</i> |
| 13. Delessertiana, <i>Petit.</i> | 34. marmorata, <i>Swain.</i> | 55. sulcata, <i>Lam.</i> |
| 14. dubia, <i>Brod.</i> | 35. megaspira, <i>Sow.</i> | 56. tuberculata, <i>Swain.</i> |
| 15. elongata, <i>Swain.</i> | 36. Mitraformis, <i>Sow.</i> | 57. Turneri, <i>Gray.</i> |
| 16. Ferussacii, <i>Donov.</i> | 37. musica, <i>Linn.</i> | 58. undulata, <i>Lam.</i> |
| 17. festiva, <i>Lam.</i> | 38. nivosa, <i>Lam.</i> | 59. vespertilio, <i>Linn.</i> |
| 18. fulgetrum, <i>Sow.</i> | 39. nodulosa, <i>Lam.</i> | 60. vexillum, <i>Chemn.</i> |
| 19. fusiformis, <i>Swain.</i> | 40. Norrissii, <i>Sow.</i> | 61. volvacea, <i>Lam.</i> |
| 20. gracilis, <i>Swain.</i> | 41. nucleus, <i>Lam.</i> | 62. zebra, <i>Leach.</i> |
| 21. Guildingii, <i>Sow.</i> | 42. Pacifica, <i>Soland.</i> | |

Figures.

VOLUTA ANGULATA. Plate D.—Shell with animal, showing its rounded head, short tentacles, remote eyes, auriform respiratory siphon, and mantle expanded over the left side of the shell. *From D'Orbigny's Voyage dans l'Amérique Méridionale.*

VOLUTA VOLVACEA. Plate 1. Fig. 7.—Shell, showing the winding plaits.

Genus 3. MITRA, Lamarck.

Animal; disc small, oblong, oval behind, squarely truncated in front; head and tentacles small, eyes situated sometimes towards the middle of the tentacles, sometimes pedunculated and towards the base; respiratory siphon thin; trunk susceptible of very considerable elongation.

Shell; turreted or fusiform, emarginated at the base, spire mostly sharply acuminate, apex narrow, varying in length; columella a little recurved at the base, lower plaits the smaller.

The Mitres constitute a numerous division of the family Columellata, distinguished from the Volutes by a very important association of character; their shells are long and turriculated, and there is a marked change in the arrangement of the columellar plaits, which, instead of increasing, diminish in size as they descend; the animal is very small; the head is of the form of a triangle, at the basal corners of which are the tentacles, with the eyes situated sometimes towards the middle, sometimes towards the base, upon short peduncles; the respiratory siphon is small and not dilated into lobes at the base, and the trunk is capable of remarkable elongation; lastly, their habits vary, and they differ in their geographical limits.

It is easy to conceive that a small mollusk, producing a ponderous turriculated shell like the ‘Bishop’s Mitre’, (*M. episcopalis*) would naturally be of a much more sluggish disposition than one whose shell is supported by an ample muscular disc like the ‘Bat Volute’ (*V. vespertilio*); and the Mitre is accordingly described by M. Quoy and Gaimard as an “animale apathique”, a creature of limited sensibility, whose activity is necessarily restrained by the over-balancing proportions of its shell. It is related by these illustrious circumnavigators, who were the first to discover the Mitre in a living state, that they kept several healthy individuals for some time without observing any decided movement; they are, however, provided in this comatose state with the faculty of elongating their trunk to an extent not enjoyed by any other genus; the extremity of it is furnished with a kind of dentated chewing apparatus, and the animal is enabled to exert this destructive organ in all directions for the capture of food, with little apparent effort, and without altering its position.

The peculiarity alluded to in the geographical distribution of the Mitres, is, that they are rarely found in places inhabited by Volutes; the Philippine Islands, for example, are probably the richest spot in the world for Mitres; during Mr. Cuming’s four years sojourn in that locality, he collected between two or three hundred species, yet scarcely a Volute presented itself;

and on the western coasts of Africa and New Holland, where the Melons and Volutes abound, very few Mitres have made their appearance.

In a monograph of this genus recently published in the 'Conchologia Iconica', I have described upwards of three hundred and thirty species, as follows:—

Species

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| 1. abbatis, <i>Chemn.</i> | 39. cælata, <i>Reeve.</i> | 77. corallina, <i>Reeve.</i> |
| 2. acuminata, <i>Swain.</i> | 40. cæligena, <i>id.</i> | 78. coriacea, <i>id.</i> |
| 3. acupicta, <i>Reeve.</i> | 41. cærulea, <i>id.</i> | 79. cornicula, <i>Desh.</i> |
| 4. Adamsoni, <i>Gray.</i> | 42. caffra, <i>Lam.</i> | 80. coronata, <i>Lam.</i> |
| 5. adusta, <i>Lam.</i> | 43. caliginosa, <i>Reeve.</i> | 81. corrugata, <i>id.</i> |
| 6. ægra, <i>Reeve.</i> | 44. callosa, <i>id.</i> | 82. costellaris, <i>id.</i> |
| 7. Æthiops, <i>id.</i> | 45. cancellata, <i>Swain.</i> | 83. crassa, <i>Swain.</i> |
| 8. affinis, <i>id.</i> | 46. candida, <i>Reeve.</i> | 84. crebrilirata, <i>Reeve.</i> |
| 9. alveolus, <i>id.</i> | 47. Capensis, <i>Dunker.</i> | 85. cremans, <i>id.</i> |
| 10. amabilis, <i>id.</i> | 48. carbonacea, <i>Reeve.</i> | 86. crenata, <i>id.</i> |
| 11. amanda, <i>id.</i> | 49. cardinalis, <i>Gronov.</i> | 87. crenifera, <i>Lam.</i> |
| 12. ambigua, <i>Swain.</i> | 50. carinata, <i>Swain.</i> | 88. crenulata, <i>id.</i> |
| 13. amphorella, <i>Lam.</i> | 51. carnicolor, <i>Reeve.</i> | 89. crocata, <i>id.</i> |
| 14. analogica, <i>Reeve.</i> | 52. casta, <i>Lam.</i> | 90. crocea, <i>Reeve.</i> |
| 15. Ancillides, <i>Swain.</i> | 53. catenata, <i>Reeve.</i> | 91. cruentata, <i>id.</i> |
| 16. angulosa, <i>Küster.</i> | 54. cavea, <i>id.</i> | 92. cucumerina, <i>Lam.</i> |
| 17. annulata, <i>Reeve.</i> | 55. chalybeia, <i>id.</i> | 93. Cumingii, <i>Reeve.</i> |
| 18. anthracina, <i>id.</i> | 56. chelonia, <i>id.</i> | 94. cylindracea, <i>id.</i> |
| 19. arenosa, <i>Lam.</i> | 57. Chinensis, <i>Gray.</i> | 95. dactylus, <i>Lam.</i> |
| 20. armiger, <i>Reeve.</i> | 58. choava, <i>Reeve.</i> | 96. dædala, <i>Reeve.</i> |
| 21. armillata, <i>id.</i> | 59. chrysalis, <i>id.</i> | 97. declivis, <i>id.</i> |
| 22. articulata, <i>id.</i> | 60. chrysostoma, <i>Swain.</i> | 98. decora, <i>id.</i> |
| 23. astrieta, <i>id.</i> | 61. cimelium, <i>Reeve.</i> | 99. decurtata, <i>id.</i> |
| 24. attenuata, <i>id.</i> | 62. cinetella, <i>Lam.</i> | 100. Defrancii, <i>Payr.</i> |
| 25. aurantia, <i>Desh.</i> | 63. cineracea, <i>Reeve.</i> | 101. Dennisoni, <i>Reeve.</i> |
| 26. aureolata, <i>Reeve.</i> | 64. circulata, <i>Kiener.</i> | 102. dermestina, <i>Lam.</i> |
| 27. Auriculoides, <i>id.</i> | 65. eithara, <i>Reeve.</i> | 103. Deshayesii, <i>Reeve.</i> |
| 28. australis, <i>Swain.</i> | 66. citrina, <i>id.</i> | 104. digitalis, <i>id.</i> |
| 29. avenacea, <i>Reeve.</i> | 67. clandestira, <i>id.</i> | 105. discoloria, <i>id.</i> |
| 30. bacillum, <i>Lam.</i> | 68. clathrata, <i>id.</i> | 106. duplilirata, <i>id.</i> |
| 31. badia, <i>Reeve.</i> | 69. coarctata, <i>Swain.</i> | 107. ebenus, <i>Lam.</i> |
| 32. balteolata, <i>id.</i> | 70. coccinea, <i>Reeve.</i> | 108. effusa, <i>Sicain.</i> |
| 33. Belcheri, <i>Hinds.</i> | 71. Columbellæformis, <i>Kie.</i> | 109. elegans, <i>Reeve.</i> |
| 34. bilineata <i>Reeve.</i> | 72. concentrica, <i>Reeve.</i> | 110. episcopalis, <i>Argen.</i> |
| 35. Bovei, <i>Kiener.</i> | 73. concinna, <i>id.</i> | 111. exasperata, <i>Desh.</i> |
| 36. brumalis, <i>Reeve.</i> | 74. conica, <i>Desh.</i> | 112. exilis, <i>Reeve.</i> |
| 37. Bulimoides, <i>id.</i> | 75. consanguineus, <i>Reeve.</i> | 113. fastigium, <i>id.</i> |
| 38. cadaverosa, <i>id.</i> | 76. Conus, <i>id.</i> | 114. fenestrata, <i>Lam.</i> |

115. ferruginea, *Lam.*
 116. festa, *Reeve.*
 117. ficalina, *Lam.*
 118. filosa, *id.*
 119. filum, *Reeve.*
 120. fissurata, *Lam.*
 121. flammea, *Quoy.*
 122. flammigera, *Reeve.*
 123. flavescens, *id.*
 124. floccata, *id.*
 125. forticostata, *id.*
 126. fulgetrum, *id.*
 127. fulgurita, *id.*
 128. fulva, *Swain.*
 129. fulvescens, *Reeve.*
 130. funerea, *id.*
 131. funiculata, *id.*
 132. fusca, *Reeve.*
 133. fusiformis, *Kiener.*
 134. gausapata, *Reeve.*
 135. gigantea, *Swain.*
 136. glabra, *Swain.*
 137. glandiformis, *Reeve.*
 138. glans, *id.*
 139. gracilis, *id.*
 140. Graja, *id.*
 141. granata, *id.*
 142. granulosa, *Lam.*
 143. granum, *Forbes.*
 144. gratiosa, *Reeve.*
 145. Grøenlandica, *Gray.*
 146. Grunerii, *Reeve.*
 147. guttata, *Swain.*
 148. hebes, *Reeve.*
 149. Hindsii, *id.*
 150. histrio, *id.*
 151. ignobilis, *id.*
 152. impressa, *Anton.*
 153. incarnata, *Reeve.*
 154. inermis *id.*
 155. infasta, *id.*
 156. infecta, *id.*
 157. inquinata, *id.*
 158. interlirata, *id.*
 159. intermedia, *Kiener.*
 160. isabella, *Reeve.*
 161. lachryma, *id.*
 162. lactea, *Lam.*
 163. lacunosa, *Reeve.*
 164. Lamarckii, *Desh.*
 165. latruncularia, *Reeve.*
 166. lauta, *id.*
 167. lens, *id.*
 168. leucodesma, *id.*
 169. lignaria, *id.*
 170. limata, *id.*
 171. limbifera, *Lam.*
 172. lineata, *Reeve.*
 173. literata, *Lam.*
 174. littoralis, *Forbes.*
 175. livida, *Reeve.*
 176. loricata, *id.*
 177. lota, *id.*
 178. lubens, *id.*
 179. lucida, *id.*
 180. luculenta, *id.*
 181. lugubris, *Swain.*
 182. lyrata, *Lam.*
 183. maculosa, *Reeve.*
 184. mæsta, *id.*
 185. melongena, *Lam.*
 186. mica, *Reeve.*
 187. micans, *id.*
 188. microzonias, *Lam.*
 189. militaris, *Reeve.*
 190. milium, *id.*
 191. millecostata, *id.*
 192. mirifica, *id.*
 193. modesta, *id.*
 194. mucronata, *id.*
 195. multicostata, *id.*
 196. muricata, *id.*
 197. muriculata, *Lam.*
 198. mutabilis, *Reeve.*
 199. nanus, *id.*
 200. nebulosa, *Swain.*
 201. nigra, *Reeve.*
 202. nivea, *id.*
 203. nodosa, *id.*
 204. Norrisii, *id.*
 205. nucea, *id.*
 206. nucleola, *Lam.*
 207. nympha, *Reeve.*
 208. obeliscus, *id.*
 209. obesa, *id.*
 210. ocellata, *Swain.*
 211. oleacea, *Reeve.*
 212. Olivæformis, *id.*
 213. orientalis, *Gray.*
 214. ossea, *Reeve.*
 215. Pacifica, *id.*
 216. papalis, *Lam.*
 217. pardalis, *Küster.*
 218. patriarchalis, *Lam.*
 219. patula, *Reeve.*
 220. paupercula, *Lam.*
 221. peculiaris, *Reeve.*
 222. pediculus, *Lam.*
 223. pellis-serpentis, *Reeve.*
 224. peregra, *id.*
 225. Phillipiana, *Forbes.*
 226. pica, *Reeve.*
 227. picta, *id.*
 228. pinguis, *id.*
 229. planilirata, *id.*
 230. plicata, *Lam.*
 231. plumbea, *id.*
 232. polita, *Reeve.*
 233. pontificalis, *Lam.*
 234. porcata, *Humph.*
 235. porphyretica, *Reeve.*
 236. pretiosa, *id.*
 237. proscissa, *id.*
 238. pruinosa, *id.*
 239. puella, *id.*
 240. pulchella, *id.*
 241. pullata, *id.*
 242. punctata, *Swain.*
 243. puncticulata, *Lam.*
 244. purpurata, *Reeve.*
 245. pyramidalis, *id.*
 246. Quoyi, *Desh.*
 247. radius, *Reeve.*
 248. recurva, *id.*
 249. regina, *Sow.*
 250. retusa, *Lam.*
 251. rhodia, *Reeve.*
 252. rigida, *Swain.*
 253. roborea, *Reeve.*
 254. robusta, *id.*
 255. rosacea, *id.*
 256. rosea, *id.*
 257. Rossiæ, *id.*
 258. rotundilirata, *id.*

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| 259. rubiginosa, <i>Reeve.</i> | 284. sphærulata, <i>Martyn.</i> | 308. turgida, <i>Reeve.</i> |
| 260. rubra, <i>id.</i> | 285. spicata, <i>Reeve,</i> | 309. turriger, <i>id.</i> |
| 261. rubricata, <i>id.</i> | 286. Stainforthii, <i>id.</i> | 310. tusa, <i>id.</i> |
| 262. rubritincta, <i>id.</i> | 287. stigmataria, <i>Lam.</i> | 311. typha, <i>id.</i> |
| 263. rugosa, <i>Sow.</i> | 288. striatula, <i>id.</i> | 312. undulosa, <i>id.</i> |
| 264. rupicolor, <i>Reeve.</i> | 289. strigata, <i>Swain.</i> | 313. ustulata, <i>id.</i> |
| 265. Rüppellii, <i>id.</i> | 290. subulata, <i>Lam.</i> | 314. Vanikorensis, <i>Quoy.</i> |
| 266. rustica, <i>id.</i> | 291. sulcata, <i>Kiener.</i> | 315. variabilis, <i>Reeve.</i> |
| 267. sanguisuga, <i>Lam.</i> | 292. suturata, <i>Reeve.</i> | 316. variata, <i>id.</i> |
| 268. Savignii, <i>Payr.</i> | 293. Swainsoni, <i>Brod.</i> | 317. variegata, <i>id.</i> |
| 269. seabriuscula, <i>Gray.</i> | 294. tabanula, <i>Lam.</i> | 318. venustula, <i>id.</i> |
| 270. Schroeteri, <i>Desh.</i> | 295. tæniata, <i>id.</i> | 319. versicolor, <i>Martyn.</i> |
| 271. sculptilis, <i>Reeve.</i> | 296. telescopium, <i>Reeve,</i> | 320. verrucosa, <i>Reeve.</i> |
| 272. scutulata, <i>Lam.</i> | 297. terebralis, <i>Lam.</i> | 321. vexillum, <i>id.</i> |
| 273. semen, <i>Reeve.</i> | 298. tessellata, <i>Martyn.</i> | 322. virgata, <i>id.</i> |
| 274. semicostata, <i>Lam.</i> | 299. testacea, <i>Swain.</i> | 323. virgo, <i>id.</i> |
| 275. semifasciata, <i>id.</i> | 300. texturata, <i>Lam.</i> | 324. vittata, <i>Swain.</i> |
| 276. semiferruginea, <i>Jonas.</i> | 301. Ticaonica, <i>Reeve.</i> | 325. vulpecula, <i>Lam.</i> |
| 277. Senegalensis, <i>Reeve.</i> | 302. tornata, <i>id.</i> | 326. vultuosa, <i>Reeve.</i> |
| 278. serpentina, <i>Lam.</i> | 303. Tornatelloides, <i>id.</i> | 327. Woldemarii, <i>Kiener.</i> |
| 279. Sinensis, <i>Reeve.</i> | 304. tristis, <i>Swain.</i> | 328. Zebuensis, <i>Reeve.</i> |
| 280. Solandri, <i>id.</i> | 305. tuberosa, <i>Reeve.</i> | 329. zelotypa, <i>id.</i> |
| 281. solida, <i>id.</i> | 306. tumida, <i>id.</i> | 330. Ziervogeliana, <i>Kiener.</i> |
| 282. solidula, <i>id.</i> | 307. turben, <i>id.</i> | 331. zonata, <i>Marryatt.</i> |
| 283. speciosa, <i>id.</i> | | |

Figure.

MITRA STAINFORTHII. Plate 3. Fig. 13.—*An extremely rare species from the collection of Thomas Norris, Esq.*

Genus 4. MARGINELLA, Lamarck.

Animal; disc large, thin, widely expanded behind; mantle extending over the shell in two lobes, by which it is nearly enveloped, sometimes furnished with filaments; head flat, small, with a pair of short tentacles, behind which are the eyes; respiratory siphon cylindrical, very short.

Shell; ovately oblong or pyriform, emarginated at the base, spire short, more or less depressed; aperture oblong, often equalling the length of the shell; columella plaited nearly equally; outer lip rolled back and solidified.

Regarding the general aspect of the *Marginellæ*, it is not surprising that Linnæus should have referred them to the genus *Voluta*; the shell differs,

however, from the type of that group in being uniformly smaller, in the occasional Cowrey-like extension of the aperture to the summit of the spire, and in the outer surface being of the same highly polished enamel, as the *Cypraea* and *Oliva*. We learn from the last of these characters, that the shell is enveloped by the mantle of its animal inhabitant; a description of which was published by M. Adanson towards the close of the last century, in his 'Voyage en Sénégal', and it has been recently confirmed with greater accuracy by the observations of M. Deshayes on the shores of the Mediterranean; he describes it as having a thin capacious disc reflected over the edge of the shell, with the mantle extended on either side, as in the Cowrey, into a thin lobe, closing together chiefly behind, so as to leave a narrow opening on the back.

The soft parts of the *Marginellæ*, like the Cowries, exhibit a brilliant variety of colouring; the shells are also similarly characterized; they are tolerably numerous in species, and are mostly found within the Tropics.

Species.

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| 1. <i>Adansoni</i> , <i>Kiener</i> . | 27. <i>cylindrica</i> , <i>Brown</i> . | 53. <i>liturata</i> , <i>Menke</i> . |
| 2. <i>affinis</i> , <i>Beck</i> . | 28. <i>Cypræola</i> , <i>Sow</i> . | 54. <i>longivaricosa</i> , <i>Lam</i> . |
| 3. <i>amygdala</i> , <i>Kiener</i> . | 29. <i>dactylus</i> , <i>Lam</i> . | 55. <i>maculosa</i> , <i>Kiener</i> . |
| 4. <i>apicina</i> , <i>Menke</i> . | 30. <i>Delessertiana</i> , <i>Récluz</i> . | 56. <i>margarita</i> , <i>Kiener</i> . |
| 5. <i>aurantia</i> , <i>Lam</i> . | 31. <i>diaphana</i> , <i>Kiener</i> . | 57. <i>marginata</i> , <i>Sow</i> . |
| 6. <i>auriculata</i> , <i>Ménard</i> . | 32. <i>elegans</i> , <i>Kiener</i> . | 58. <i>miliacea</i> (<i>Volv.</i>), <i>Adan</i> . |
| 7. <i>avellana</i> , <i>Lam</i> . | 33. <i>evanida</i> , <i>Sow</i> . | 59. <i>monilis</i> , <i>Sow</i> . |
| 8. <i>avenacea</i> , <i>Valen</i> . | 34. <i>faba</i> , <i>Lam</i> . | 60. <i>muscaria</i> , <i>Lam</i> . |
| 9. <i>Belangeri</i> , <i>Kiener</i> . | 35. <i>festiva</i> , <i>Kiener</i> . | 61. <i>musica</i> , <i>Hinds</i> . |
| 10. <i>Belcheri</i> , <i>Hinds</i> . | 36. <i>formicula</i> , <i>Lam</i> . | 62. <i>neglecta</i> , <i>Sow</i> . |
| 11. <i>Bellii</i> , <i>Sow</i> . | 37. <i>frumentum</i> , <i>Sow</i> . | 63. <i>nodata</i> , <i>Hinds</i> . |
| 12. <i>bifasciata</i> , <i>Lam</i> . | 38. <i>fulminata</i> , <i>Kiener</i> . | 64. <i>nubeculata</i> , <i>Lam</i> . |
| 13. <i>bivaricosa</i> , <i>id</i> . | 39. <i>fusiformis</i> , <i>Hinds</i> . | 65. <i>oblonga</i> , <i>Swainson</i> . |
| 14. <i>blanda</i> , <i>Hinds</i> . | 40. <i>glabella</i> , <i>Lam</i> . | 66. <i>Olivæformis</i> , <i>Kiener</i> . |
| 15. <i>bullata</i> , <i>Lam</i> . | 41. <i>Goodalli</i> , <i>Sow</i> . | 67. <i>oryza</i> (<i>Volv.</i>), <i>Lam</i> . |
| 16. <i>cærulescens</i> , <i>id</i> . | 42. <i>guttata</i> , <i>Swains</i> . | 68. <i>pallida</i> , <i>Sow</i> . |
| 17. <i>callosa</i> , <i>Sow</i> . | 43. <i>helmatina</i> , <i>Rang</i> . | 69. <i>persicula</i> , <i>Lam</i> . |
| 18. <i>catenata</i> , <i>Sow</i> . | 44. <i>inconspicua</i> , <i>Sow</i> . | 70. <i>Petitii</i> , <i>Duval</i> . |
| 19. <i>cincta</i> , <i>Kiener</i> . | 45. <i>interrupta</i> , <i>Lam</i> . | 71. <i>prunum</i> , <i>Swainson</i> . |
| 20. <i>cingulata</i> , <i>Swainson</i> . | 46. <i>irrorata</i> , <i>Menke</i> . | 72. <i>pseudo-faba</i> , <i>Sow</i> . |
| 21. <i>clandestina</i> , <i>Brong</i> . | 47. <i>Kieneriana</i> , <i>Petit</i> . | 73. <i>pulchella</i> , <i>Kiener</i> . |
| 22. <i>Cleryi</i> , <i>Petit</i> . | 48. <i>labiata</i> , <i>Valen</i> . | 74. <i>pulchra</i> , <i>Gray</i> . |
| 23. <i>conoidalis</i> , <i>Kiener</i> . | 49. <i>lactea</i> , <i>Kiener</i> . | 75. <i>punctulata</i> , <i>Petit</i> . |
| 24. <i>cornea</i> , <i>Lam</i> . | 50. <i>Largillieri</i> , <i>Kiener</i> . | 76. <i>quinqueplicata</i> , <i>Lam</i> . |
| 25. <i>Cumingiana</i> , <i>Petit</i> . | 51. <i>limbata</i> , <i>Lam</i> . | 77. <i>retusa</i> , <i>id</i> . |
| 26. <i>curta</i> , <i>Sow</i> . | 52. <i>lineata</i> , <i>id</i> . | 78. <i>rosea</i> , <i>id</i> . |

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| 79. <i>sapotilla</i> , <i>Hinds.</i> | 84. <i>strigata</i> , <i>Chemn.</i> | 89. <i>undulata</i> (<i>Voluta</i>), <i>Ch.</i> |
| 80. <i>sarda</i> , <i>Kiener.</i> | 85. <i>tæniata</i> , <i>Sow.</i> | 90. <i>varia</i> , <i>Sow.</i> |
| 81. <i>Sauliæ</i> , <i>Sow.</i> | 86. <i>tessellata</i> , <i>Lam.</i> | 91. <i>vitrea</i> , <i>Hinds.</i> |
| 82. <i>scripta</i> , <i>Hinds.</i> | 87. <i>tricincta</i> , <i>Hinds.</i> | 92. <i>zonata</i> , <i>Kiener.</i> |
| 83. <i>splendens</i> , <i>Humph.</i> | 88. <i>triticea</i> , <i>Sow.</i> | |
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Figure.

MARGINELLA NUBECULATA. Plate 1. Fig. 1.—*From the collection of H. Cuming, Esq.*

Genus 5. RINGICULA, *Deshayes.*

Animal; *unknown.*

Shell; *small, globose, very solid, sinuated at the base, spire short, sharply acuminated, columella short, with a plait-like callosity at the upper part, and two strong plaits beneath; aperture small; lip remarkably thickened.*

The genus *Ringicula* was instituted by M. Deshayes for the reception of a solid marine shell, about the size of a small pea, the fossil analogue of which had been erroneously placed by Lamarck among the fresh-water, or rather amphibious, *Auriculae*. It was first discovered in a living state by M. Ménard de la Groye in the gulf of Tarentum, and, upon noticing its affinity with the fossil *Auricula ringens* of Lamarck, he at once observed that from its marine nature and sinuated aperture, the fossil species to which it was related had been referred to the wrong genus. The characters which his shell exhibited were more intimately allied to *Marginella*, and he named it accordingly *Marginella auriculata*. M. Deshayes, however, has justly observed that its general form, and the disposition of the plaits, are not like those of *Marginella*, though closely allied to them, and I fully concur in the course he has adopted. It is a small white porcellanous shell, of very solid growth, the spire of which, though short, is sharply acuminated; the columella is peculiarly characterized by a rude plait-like callosity round the upper part, and two very prominent winding plaits beneath; there is a broad sinus at the base of the shell, and the lip is very considerably thickened. The following is the only recent species at present known.

Figure.

RINGICULA AURICULATA. Plate 1. Fig. 2. (Magnified).—*From the collection of H. Cuming, Esq.*

Family 3. PURPURIFERA.

Shell ; terminating at the base, either with a short slightly ascending canal, or with a deep sinus.

The genera enumerated under the head of *Purpurifera*, are grouped together upon a very artificial basis; the animal is characterized by a variation of form which it is difficult to reconcile with the propriety of their being associated in the same natural family, and the shell is scarcely less dissimilar in its general aspect. In *Terebra* the shell is of a smooth elongated lanceolate growth, whilst in *Harpa* it is of an ovate ventricose structure, thickly studded with varices; the only distinguishing character of the family, therefore, as constituted by Lamarck, resides in the basal sinus, that posterior portion of the shell which is fitted to the passage of the respiratory siphon, conveying water to the branchial cavity.

The soft parts of the *Purpurifera*, as in most of the molluscous tribe, display a striking contrast of colouring compared with the shell, and the relation of form is equally remote; in *Dolium*, the animal is green or mottled-blue, colours of which there is not the slightest approximating tinge in the shell; it is also characterized by an ample muscular disc, and a remarkable elongation of the proboscis, terminating in the *D. perdix* with a flattened funnel-like rosette, whilst the shell is chiefly distinguished for its comparative tenuity. The animal of *Harpa* has a beautifully coloured ocellated disc, extending in a remarkable degree beyond the posterior extremity of the shell to nearly a peak. In some of the *Buccina* the disc is expanded on either side of the aperture, and truncated behind forming a flat square; in *Oliva* and *Ancillaria* we have a modification of the ventral disc somewhat analogous to the lobate structure of the Cowrey, which being reflected into an ample fold, though generally partially retracted, is sufficiently capacious to envelope the shell; in *Mugilus*, on the other hand, the locomotive and calcifying organs are extremely limited in their dimensions, owing to the confined nature of its habitation, although the latter is exercised with a degree of energy which is truly wonderful.

The genera at present referred to this family are as follows:—

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| TEREBRA. | POLLIA. | CONCHOLEPAS. |
| OLIVA. | PHOS. | MONOCEROS. |
| ANCILLARIA. | BUCCINUM. | PURPURA. |
| EBURNA. | LEPTOCONCHUS. | COLUMBELLIA. |
| PLANAXIS. | MAGILUS. | RICINULA. |
| QUOYIA. | TRICHOTROPIS. | CASSIS. |
| NASSA. | DOLIUM. | ONISClA. |
| CYLLENE. | HARPA. | CASSIDARIA. |

Genus 1. TEREBRA, Bruguière.

Animal; disc short, very thick and muscular; head proboscis-shaped, cylindrical, tentacles short and conical with an eye situated on the outer side of each at the base; respiratory siphon cylindrical, rather prolonged.

Shell; elongated, turriculated, sinuated at the base; whorls very numerous, but slightly convex, apex very sharp and elevated; aperture small; columella swollen, contorted, terminating in a point; lip simple. Operculum horny, imbricated.

The genus *Terebra* is one of those well-defined groups which cannot easily be confounded with any other; it is distinguished by a long subulate shell, composed of a number of small whorls tapering gradually to a point, as sharp as a needle, and the base of the aperture is invariably sinuated. The shell of *Turritella* has very much the form of *Terebra*, but the aperture is rounded and entire; so that *Terebra* may be likened to a very long drawn-out *Buccinum*, and *Turritella* to a similarly elongated *Turbo*. The shells of these genera may, however, be readily distinguished from each other without referring to the generic peculiarities of the aperture. The calcifying function of the animal is much the more vigorously exercised in the genus under consideration, the shell is more solid, it exhibits a greater variety of structural embellishment, and whilst the colours are vivid and less obscure, they display a more pleasing variety of pattern and design.

The soft parts of *Terebra* are naturally very limited, the head and tentacles are small, and the entire mass when fully exserted, rarely extends beyond a tenth of the shell. But although the animal is cumbered with a shell ten times the length of its exserted body, it is not of the sluggish character of the *Mitre*; the shell of *Terebra*, though longer, is not of such overbalancing proportions, it is more truly acuminate, the weight is chiefly at the base, and the animal obtains a comparative facility of locomotion by the force with which it is able to secure its muscular disc to the place of attachment.

The *Terebræ* chiefly inhabit the eastern world, and are confined to warm temperatures; one small species, only, reaching so far north as the Mediterranean. The well-known *T. maculata* of Ceylon is the largest of the genus, the greater number of species vary from three to four inches in length, and are characterized by an interesting variety of sculpture and design. The most elongated and remarkable species is the *T. pretiosa*, which I have selected as an example on account of its rarity; only two or three specimens have yet been seen.

Species.

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| 1. aciculata, <i>Gray</i> . | 38. fatua, <i>Hinds</i> . | 74. picta, <i>Hinds</i> . |
| 2. affinis, <i>id</i> . | 39. fenestrata, <i>id</i> . | 75. plicata, <i>Gray</i> . |
| 3. alba, <i>id</i> . | 40. fictilis, <i>id</i> . | 76. plombea, <i>Dufo</i> . |
| 4. albida, <i>id</i> . | 41. flammea, <i>Lam</i> . | 77. plumbea, <i>Quoy</i> . |
| 5. albula, <i>Menke</i> . | 42. flava, <i>Gray</i> . | 78. pretiosa, <i>Reeve</i> . |
| 6. alveolata, <i>Hinds</i> . | 43. frigida, <i>Hinds</i> . | 79. pulchra, <i>Hinds</i> . |
| 7. amanda, <i>id</i> . | 44. funiculata, <i>id</i> . | 80. pygmæa, <i>id</i> . |
| 8. anomala, <i>Gray</i> . | 45. granulata, <i>Kiener</i> . | 81. radula, <i>id</i> . |
| 9. argus, <i>Hinds</i> . | 46. glauca, <i>Hinds</i> . | 82. raphanula, <i>Lam</i> . |
| 10. armillata, <i>id</i> . | 47. hastata, <i>Kiener</i> . | 83. robusta, <i>Hinds</i> . |
| 11. aspera, <i>id</i> . | 48. inconstans, <i>Hinds</i> . | 84. rudis, <i>Gray</i> . |
| 12. Babylonia, <i>Lam</i> . | 49. intertincta, <i>id</i> . | 85. rustica, <i>Hinds</i> . |
| 13. bicincta, <i>Hinds</i> . | 50. lævigata, <i>Gray</i> . | 86. Sandwicensis, <i>Sow</i> . |
| 14. bifrons, <i>id</i> . | 51. lanceata, <i>Lam</i> . | 87. Senegalensis, <i>Lam</i> . |
| 15. cærulescens, <i>Lam</i> . | 52. larvæformis, <i>Hinds</i> . | 88. specillata, <i>Hinds</i> . |
| 16. cancellata, <i>Quoy</i> . | 53. laurina, <i>id</i> . | 89. spectabilis, <i>id</i> . |
| 17. casta, <i>Hinds</i> . | 54. lepida, <i>id</i> . | 90. straminea, <i>Gray</i> . |
| 18. castanea, <i>Kiener</i> . | 55. ligata, <i>id</i> . | 91. strigata, <i>Sow</i> . |
| 19. cerithina, <i>Lam</i> . | 56. lingualis, <i>id</i> . | 92. strigilata, <i>Lam</i> . |
| 20. cinerea, <i>Basterot</i> . | 57. luctuosa, <i>id</i> . | 93. stylata, <i>Hinds</i> . |
| 21. chlorata, <i>Lam</i> . | 58. maculata, <i>Lam</i> . | 94. subulata, <i>Lam</i> . |
| 22. cingula, <i>Kiener</i> . | 59. mera, <i>Hinds</i> . | 95. succinea, <i>Hinds</i> . |
| 23. cingulifera, <i>Lam</i> . | 60. micans, <i>id</i> . | 96. tenera, <i>id</i> . |
| 24. columellaris, <i>Hinds</i> . | 61. monilis, <i>Quoy</i> . | 97. tessellata, <i>Gray</i> . |
| 25. commaculata, <i>Pfeiff</i> . | 62. muscaria, <i>Lam</i> . | 98. textilis, <i>Hinds</i> . |
| 26. consors, <i>Hinds</i> . | 63. Nassoides, <i>Hinds</i> . | 99. tigrina, <i>Gray</i> . |
| 27. conspersa, <i>id</i> . | 64. nebulosa, <i>Sow</i> . | 100. tricolor, <i>Sow</i> . |
| 28. copula, <i>id</i> . | 65. nimbosa, <i>Hinds</i> . | 101. triseriata, <i>Gray</i> . |
| 29. corrugata, <i>Lam</i> . | 66. nitida, <i>id</i> . | 102. tuberculosa, <i>Hinds</i> . |
| 30. Cosentini, <i>Philippi</i> . | 67. nubeculata, <i>Sow</i> . | 103. tuberosa, <i>id</i> . |
| 31. crenulata, <i>Lam</i> . | 68. obesa, <i>Hinds</i> . | 104. undulata, <i>Gray</i> . |
| 32. cuspidata, <i>Hinds</i> . | 69. oculata, <i>Lam</i> . | 105. varicosa, <i>Hinds</i> . |
| 33. dimidiata, <i>Lam</i> . | 70. ornata, <i>Gray</i> . | 106. variegata, <i>Gray</i> . |
| 34. duplicata, <i>id</i> . | 71. Patagonica, <i>D'Orb</i> . | 107. venosa, <i>Hinds</i> . |
| 35. Dussumieriæ, <i>Kiener</i> . | 72. penicillata, <i>Hinds</i> . | 108. violascens, <i>id</i> . |
| 36. eburnea, <i>Hinds</i> . | 73. pertusa, <i>Basterot</i> . | 109. vittata, <i>Lam</i> . |
| 37. elata, <i>id</i> . | | |

Figure.

TEREBRA PREIOSA. Plate 3. Fig. 15. *An extremely rare species, in the collection of E. G. L. Gruner, Esq., of Bremen.*

Genus 2. OLIVA, *Bruguière.*

Animal; disc widely expanded, reflected on either side over the anterior portion of the shell, forming a capacious fold, sometimes rounded, sometimes acuminated behind, front extremity furnished with a pair of wing-like lobes, anterior to the head; head very small, tentacles thickened about half-way, at the summit of which thickened portion is the eye: mantle small, hind extremity furnished with a filament or cord which passes into a groove in the spire of the shell, front portion forming an ample siphon for conveying the water to the branchial cavity, with a flowing triangularly pointed appendage behind it.

Shell; polished, more or less cylindrical, emarginated at the base; spire short, sharp at the apex; whorls closely convoluted, with a deep narrow channel round the spire, in the place of the suture; aperture narrow, extending nearly the length of the shell; columella obliquely grooved, terminating with a callosity, lip simple.

The Olives were arranged by Lamarck in the same family with the Cowries on account of their polished exterior; they have been removed to the *Purpurifera*, because of their affinity with *Ancillaria* and *Eburna*. The whorls of the shell are convoluted on nearly the same vertical plane with the spire, and the columella is obliquely grooved, as if it had been bound, as it were, with cords, sufficient to swell the base into a callosity; the most striking character, however, is the presence of a deep narrow groove, encircling the spire in the place of the suture, the use of which I have now to explain.

The enamelled exterior of the Olive-shell indicates that it is more or less enveloped, like the Cowrey, with a portion of the animal; but it is not covered by the mantle, it is protected by a modification of the disc; the calcifying organ of these mollusks differs both in structure and function. In the Cowrey, the office of calcification is performed by a lobate extension of the mantle from either side of the aperture, sufficient to cover the shell, and only retracted under a state of alarm. In *Oliva* the mantle is limited to the interior and aperture of the shell; it appears to be furled over the edge of the lip, and is held, as it were, in a state of tension by a cord or filament passing from the posterior extremity into a deep narrow channel, which is excavated round the spire of the shell in place of the suture. The result of this difference in the condition of the calcifying organ, is, that in

the Cowrey the testaceous fluid is deposited from the outside, in layers at different intervals, whilst in the Olive it is secreted in layers simultaneously at the lip, and the porcellaneous surface of the shell is preserved in its course of retrovolution, as well as after maturity, by a reflexion of the ventral disc, in a manner somewhat analogous to the reflected mantle of the Cowrey; bearing no part in the formation of the shell, however it may minister to its preservation by the tendency of its viscid humour.

It now remains to ascertain whether the distinction here assigned to the calcifying functions of these mollusks, is borne out by the physical condition of their shells at different stages of growth. Each period in the life of the Cowrey (as described at page 40) is illustrated by a different design of colouring; the shell ceases its course of retrovolution long before arriving at the adult state, and increases in substance and variety of colouring by the outward expansion of the mantle. It is not so in the case of the Olive; the shell of this mollusk exhibits the same appearance at all stages of growth, the different layers of colouring matter must of necessity be deposited simultaneously, because the organ of calcification reaches only to the lip, from which the shell gradually recedes in its progress of growth. The Olive-shell has no periodical change of colour to mark its advancement, yet it will be found on removing the outer coat by chemical agency, that there is a superincumbent layer of different colour and design. The external coating of the *Oliva utriculus* is of an obscure milky blue colour, but the removal of this layer by the application of an acid, reveals a dark ashy ground, sprinkled with numerous triangular opal-like dashes; the removal of the outer layer of the *Oliva Brasiliensis* exhibits a longitudinally striped pattern, and other varieties of design may be found in different species.

The Olives are confined exclusively to the tropical regions, we have none on our own coast, nor is there a single species in any part of the Mediterranean. They are described by M. Quoy, in the 'Voyage de l'Astrolabe', as possessing an unusual degree of activity, and able to regain their position when placed upon their backs; and Mr. Gray observes in Beechey's Voyage, that they live partially buried in the sand, though easily taken by lines baited with flesh.

Species *.

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| 1. acuminata, <i>Chemn.</i> | 5. aniomina, <i>Duclos.</i> | 9. australis, <i>Duclos.</i> |
| 2. alectona, <i>Duclos.</i> | 6. araneosa, <i>Lam.</i> | 10. avellana, <i>Lam.</i> |
| 3. anaxora, <i>id.</i> | 7. atelina, <i>Duclos.</i> | 11. bicineta, <i>id.</i> |
| 4. angulata, <i>Chemn.</i> | 8. auricularia, <i>Lam.</i> | 12. biplicata, <i>Sow.</i> |

* The species of *Oliva* have been so inefficiently described, and so many nonsensical names have been introduced by M. Duclos, that a complete monograph of the genus with a change of nomenclature, would, I think, be an admissible and most acceptable contribution.

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| 13. <i>Braziliana</i> , <i>Chemn.</i> | 48. <i>lepta</i> , <i>Duclos.</i> | 83. <i>razamola</i> , <i>id.</i> |
| 14. <i>caldania</i> , <i>Duclos.</i> | 49. <i>leucophrea</i> , <i>Lam.</i> | 84. <i>reticularis</i> , <i>Lam.</i> |
| 15. <i>canalifera</i> , <i>id.</i> | 50. <i>leucostoma</i> , <i>Dufo.</i> | 85. <i>rosolina</i> , <i>Duclos.</i> |
| 16. <i>candida</i> , <i>Lam.</i> | 51. <i>leucozonias</i> , <i>Gray.</i> | 86. <i>sanguinolenta</i> , <i>Lam.</i> |
| 17. <i>carneola</i> , <i>id.</i> | 52. <i>lineolata</i> , <i>id.</i> | 87. <i>scripta</i> , <i>id.</i> |
| 18. <i>columba</i> , <i>Duclos.</i> | 53. <i>literata</i> , <i>Lam.</i> | 88. <i>selasia</i> , <i>Duclos.</i> |
| 19. <i>columellaris</i> , <i>Sow.</i> | 54. <i>lugubris</i> , <i>id.</i> | 89. <i>semistriata</i> , <i>Gray.</i> |
| 20. <i>conoidalis</i> , <i>Lam.</i> | 55. <i>luteola</i> , <i>id.</i> | 90. <i>Senegalensis</i> , <i>Lam.</i> |
| 21. <i>dama</i> , <i>Duclos.</i> | 56. <i>mandarina</i> , <i>Duclos.</i> | 91. <i>sepulturalis</i> , <i>Lam.</i> |
| 22. <i>eburnea</i> , <i>Lam.</i> | 57. <i>Marminii</i> , <i>id.</i> | 92. <i>splendidula</i> , <i>Sow.</i> |
| 23. <i>elegans</i> , <i>id.</i> | 58. <i>maura</i> , <i>Lam.</i> | 93. <i>stellata</i> , <i>Duclos.</i> |
| 24. <i>episcopalalis</i> , <i>id.</i> | 59. <i>mica</i> , <i>Duclos.</i> | 94. <i>subulata</i> , <i>Lam.</i> |
| 25. <i>erythrostoma</i> , <i>id.</i> | 60. <i>miriadina</i> , <i>Duclos.</i> | 95. <i>tehuclhana</i> , <i>D'Orb.</i> |
| 26. <i>esmiliota</i> , <i>Duclos.</i> | 61. <i>mitreola</i> , <i>id.</i> | 96. <i>tergina</i> , <i>Duclos.</i> |
| 27. <i>Esther</i> , <i>id.</i> | 62. <i>mustelina</i> , <i>Lam.</i> | 97. <i>tessellata</i> , <i>Lam.</i> |
| 28. <i>fabagina</i> , <i>Lam.</i> | 63. <i>mutica</i> , <i>Say.</i> | 98. <i>testacea</i> , <i>id.</i> |
| 29. <i>fallotina</i> , <i>Duclos.</i> | 64. <i>nana</i> , <i>Lam.</i> | 99. <i>textilina</i> , <i>Lam.</i> |
| 30. <i>flammulata</i> , <i>Lam.</i> | 65. <i>nebulosa</i> , <i>id.</i> | 100. <i>tigridella</i> , <i>Duclos.</i> |
| 31. <i>flaveola</i> , <i>Duclos.</i> | 66. <i>nedulina</i> , <i>Daclos.</i> | 101. <i>tigrina</i> , <i>Lam.</i> |
| 32. <i>funebralis</i> , <i>Lam.</i> | 67. <i>nitelina</i> , <i>.id.</i> | 102. <i>tricolor</i> , <i>Chemn.</i> |
| 33. <i>fusifera</i> , <i>Dufo.</i> | 68. <i>nitidula</i> , <i>id.</i> | 103. <i>tringa</i> , <i>Duclos.</i> |
| 34. <i>fusiformis</i> , <i>Lam.</i> | 69. <i>obtusa</i> , <i>Lam.</i> | 104. <i>tritcea</i> , <i>id.</i> |
| 35. <i>glandiformis</i> , <i>id.</i> | 70. <i>olorinella</i> , <i>Duclos.</i> | 105. <i>tunquina</i> , <i>id.</i> |
| 36. <i>gracilis</i> , <i>Brod.</i> | 71. <i>oriola</i> , <i>Lam.</i> | 106. <i>undata</i> , <i>Lam.</i> |
| 37. <i>granitella</i> , <i>Lam.</i> | 72. <i>oryza</i> , <i>id.</i> | 107. <i>undatella</i> , <i>id.</i> |
| 38. <i>guttata</i> , <i>id.</i> | 73. <i>ozodona</i> , <i>Duclos.</i> | 108. <i>ustulata</i> , <i>id.</i> |
| 39. <i>harpularia</i> , <i>id.</i> | 74. <i>panniculata</i> , <i>id.</i> | 109. <i>utriculus</i> , <i>id.</i> |
| 40. <i>hepatica</i> , <i>id.</i> | 75. <i>Peruviana</i> , <i>Lam.</i> | 110. <i>ventricosa</i> , <i>Duclos.</i> |
| 41. <i>hiatula</i> , <i>id.</i> | 76. <i>pica</i> , <i>id.</i> | 111. <i>venulata</i> , <i>Chemn.</i> |
| 42. <i>inflata</i> , <i>Chemn.</i> | 77. <i>polpasta</i> , <i>Duclos.</i> | 112. <i>volutella</i> , <i>Lam.</i> |
| 43. <i>irisans</i> , <i>Lam.</i> | 78. <i>porphyria</i> , <i>Lam.</i> | 113. <i>zanoeta</i> , <i>Duclos.</i> |
| 44. <i>ispidula</i> , <i>Linn.</i> | 79. <i>puelcha</i> , <i>Duclos.</i> | 114. <i>zenopira</i> , <i>id.</i> |
| 45. <i>kaleotina</i> , <i>Duclos.</i> | 80. <i>puelchana</i> , <i>D'Orb.</i> | 115. <i>Zeylanica</i> , <i>Lam.</i> |
| 46. <i>Laumontiana</i> , <i>id.</i> | 81. <i>pulchella</i> , <i>Duclos.</i> | 116. <i>zigzag</i> , <i>Duclos.</i> |
| 47. <i>leptidea</i> , <i>Dufo.</i> | 82. <i>puersolina</i> , <i>id.</i> | 117. <i>zonalis</i> , <i>Lam.</i> |

Figure.

OLIVA MAURA. Plate F.—Shell with animal, showing its ample reflected disc, the broad lobes in front, the tentacles and eyes, the respiratory siphon, and floating appendage, and the filamentary cord proceeding from the posterior extremity of the concealed mantle and passing into the groove of the spire. *From the Zoology of the Voyage de l'Astrolabe.*

OLIVA ANGULATA. Plate 1. Fig. 4. Shell, showing the grooved columella and basal sinus.

Genus 3. ANCILLARIA, Bruguière.

Animal; *disc oblong, bifurcated behind, triangularly lobed in front, partially reflected over the shell, under surface furnished beneath the head with an orifice; head and tentacles small, with a cylindrical trunk; respiratory siphon rather prominent.*

Shell; *oblong, cylindrical, widely emarginated at the base; spire rather short, suture obtuse; columella obliquely grooved, sometimes umbilicated, slightly twisted; operculum small, horny.*

The *Ancillariae* are a limited group of mollusks allied to the Olives, yet possessing characters very much opposed to those recorded in that peculiar genus. According to M. Quoy's figure of the *A. albisulcata*, the shell is partially imbedded in the substance of the disc, somewhat after the manner of *Natica*, the middle portion of it being reflected over the shell, not the outer edge as in the Olive. There is, moreover, no filamentary cord passing from the extremity of the mantle around the spire; the spire of *Ancillaria* being distinguished, on the contrary, by a callous deposit of enamel, a condition the very reverse of that indicated by the deeply excavated groove in the Olive. The hinder extremity of the disc is peculiarly bifurcated; the front exhibits a similar lobed appearance, and the head and tentacles are small, concealed within the fold of the disc, probably from the animal's habit of burrowing in the sand.

The shell of *Ancillaria* differs equally in its lesser detail from that of the Olive; it exhibits no pattern or design, and is mainly characterized by an uniform bright golden yellow, passing into a bright cinnamon red.

The rarest species are from New Holland.

Species

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| 1. <i>albifasciata</i> , Swains. | 9. <i>eburnea</i> , Deshayes. | 17. <i>mucronata</i> , Sow. |
| 2. <i>albisulcata</i> , Sow. | 10. <i>effusa</i> , Swainson. | 18. <i>nivea</i> , Swainson. |
| 3. <i>aperta</i> , id. | 11. <i>exigua</i> , Sow. | 19. <i>oblonga</i> , Sow. |
| 4. <i>australis</i> , id. | 12. <i>fulva</i> , Swainson. | 20. <i>obtusa</i> , Swainson. |
| 5. <i>candida</i> , Lam. | 13. <i>glabrata</i> , id. | 21. <i>rubiginosa</i> , id. |
| 6. <i>castanea</i> , Sow. | 14. <i>mamillata</i> , Hinds. | 22. <i>Tankervillii</i> , id. |
| 7. <i>cingulata</i> , id. | 15. <i>marginata</i> , Lam. | 23. <i>ventricosa</i> , Lam. |
| 8. <i>cinnamomea</i> , Lam. | 16. <i>Mauritiana</i> , Sow. | |
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Figure.

ANCILLARIA MAURITIANA. Plate 4. Fig. 21. Showing the aperture and white twisted columella.

Genus 4. EBURNA, Lamarch.

Animal; disc stout and thick, oval in front, pointed behind, carrying a horny operculum at the posterior extremity which fits exactly to the aperture of the shell; head large, bifurcated in front into two elongated tentacles, at the outer base of which are the eyes; mouth armed with a cylindrical trunk; respiratory siphon rather long.

Shell; oblong-ovate, spire acuminate, with the sutures more or less deeply channelled; whorls forming a deep umbilicus which is rarely filled up; colour ivory white, tessellated and spotted with orange-brown.

The genus *Eburna* includes a natural, though extremely limited group of species, but M. Deshayes questions whether it is entitled to rank higher than as a section of *Buccinum*; from his description of the animal, above recorded, we learn that it has a strong natural affinity with that genus, yet there is a curious peculiarity of design in the structure and colour of the shells. It is not usual to regard colour as an element in the character of a genus, but in the case before us it constitutes a feature which cannot be overlooked. Divested of the *E. glabrata*, *plumbea*, and *spirata*, which have been erroneously referred to this genus, the species are each distinguished by a blotched and tessellated painting of orange brown upon a white ground, which is very characteristic; the apex throughout is black, and the columella and interior of the aperture white.

The *E. spirata* and *Zeylanica* are found in Ceylon in great abundance; the species selected for illustration are from Japan, and of great rarity.

Species.

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| 1. <i>ambulaicum</i> , <i>Sow.</i> | 4. <i>Japonica</i> , <i>Reeve.</i> | 7. <i>Valentiana</i> , <i>Swainson.</i> |
| 2. <i>areolata</i> , <i>Lam.</i> | 5. <i>lutosa</i> , <i>Lam.</i> | 8. <i>Zeylanica</i> , <i>Lam.</i> |
| 3. <i>australis</i> , <i>Sow.</i> | 6. <i>papillaris</i> , <i>Sow.</i> | |

Figures.

EBURNA PAPILLARIS. Plate 4. Fig. 19 *a.* — *From Mr. Cuming's collection.*

EBURNA JAPONICA. Plate 4. Fig. 19 *b.* — *From Mr. Cuming's collection.*

Genus 5. PLANAXIS, Lamarck.

Animal; disc short, thick, furnished at its posterior extremity with a horny operculum; head proboscidiform, with two elongated tentacles, each having an eye on the outer side of the base, edge of the mantle simple, not canaliculated, open in front to give access to the branchial cavity.

Shell; solid, ovately conical, terminating at the base with a narrow sinus; columella depressly concave, with a callousness at the upper part; interior of the aperture grooved.

I cannot agree with M. Deshayes in transferring the little group of mollusks, associated under the title of *Planaxis*, to a place among the vegetable-feeders, *Littorinæ*, *Melaniæ*, and *Paludinæ*. The shell is not much unlike that of *Nassa*, nor is there sufficient variation in the soft parts to influence the propriety of their being arranged in the same family with the *Purpuræ*. The animal is distinguished by its ringed proboscis-shaped head, and the free opening of the mantle communicating with the branchial cavity, and the shell exhibits that peculiar solidity of structure which is so characteristic a type of carnivorous habits; it has a prominent callousness on the upper part of the columella, and the interior of the aperture is more or less strongly grooved.

MM. Quoy and Gaimard have figured a shell with its molluscous inhabitant, in the Zoology of the 'Voyage de l'Astrolabe', under the title of *Planaxis decollatus*, which has been elevated to the rank of a new genus, with the name of *Quoyia*; the characters of this shell are very similar to those of the genus under consideration, but its subulate form and grooved columella are peculiar and characteristic.

Very few *Planaxes* have been collected; they are not, however, uncommon.

Species.

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|---------------------------------|------------------------------|----------------------------|
| 1. areolata, <i>Lesson.</i> | 5. Buccinoides, <i>Desh.</i> | 9. semisulcata, <i>id.</i> |
| 2. atropurpurea, <i>Récluz.</i> | 6. circinata, <i>Lesson.</i> | 10. undulata, <i>Lam.</i> |
| 3. Brasiliana, <i>Deshayes.</i> | 7. niger, <i>id.</i> | 11. sulcata, <i>Lam.</i> |
| 4. brevis, <i>Quoy.</i> | 8. planicostata, <i>Sow.</i> | |

Figure.

PLANAXIS PLANICOSTATA. Plate 3. Fig. 17.—From Mr. Cuming's collection.

Genus 6. QUOYIA, Gray.

Animal; disc small, ovate, folded across and crumpled in front, hind part furnished with a semi-ovate operculum, side of the body simple; proboscis short and ringed; tentacles slender, conical, far apart at the base; eyes placed on short tubercles at their outer base; mantle simple, with a groove on the left angle.

Shell; subelongated, aperture short, slightly sinuated at the base, columella peculiarly cut away at the top, interior finely grooved.

The shell of this mollusk, figured by MM. Quoy and Gaimard in the 'Voyage de l'Astrolabe', has very much the appearance of an elongated *Planaxis*, and we learn from the characters of the soft parts above recited, from Mr. Gray's 'Zoology of Beechey's Voyage', that the animals of these genera are in reality very closely allied. There is, however, a great dissimilarity in the form of the shell, and the upper portion of the columella is characterized by a curious broad groove or cutting away of the white enamelled surface in place of any callosity; from whence, I think, with Mr. Gray, that it may be entitled to rank as a separate genus.

Figure.

QUOYIA DECOLLATA. Plate 3. Fig. 18.—*From Mr. Cuming's collection.*

Genus 7. NASSA, Lamarck.

Animal; disc large and thin, nearly semicircular in front, terminated on each side by a short ear-shaped appendage, hind extremity bifurcated; head flattened, very large, with a conical tentacle on each side, swollen at the outer side of the base and having the eye situated at the top of the swollen portion.

Shell; ovate, slightly turreted, terminating at the base with a deep sinus or very short canal; aperture orbicular, angulated at the upper part; columella smooth, sometimes broadly effused, with a tooth or callosity at the upper part; lip toothed, sometimes crenulated within. Operculum very small, horny.

The *Nassæ* are an interesting group, distinguished alike from the *Buccina*, with which they were formerly associated, both in respect to the

animal and the shell. The description above quoted, from the observations of M. Deshayes, informs us that there is a peculiarity in the structure of the disc, beautifully illustrated by M. Quoy in the 'Voyage de l'Astrolabe', in having the front extremity furnished with two ear-shaped appendages, and the hind part bifurcated, the corners presenting a tentacle-like appearance.

There is a singular uniformity in the form and colour of the shells of *Nassa*; they are all small, and mostly distinguished by a remarkably thickened deposit of enamel in the vicinity of the aperture.

Some time after Lamarck introduced the genus *Nassa*, he abandoned it except as a sectional division of the *Buccina*; the generic peculiarities of this comparatively extensive group were, however, too obvious to escape attention.

They are confined to the southern and tropical regions.

Species.

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|--------------------------------|---------------------------------------|---------------------------------|
| 1. abbreviata, <i>Desh.</i> | 24. festiva, <i>Powis.</i> | 47. olivacea, <i>Desh.</i> |
| 2. achatina, <i>id.</i> | 25. gaudiosa, <i>Hinds.</i> | 48. Olivæformis, <i>id.</i> |
| 3. acuta, <i>Say.</i> | 26. gemmulata, <i>Desh.</i> | 49. pallida, <i>Powis.</i> |
| 4. ampullacea, <i>Desh.</i> | 27. gibbosula, <i>Lam.</i> | 50. papillosa, <i>Sow.</i> |
| 5. annulata, <i>id.</i> | 28. glans, <i>Desh.</i> | 51. pauperata, <i>Lam.</i> |
| 6. arcularia, <i>Lam.</i> | 29. globosa, <i>id.</i> | 52. perpinguis, <i>Hinds.</i> |
| 7. Ascanias, <i>Desh.</i> | 30. grana, <i>id.</i> | 53. polita, <i>Desh.</i> |
| 8. attenuata, <i>Gray.</i> | 31. granifera, <i>id.</i> | 54. polygonata, <i>Lam.</i> |
| 9. Belangeri, <i>Desh.</i> | 32. Grayi, <i>id.</i> | 55. pulla, <i>id.</i> |
| 10. callosa, <i>Gray.</i> | 33. inflata, <i>id.</i> | 56. reticulata, <i>Desh.</i> |
| 11. canaliculata, <i>Desh.</i> | 34. limata, <i>id.</i> | 57. retusa, <i>id.</i> |
| 12. candens, <i>Hinds.</i> | 35. luteostema, <i>Br. & Sow.</i> | 58. Roissyi, <i>id.</i> |
| 13. coccinella, <i>Desh.</i> | 36. marginulata, <i>Lam.</i> | 59. scabriuscula, <i>Powis.</i> |
| 14. complanata, <i>Powis.</i> | 37. mæsta, <i>Hinds.</i> | 60. stolata, <i>Desh.</i> |
| 15. concinna, <i>id.</i> | 38. Melanoides, <i>Desh.</i> | 61. subspinosa, <i>id.</i> |
| 16. conoidalis, <i>Desh.</i> | 39. miga, <i>id.</i> | 62. suturalis, <i>id.</i> |
| 17. coronata, <i>Lam.</i> | 40. muricata, <i>Quoy.</i> | 63. texta, <i>id.</i> |
| 18. crenata, <i>Hinds.</i> | 41. mutabilis, <i>Desh.</i> | 64. Thesites, <i>Lam.</i> |
| 19. crenulata, <i>Desh.</i> | 42. myristicata, <i>Hinds.</i> | 65. tricarinata, <i>Desh.</i> |
| 20. dentifera, <i>Powis.</i> | 43. neritea, <i>Lam.</i> | 66. trivittata, <i>Say.</i> |
| 21. exilis, <i>id.</i> | 44. nodata, <i>Hinds.</i> | 67. unicineta, <i>id.</i> |
| 22. fasciata, <i>Desh.</i> | 45. nodifera, <i>Powis.</i> | 68. vibex. <i>id.</i> |
| 23. fasciolata, <i>id.</i> | 46. obsoleta, <i>Say.</i> | |
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Figure.

NASSA LUTEOSTOMA. Plate 3. Fig. 11.—*From Mr. Cuming's collection.*

Genus 8. CYLLENE, Gray.

Animal; unknown.

Shell; small, ovate, swollen, truncate, and a little recurved at the base, spire rather short, acute, with the sutures minutely channelled, columella concave, smooth or finely grooved; lip slightly notched near the base, emarginated at the summit; interior finely radiately grooved.

The genus *Cyllene* was introduced by Mr. Gray in his 'Synopsis' of our national collection, for the sake of distinguishing a few small shells exhibiting an association of character of remarkable peculiarity, and of which the *Buccinum lyratum* of Lamarck, figured by M. Kiener in his illustration of that genus, (Pl. 22. Fig. 38.) may be regarded as the type. It may be observed on reference to our figure, that the shell is of a small Voluta-like structure, without plaits, however, on the columella, which is a little excavated, and slightly grooved, the spire being short though sharply acuminated; the lip is very characteristic; at its junction with the body whorl, it is emarginated in a manner similar to that of *Oliva*, and near the base, it is distinguished by a small notch, like that which constitutes one of the principal generic features in *Phos*; the interior is deeply radiately grooved, as in many of the *Purpureæ*. I am not aware that the two or three species referable to this type, have been yet described; it therefore only remains to record the one included under *Buccinum* by Lamarck, and that selected for illustration which I dedicate to the founder of the genus.

Species.

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|--------------------------|-------------------------------------|
| 1. <i>Grayi</i> , Reeve. | 2. <i>lyratum</i> , (Buc.) Lamarck. |
|--------------------------|-------------------------------------|
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Figures.

CYLLENE GRAYI. Plate 3. Fig 12.—Showing the front portion of the shell. *From Mr. Cuming's collection.*

Genus 9. BULLIA, Gray.

Animal: disc very large, thin, flatly expanded, head flattened, with the tentacles long, subulate, and rather distant; no eyes.

Shell; ovate, turreted, spire more or less subulately acuminated, sutures frequently callous; columella callous towards the upper part, excavated; aperture emarginated above and below.

The shells assembled under the title of *Bullia* by Mr. Gray, are deserving of generic distinction, not only on account of their peculiar affinity of form and colour, but because of the curious expanded structure of the animal-disc, as represented by M. M. Quoy and Gaimard in their figure of the *Buccinum lavigissimum* of Lamarck.* The *Buccinum cochlidium* of Chemnitz is the largest and most conspicuous of the group, whilst the *B. annulatum* of Lamarck, is characteristic of the Terebra-like portion of the species.

Mr. Gray notices in his observations on this genus†, that the *Bulliae* "are found crawling on the sand in bays; they generally remain at the bottom of the water, and are easily caught alive with a bit of meat tied at the end of a string, as they immediately attach themselves to it."

In confirmation of the importance of this genus, it only remains to notice that M. Deshayes proposes to remove those species hitherto arranged under the head of *Buccinum*, to a place amongst the *Nassæ*, to which they are apparently still more remotely allied.

Species‡.

| | | |
|----------------|------------------|------------------|
| 1. achatina. | 7. hastata. | 13. Paytense. |
| 2. annulata. | 8. lavigata. | 14. polita. |
| 3. armata. | 9. laevis. | 15. semiplicata. |
| 4. cochlidium. | 10. lavigissima. | 16. terebralis. |
| 5. globulosa. | 11. lineolata. | 17. turrita. |
| 6. granulosa. | 12. Mauritiana. | 18. vittata. |

Genus 10. PHOS, *De Montford.*

Animal; disc oblong, expanded, carrying a small horny operculum, head small, tentacles high up, very long, slender, eyes situated at the tips of the tentacles.

Shell; oblong, mostly acuminate, and longitudinally ribbed, outer lip notched towards the base; columella somewhat obsoletely one-plaited.

The *Buccinum senticosum* Linnæus, *Cancellaria senticosa* Lamarck, was figured by De Montford in his 'Conchyliologie Systematique' as the type of a new genus, under the laconic title of *Phos*; and it is one of the few genera introduced by that author, the propriety of which has been confirmed by subsequent discoveries. The species above referred to, is not,

* Voyage de l'Astrolabe.

† Zoology of Beechey's Voyage.

‡ A monograph of this genus will shortly appear in the 'Conchologia Iconica'; I can give but an undigested list of species at present, and refrain from attaching any authorities.

however, the most characteristic of the group; in the exhaustless stores of Hugh Cuming, Esq. are thirty or more distinct kinds, collected by that indefatigable traveller in the course of his prolific researches, nearly the whole of which remain to be described. Suffice it to say, that the chief peculiarity consists in the notch near the base of the lip, though independent of this, the species are characterized throughout by a marked degree of generic affinity.

Species *.

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|---------------------------------------|---------------------------------------|---------------------------------------|
| 1. <i>articulatus</i> , <i>Hinds.</i> | 5. <i>pyrostoma</i> , <i>Reeve.</i> | 8. <i>senticosus</i> , <i>Montf.</i> |
| 2. <i>crassus</i> , <i>Hinds.</i> | 6. <i>reticulatus</i> , <i>Hinds.</i> | 9. <i>Veragueusis</i> , <i>Hinds.</i> |
| 3. <i>Cumingii</i> , <i>Reeve.</i> | 7. <i>roseatus</i> , <i>Hinds.</i> | 10. <i>virgatus</i> , <i>Hinds.</i> |
| 4. <i>gaudens</i> , <i>Hinds.</i> | | |
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Figure.

Phos CUMINGII. Pl. 3. Fig. 16. Showing the front portion of the shell.

Genus 11. *BUCCINUM*, *Linnæus.*

Animal; disc oval, sometimes elongated in front; head narrow, flattened, with two cylindrical tentacles, at the base of which are two slightly pedunculated eyes; trunk cylindrical, more or less elongated.

Shell; ovate or oblong, emarginated and sometimes a little channelled at the base, columella for the most part smooth; aperture oblong-ovate, sometimes furnished on each side at the upper part with a callosity or denticles; lip very slightly, if at all, thickened, serrated or crenated.

The Latin word *Buccinum*, a trumpet, was applied indiscriminately by the ancients, to almost any sort of spiral univalve shell; Linnæus made a more restricted application of the word, but his genus still included species of very anomalous character. Lamarck, the great reformer of the Linnaean system of classification, divided the *Buccina* of that author, into several excellent acknowledged genera, including nearly the whole of those enumerated under the present family, reserving the *Buccinum undatum*, (the common Whelk of our market) for the type of his genus. This has been since dismembered of the groups *Nassa*, *Bullia*, *Cyllene*, and *Phos*, and M. Deshayes further distinguishes the Whelk, and its congeners, by

* The species above referred to in Mr. Cuming's collection, will shortly be described and illustrated in the 'Conchologia Iconica.'

title of *Tritonium*, once assigned to them by Muller. These latter, however, I propose to retain in the present genus, together with all those species of which the upper part of the aperture is distinguished by the presence of a callosity or denticles, such as the *B. undosum* and others, added to which I include the *Purpuræ sertum*, *Francolina*, and *lagenaria* of Lamarck, as well as the *Fusus articulatus* of the same author.*

Species

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|---|---|---|
| 1. aciculatum, <i>Lam.</i> | 29. <i>Gervilii</i> , <i>Kiener</i> . | 56. <i>plicatulum</i> , <i>Nuttall</i> . |
| 2. acuminatum, <i>Menke</i> . | 30. <i>glaciale</i> , <i>Lam.</i> | 57. <i>polaris</i> , <i>Gray</i> . |
| 3. affinis, <i>Less.</i> | 31. <i>gradatum</i> , <i>Desh.</i> | 58. <i>porcatum</i> , <i>Gmel.</i> |
| 4. alveolatum, <i>Kiener</i> . | 32. <i>graniferum</i> , <i>Kiener</i> . | 59. <i>Poulsoni</i> , <i>Nuttall</i> . |
| 5. ambiguum, <i>Mont.</i> | 33. <i>Gualterianum</i> , <i>Kiener</i> . | 60. <i>pulicaris</i> , <i>Lesson</i> . |
| 6. Anglicanum, <i>Lam.</i> | 34. <i>hepaticum</i> , <i>Mont.</i> | 61. <i>rufulum</i> , <i>Kiener</i> |
| 7. angulosum, <i>Gray</i> . | 35. <i>hirtum</i> , <i>Kiener</i> . | 62. <i>scaralinum</i> , <i>Sow.</i> |
| 8. articulatum (<i>Fus.</i>), <i>L.</i> | 36. <i>Humphreysianum</i> , <i>Bt.</i> | 63. <i>Schroeteri</i> , <i>Beck</i> . |
| 9. aurantium, <i>Lam.</i> | 37. <i>Jacksonianum</i> , <i>Kiener</i> . | 64. <i>Sechellarum</i> , <i>Dufo.</i> |
| 10. Australe, <i>Chemn.</i> | 38. <i>lagenarium</i> (<i>Purp.</i>), <i>L.</i> | 65. <i>sertum</i> (<i>Purp.</i>), <i>L.</i> |
| 11. boreale, <i>Brod.</i> | 39. <i>lineatum</i> , <i>Sow.</i> | 66. <i>sepimentum</i> , <i>Rang.</i> |
| 12. Boissii, <i>Nuttall</i> . | 40. <i>lineolatum</i> , <i>Lam.</i> | 67. <i>serratum</i> , <i>Dufresne</i> . |
| 13. breve, <i>Adams</i> . | 41. <i>luteostoma</i> , <i>Kiener</i> . | 68. <i>succintum</i> , <i>Powis</i> . |
| 14. catenatum, <i>Powis</i> . | 42. <i>macula</i> , <i>Mont.</i> | 69. <i>tenue</i> , <i>Gray</i> . |
| 15. cinctum, <i>Quoy</i> . | 43. <i>maculatum</i> , <i>Martyn.</i> | 70. <i>tenuiplicatum</i> , <i>Lam.</i> |
| 16. clavula, <i>Menke</i> . | 44. <i>maculosum</i> , <i>Lam.</i> | 71. <i>testudineum</i> , <i>Chemn.</i> |
| 17. Coromandelianum, <i>L.</i> | 45. <i>melanostoma</i> , <i>Lam.</i> | 72. <i>tigrinum</i> , <i>Kiener</i> . |
| 18. costatum, <i>Quoy</i> . | 46. <i>melo</i> , <i>Less.</i> | 73. <i>Tranquebaricum</i> , <i>Lam.</i> |
| 19. Cuvierii, <i>Payr.</i> | 47. <i>metula</i> , <i>Hinds.</i> | 74. <i>Triton</i> , <i>Less.</i> |
| 20. Delalandi, <i>Kiener</i> . | 48. <i>modestum</i> , <i>Powis</i> . | 75. <i>tulipa</i> , <i>Less.</i> |
| 21. distortum, <i>Gray</i> . | 49. <i>moniliferum</i> , <i>Valen.</i> | 76. <i>undatum</i> , <i>Lam.</i> |
| 22. D'Orbignii, <i>Payr.</i> | 50. <i>obsoletum</i> , <i>Say</i> . | 77. <i>undosum</i> , <i>Quoy</i> . |
| 23. elegans, <i>Reeve</i> . | 51. <i>ornatum</i> , <i>Say</i> . | 78. <i>varicosum</i> , <i>Chemn.</i> |
| 24. Francolinum (<i>Purp.</i>), <i>L.</i> | 52. <i>ovum</i> , <i>Turton</i> . | 79. <i>vinosum</i> , <i>Lam.</i> |
| 25. fasciculare, <i>Menke</i> . | 53. <i>papyraceum</i> , <i>Lam.</i> | 80. <i>viverratum</i> , <i>Kiener</i> . |
| 26. Floridanum, <i>Less.</i> | 54. <i>pediculare</i> , <i>Lam.</i> | 81. <i>vittatum</i> , <i>Linn.</i> |
| 27. fuscatum, <i>Lam.</i> | 55. <i>phalæna</i> , <i>Lesson</i> . | 82. <i>zebra</i> , <i>Lam.</i> |
| 28. Genetta, <i>Less.</i> | | |
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Figure.

BUCCINUM MELANOSTOMA. Pl. 4. Fig. 22. Showing the front portion of the shell with its black-enamelled columella.

* These and several new allied species, arranged in part by Mr. Gray, in the British Museum, under the head of *Pollia*, will appear shortly in a Monograph of *Buccinum* in the 'Conchologia Iconica'; the list of species given herewith is necessarily incomplete.

Genus 12. LEPTOCONCHUS, *Rüppell.*

Animal; *proboscis elongated, retractile; tentacles two, smooth, triangular, jointed internally at the base, and bearing the eyes externally in the middle; disc middling, no operculum; mantle circular at the edge, without any siphonal appendage, a little produced on the left side; branchial orifice rather large.*

Shell; *thin, pellucid, nearly globose, spire depressed, rather obsolete; aperture large, suboval, extremities turned contrariwise, margins disjointed, right margin thin, a little expanded anteriorly; umbilicus none, truncated anteriorly, contorted.*

Such are the descriptions of *Leptoconchus* recorded by Dr. Rüppell, in his communication to the Zoological Society of London in September, 1834. It is allied to the *Magilus*, with this difference, the margins of the aperture are not united, and by reason of its dwelling in exposed cavities of madre-pore, forms no extended tubular growth.

"The colour of the shell," says the learned traveller, "which constitutes the type of this new genus, is constantly a slightly sordid milk-white. It is sulcated externally by numerous longitudinal undulated closely-set lines, the outer whorls encroaching on the spire of the earlier ones so as almost to obliterate it. Individuals of all ages have the shell thin and fragile, and constantly occur imbedded in the calcareous mass of polypes, having a communication with the sea by only a moderate opening. The animals of *Magilus* and *Leptoconchus* are distinguished by the presence and absence of an operculum, and by the difference in the proboscis; the siphon of the former, moreover, does not occur in the latter."*

Dr. Rüppell suggests that *Leptoconchus* might be arranged in the vicinity of *Ianthina*, I cannot, however, subscribe to this opinion, the habits and structure of these mollusks being so totally dissimilar.

Figure.

LEPTOCONCHUS STRIATUS. Pl. 4. Fig. 20. Showing, *a* and *b*, back and front view of the shell; *c*, as it appears imbedded in a mass of coral.—*From Mr. Cuming's collection.*

* Pro Zool. Soc. 1834. p. 105.

Genus 13. MAGILUS, *De Montford.*

Animal; disc muscular, furnished posteriorly with a small oblong elliptic horny operculum; head small, somewhat obscure, prolonged on each side into two short tentacles, on the outer side, at the base, of which are the eyes; proboscis obtuse.

Shell; ovate, spiral for three or four whorls, then continued in a straight or flexuous direction to a considerable extent, the tube forming a keel on the lower side and a corresponding siphon at the aperture.

The *Magilus* affords a striking example of the fallacy of arranging shells according to their external form and aspect, without reference to the nature and habits of their animal inhabitants; it presents also a remarkable instance of intelligent economy. Lamarck concluded from the vermiform structure of this shell, that it must be formed by an *Annelide*, after the manner of a *Serpula*, upon some foreign body, and he arranged it accordingly in the same natural group with the Testaceous Worms, the Earth Worms, Leeches, &c. It was, however, discovered by Dr. Rüppell, during his researches on the coast of Abyssinia, that the animal in question is a true pectinibranchiate mollusk, inhabiting masses of Madrepore; the vermiform structure of whose shell is induced by its confined situation of growth. The formation of the shell originates in the same spiral plan of volution as that of other pectinibranchiate mollusks, but the animal finding it necessary to be in immediate communication with the surrounding fluid, is obliged to leave its spiral plan of growth in order to follow the enlarging surface of the coral. To accomplish this, it pursues a straight, or flexuous growth, solidifying the posterior portion of the shell in its progress, to enable it to reside within the vicinity of the aperture*; the soft parts of this mollusk scarcely exceed two inches in length, although its shell is prolonged to the extent of from twelve to fifteen inches, by a gradual slipping of the muscle of attachment along the colu-

* Peu à peu la partie du corps de l'animal qui repose sur la columelle sécrète en abondance de la matière calcaire qui remplit non-seulement tout l'intérieur des premiers tours de spire, mais qui force même, par sa surabondance, l'animal à donner une autre direction aux nouveaux tours de sa coquille, de manière que celle-ci, qui jusqu'au quatrième tour de spire est héliciforme, prend au-delà un accroissement obsolument irrégulier: tantôt les nouveaux tours se contournent en tire-bouchon, et tantôt la coquille se continue en ligne presque droite ou coudée. On reconnaît cependant toujours la cause de cet accroissement irrégulier, qui est la copieuse sécrétion de substance calcaire faite par le rebord gauche du manteau. Il se forme par là une arête émoussée le long de la gouttière de l'ouverture, et la partie des nouveaux tours qui reposeraient sur la columelle prend tantôt une surface lisse, et tantôt elle présente des lames irrégulières. Pendant que la coquille s'allonge ainsi par son accroissement, la cavité des premiers tours se remplit progressivement de manière que la cavité de la coquille dépasse rarement deux pouces de profondeur, quoique le tube entier ait souvent douze à quinze pouces."—RUPPELL, *Mém.* 1832.

mella, accompanied by a copious secretion of calcareous matter from the mantle.

It may be observed that the growth of the *Magilus* presents a sort of negative analogy with that of the *Nautilus*; the animal of each advancing in the outer porch of its shell by the aid of a relaxing muscle; and their mode of operation is curiously adapted to the difference in their circumstances of habitation. The former, in order to sustain the increasing pressure of the coral, fills up the vacated portion of its shell with solid matter, the latter, having a different medium to contend with, chambers in its shell by a succession of light partitions to give it buoyancy; if the *Magilus* pursued its course by the deposit of light transverse partitions, after the manner of the *Nautilus*, the increasing growth of the coral would probably crush it (unless the effect be nullified, as in the case of the *Pholades*, by a circulating current of solvents), and if the *Nautilus* advanced in its shell by solidifying the vacated portion, after the manner of the *Magilus*, it would produce an incumbrance incompatible with its locomotive faculties.

Like all mollusks inhabiting coral, the *Magilus* is almost devoid of colouring matter; the shell is of a transparent alabaster white, whilst the edge of the mantle of the animal is tinged with violet. I am not aware that this mollusk has been found in any other locality than the shores of the Red Sea, or in any other species of coral than the *Meandrina phrygia*.

Figure.

MAGILUS ANTIQUUS. Pl. 6. Fig. 25. Showing its vermiform structure, keel, and siphonated aperture.—*From the cabinet of H. Cuming Esq; collected by Dr. Rüppell, at the Red Sea.*

Genus 14. TRICHOTROPIS, *Broderip.*

Animal; unknown.

Shell; thin, turbinated, umblicated; and slightly canaliculated at the base, covered with a strong horny epidermis, sometimes furnished with spiral rows of fine bristles, spire angularly turreted; aperture triangularly ovate; operculum thin, laminated.

Although a specimen of this remarkable shell was collected with the soft parts by Captain Belcher, I am not aware that the animal has ever been described; its true relation in the molluscous system still remains to be

determined. Of the species at present known, the *T. bicarinata*, is the only one at all remarkable for its size and bristly appearance; it is of a fragile texture, and unlike the shell of any other genus.

The species above alluded to is from Icy Cape; those collected by Mr. Hinds, are from a much warmer region.

Species

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|---------------------------------|-------------------------------|-------------------------------|
| 1. acuminata, <i>Jeffreys.</i> | 4. borealis, <i>Broderip.</i> | 7. flavida, <i>Hinds.</i> |
| 2. Atlantica, <i>Muller.</i> | 5. cancellata, <i>Hinds.</i> | 8. inermis, <i>Hinds.</i> |
| 3. bicarinata, <i>Broderip.</i> | 6. costellata, <i>Courth.</i> | 9. umbilicata, <i>Magill.</i> |
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Figure.

TRICHOTROPIS BICARINATA. Pl. 7. Fig. 33. Showing the aperture and
bristly epidermis.

Genus 15. DOLIUM, Lamarck.

Animal; disc ovately oblong, large, very thick and muscular, subauriculated on each side in front; head large and rather flattened, with an unusually long conical tentacle on each side, at the base of which are the eyes, fixed upon short peduncles; trunk capable of considerable elongation, branchial siphon ample, reflexed.

Shell; thin, rotundately swollen, light and ventricose, ribbed transversely, but not longitudinally; columellar lip thin, widely expanded, outer lip fimbriated or crenated.

The *Dolia* constitute a limited, but very characteristic group, distinguished by their size and muscular strength, and by the voracity and comparative activity of their habits. The head is furnished with a long retractile trunk, which they have the capacity of rapidly protruding and withdrawing; they have also an ample disc, and "when the animal desires to swim," says M. Deshayes, who had an opportunity of observing the *Dolium* on the shores of the Mediterranean, in the course of his expedition to Algeria, "he swells it out with an enormous quantity of water, which is imbibed through certain pores". I have given representations of three different species of this genus with the soft parts, in order to show how much greater variety and brightness of colour is exhibited in the animal, than in the shell; in the *D. perdix*, we find a bright blue-striped animal with a dull brown shell, and the *D. olearium* and *pomum*, with pale shallow yellowish shells, have

one an animal of a bright blue colour, the other of a rich coppery green; in the first of these, the proboscis appears to be furnished with a sort of grappling rosette, analogous to the dentated extremity of the trunk in *Mitra*, the animal has not, however, the sluggish habits of that genus, by reason of the light and portable structure of its shell.

The *Dolium* shell is, for its size, the lightest of spiral univalves, approaching somewhat in form to that of *Cassis*, but fully distinguished by its tenuity and want of varices, as well as by the absence of any recurvature at the base.

Species.

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|----------------------------|-----------------------------|-----------------------------|
| 1. Chinense, <i>Desh.</i> | 5. galea, <i>Lam.</i> | 9. perdix, <i>Lam.</i> |
| 2. costatum, <i>Desh.</i> | 6. maculatum, <i>Lam.</i> | 10. pomum, <i>Lam.</i> |
| 3. fasciatum, <i>Lam.</i> | 7. melanostoma, <i>Jay.</i> | 11. variegatum, <i>Lam.</i> |
| 4. fimbriatum, <i>Sow.</i> | 8. olearium, <i>Lam.</i> | |
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Figures.

DOLIUM PERDIX. Plate E. Shell with animal, showing its expanded blue-striped disk, with the auriculated structure in front, the conspicuous head and tentacles, with the eyes on short peduncles at the base, the respiratory siphon for conveying water to the branchial cavity, reclining back upon the shell, and the extended trunk with its dilated rosette-like extremity.

DOLIUM POMUM. Plate G. Shell with animal, showing its blue-striped disk, the proboscis only partially exserted, tentacles, eyes, siphon, &c.

DOLIUM OLEARIUM. Plate G. Shell with animal, showing its coppery green disk, tentacles, eyes, siphon &c, the trunk being wholly withdrawn.—*All from the 'Voyage de l'Astrolabe'.*

DOLIUM FIMBRIATUM. Plate 5. Fig. 24. Shell, showing the aperture and excavated columella.—*From Mr. Cuming's collection.*

Genus 16. HARPA, Lamarck.

Animal; disc very large, elongated, semicircular in front, terminating posteriorly in a point; head flattened, auriculated on either side, tentacles not very long, with the eyes situated on the outer side towards the base; respiratory siphon very long.

Shell; ovate, ventricose, spire short, with the apex elevated and acute; whorls longitudinally varicose or ribbed; columella smooth, highly enamelled; aperture large.

The "Many-ridged Harp", the "Rose Harp" the "David's Harp" and others, are shells of such familiar occurrence, that it will be interesting to form some acquaintance with the animal from which they derive their existence. It will be seen on reference to plate *E* that the soft parts of *Harpa* are of unusually large size, the disk being elongated posteriorly to a point, and widely auriculated in front; indeed, it is described as being so large and muscular as to be scarcely susceptible of being contracted within the aperture of the shell. The animal of the 'Harps', like that of the 'Tuns', appears to exhibit a rather more than ordinary degree of activity; it is related both by M. Reynaud and M. Quoy, to have the faculty of spontaneously divesting itself of a portion of the disk, under irritation or emergency, after the manner of the *Annelides*, which it is well known often separate in pieces from violent contraction. The colours of the animal are scarcely less vivid than those of the shell, being of yellowish-green and rose, curiously ocellated throughout, whilst the respiratory siphon is striped across.

The shells of this beautiful and very limited genus are too well known to require mention; it may be added, however, that the prominent longitudinal ribs, which impart the harp-like symmetry of structure to the shell are regarded as so many varices; analogous in structure to the varices in the shell of *Murex*, each forms in its turn the margin of the aperture, and the intervals between them are probably of rapid growth.

The *Harpe* mostly inhabit the shores of Ceylon, the Mauritius, and the Philippine Islands; one species, the *H. crenata*, is from Mexico. They are all extremely rich in colour, and are not less remarkable for the bright enamelling of the body-whorl, in the immediate vicinity of the aperture.

Species.

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|-------------------------------------|--------------------------------------|------------------------------------|
| 1. <i>articularis</i> , <i>Lam.</i> | 4. <i>gracilis</i> , <i>Brod.</i> | 7. <i>nobilis</i> , <i>Rumph.</i> |
| 2. <i>conoidalis</i> , <i>Lam.</i> | 5. <i>imperialis</i> , <i>Chemn.</i> | 8. <i>rosea</i> , <i>Lam.</i> |
| 3. <i>crenata</i> , <i>Swain.</i> | 6. <i>minor</i> , <i>Rumph.</i> | 9. <i>ventricosa</i> , <i>Lam.</i> |

Figures.

HARPA VENTRICOSA. Plate *E*. Shell with animal, showing its large elongated disc, auricular appendage in front, tentacles, eyes, and erect branchial siphon.—*From the 'Voyage de l'Astrolabe'.*

HARPA IMPERIALIS. Plate 5. Fig. 26. Shell, showing its many-ridged structure, arising from the rapid succession of varices.

Genus 17. CONCHOLEPAS, Lamarck.

Animal; disc oval, large, furnished posteriorly with an operculum; head flattened, prolonged on each side into two tentacles, the lower portion of which is thickened and truncated; eyes situated at the summit of the truncated portion; proboscis obtuse; respiratory siphon rather small.

Shell; ovate, spire very short, minute, apex sharp; whorls ribbed and imbricated; aperture very large and inflated, lip furnished at the base with two or three projecting teeth.

The term Concho-Lepas, applied to this shell in a generic sense by Lamarck, seems to have emanated from the difficulty which our conchological ancestors found in determining whether it was of a spiral or non-spiral structure; shells of the former growth, being designated by the title of *Cochlea* or *Conchs*, of the latter, meaning the Limpets, by that of *Lepas* or rock shells. The spire is extremely minute, and the shell has all the appearance of a compressed cornucopia, with the margin of the aperture reflected outwards like the mouth of a trumpet.

The animal appears to differ in no respect from that of *Purpura*, and our continental neighbours are unwilling that it should occupy any higher rank than as a section of that genus; the characteristic variation in the growth of the shell is sufficient, however, to warrant its separate arrangement, according to the method originally adopted by Lamarck.

The genus is only represented by the following species, found at Peru.

Figure.

CONCHOLEPAS PERUVIANUS. Plate 5. Fig. 27. Shell, showing its widely inflated, Limpet-like, aperture.

Genus 18. MONOCEROS, Lamarck.

Animal; similar to that of *Purpura*.

Shell; ovate, spire sometimes elevated, sometimes rather depressed, columella wide and flattish, sometimes indistinctly plaited, lip armed near the base with a sharp prominent recurved tooth. Operculum horny.

The genus *Monoceros* of Lamarck, introduced almost simultaneously by De Montford under the title of *Unicornus*, is characterized solely by the

very conspicuous tooth which becomes developed at the lower portion of the lip; the distinction is not, however, universally admitted, as several of the *Purpureæ* exhibit indications of a tooth, and the animals of the two genera, are identical.

Species

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|------------------------------|---|--------------------------------|
| 1. acuminatum, <i>Sow.</i> | 6. cymatum (<i>Buc.</i>), <i>Sol.</i> | 11. maculatum, <i>Gray.</i> |
| 2. brevidens, <i>Conrad.</i> | 7. giganteum, <i>Less.</i> | 12. punctatum, <i>Gray.</i> |
| 3. calcar, <i>Desh.</i> | 8. glabratum, <i>Lam.</i> | 13. truncatum, <i>Reeve.</i> |
| 4. cingulatum, <i>Lam.</i> | 9. grande, <i>Gray.</i> | 14. tuberculatum, <i>Gray.</i> |
| 5. crassilabrum, <i>Lam.</i> | 10. imbricatum, <i>Lam.</i> | 15. unicarinatum, <i>Sow.</i> |
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Figure.

MONOCEROS GRANDE. Plate 6. Fig. 29. Shell, showing the aperture and prominent tooth.

Genus 19. PURPURA, *Lamarch.*

Animal; disc large, slightly acuminate in front, acuminate rounded behind, carrying at the extremity a thin horny semi-lunar operculum; head rather small and flattened, prolonged at each extremity into two pedunculated tentacles, at the summit of the thickened portion of which, extending to one half or two thirds of the length, are the eyes; respiratory siphon of moderate length; proboscis small.

Shell; ovate, or oblong-ovate, generally noduled or tuberculated, spire short; last whorl swollen, more or less widely inflated, with the aperture dilated and mostly grooved; base emarginated; columella more or less depressedly flattened; lip generally denticated.

The terms κῆρυξ, *Murex*, and πορφύρα, *Purpura*, were used indiscriminately by ancient Greek writers in reference to all mollusks yielding a purple juice, and they became objects of especial interest in that remote age, on account of the limited sources then known of obtaining colour. Who has not heard of the purple dye, produced by the 'Tyrinus murex' of Ovid, (*Murex trunculus* Linn.), which no doubt abounded on the shores of the ancient Phœnician city of Tyros.

The purple juice of the mollusk affords, however, no assistance to the systematist; it abounds alike in animals of very dissimilar character; in

Scalaria and *Ianthina*, as well as in *Murex* and *Purpura*; hence the term *Purpura* was adopted by Lamarck to distinguish the genus under consideration, regardless of any property with which the animal might be endowed of secreting a purple juice. The most striking feature in the soft parts of *Purpura* is that of the head being a little flattened, and prolonged at each extremity into the tentacles, without any prominence in the centre; approximating in this respect to *Buccinum*. The tentacles are pedunculated to generally two thirds of their extent, and at the summit of the pedunculated portion are the eyes. The operculum which the animal carries on the hind extremity of its disk, is invariably horny, and fits closely to the aperture of the shell.

The shell of *Purpura* is mainly distinguished by an ovate dilated growth, emarginated at the base, with a more or less flattened columella, the spire being sometimes extremely short, sometimes a little acuminated. There are three closely allied genera, *Concholepas*, *Monoceros*, and *Ricinula*, which the French authors propose to fuse into the present; I have not considered it prudent, however, to follow this course, as they afford good typical distinctions, and their amalgamation under the head of *Purpura* would only tend to confusion by involving a change of names.*

The *Purpuræ* vary exceedingly in their detail of sculpture, but are somewhat constant in colour; the well-known *P. lapillus* of Europe varies in both respects to an almost inconceivable degree; indeed, no one who has not thoroughly examined a numerous series of specimens can form an adequate idea of its Protean character.

Species.

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|--|--|---|
| 1. <i>aegrota</i> <i>Reeve.</i> | 15. <i>Callaoensis</i> , <i>Gray.</i> | 29. <i>emarginata</i> , <i>Desh.</i> |
| 2. <i>affinis</i> , <i>id.</i> | 16. <i>carinifera</i> , <i>Lam.</i> | 30. <i>fasciata</i> , <i>Reeve.</i> |
| 3. <i>alveolata</i> , <i>id.</i> | 17. <i>Carolensis</i> , <i>Reeve.</i> | 31. <i>Floridana</i> , <i>Conrad.</i> |
| 4. <i>anaxares</i> , <i>Duclos.</i> | 18. <i>cataracta</i> , (<i>Buc.</i>) <i>Ch.</i> | 32. <i>Freycinetii</i> , <i>Desh.</i> |
| 5. <i>aperta</i> , <i>De Blainv.</i> | 19. <i>chocolatum</i> , <i>Duclos.</i> | 33. <i>galca</i> , <i>Reeve.</i> |
| 6. <i>armigera</i> , <i>Lam.</i> | 20. <i>columellaris</i> , <i>Lam.</i> | 34. <i>gibbosa</i> , <i>id.</i> |
| 7. <i>Ascensionis</i> , <i>Quoy.</i> | 21. <i>consul</i> , <i>Lam.</i> | 35. <i>gigantea</i> , <i>id.</i> |
| 8. <i>attenuata</i> <i>Reeve.</i> | 22. <i>coronata</i> , <i>Lam.</i> | 36. <i>haemastoma</i> , <i>Lam.</i> |
| 9. <i>bicostalis</i> , <i>Lam.</i> | 23. <i>costularis</i> (<i>Murex.</i>), <i>L.</i> | 37. <i>haustrum</i> , <i>Quoy.</i> |
| 10. <i>biserialis</i> , <i>De. Blainv.</i> | 24. <i>deltoidea</i> , <i>Lam.</i> | 38. <i>hippocastanum</i> , <i>Lam.</i> |
| 11. <i>bitubercularis</i> , <i>Lam.</i> | 25. <i>diadema</i> , <i>Lam.</i> | 39. <i>hystrix</i> , <i>id.</i> |
| 12. <i>Blainvillii</i> , <i>Desh.</i> | 26. <i>D'Orbignii</i> , <i>Reeve.</i> | 40. <i>imperialis</i> , <i>De Blainv.</i> |
| 13. <i>buccinea</i> , <i>id.</i> | 27. <i>echinata</i> , <i>De. Blainv.</i> | 41. <i>inerma</i> , <i>Reeve.</i> |
| 14. <i>bufo</i> , <i>Lam.</i> | 28. <i>echinulata</i> , <i>Lam.</i> | 42. <i>intermedia</i> , <i>Kiener.</i> |

* In the monographs of *Purpura* and *Ricinula* just published in the 'Conchologia Iconica', I have added to the importance of the latter genus by the introduction of some small species intermediate between *Purpura* and *Columbella*, the greater portion of which were not previously described.

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|----------------------------|------------------------------------|------------------------|
| 43. Janellii, Kiener. | 56. persica, Lam. | 69. squamosa, Lam. |
| 44. kiosquiformis, Duclos. | 57. pica, De Blainv. | 70. squamulosa, Reeve. |
| 45. lapillus, Lam. | 58. planospira, Lam. | 71. succineta, Lam. |
| 46. lineata, id. | 59. pupillata, Reeve. | 72. textilosa, id. |
| 47. luteostoma, Desh. | 60. Quoyi, id. | 73. thiarella, id. |
| 48. Madreporarum, Sow. | 61. Rudolphi, Lam. | 74. trigona, Reeve. |
| 49. mancinella, Lam. | 62. rustica, id. | 75. trochlea, Lam. |
| 50. melones, Duclos. | 63. sacellum (<i>Murex</i>), Ch. | 76. tumulosa, Reeve. |
| 51. muricina, De Blainv. | 64. Scalariformis, Lam. | 77. undata, Lam. |
| 52. musiva, Kiener. | 65. scobina, Quoy. | 78. unifascialis Lam. |
| 53. Neritoidea, Desh. | 66. septentrionalis, Reeve. | 79. violacea, Kiener. |
| 54. nux, Reeve. | 67. speciosa, Valenc. | 80. xanthostoma, Brod. |
| 55. patula, Lam. | 68. spiralis, Reeve. | |
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Figure.

PURPURA APERTA. Plate 6. Fig. 30. Shell showing its depressed spire, dilated aperture, and flattened columella.

Genus 20. COLUMBELLA, Lamarck.

Animal; disc elongated and narrow, truncated and a little dilated in front, hind extremity furnished with a small horny operculum, head small, flattened, triangular, prolonged into two conical cylindrical tentacles, pedunculated to about a third of their extent, at the summit of which portion are the eyes; trunk rather long.

Shell; small, ovately oblong or triangular, sometimes fusiform, columella arched and denticulated, rarely smooth; outer lip thickened, swollen, gibbous and most frequently denticulated in the middle.

The genus *Columbella* includes a very numerous series whose shells are uniformly small, and distinguished by a greater or less number of plait-like denticles on the lip and columella after the manner of *Ricinula*. From the circumstance of Lamarck having confounded a few of the small *Mitres* with the *Columbellæ*, he was induced to refer the genus to the family *Columbellata*, assuming the existence of a plaited columella; the plaits by which the genera of that family are characterized are, however, of very different structure, from the protuberances which are here designated plait-like denticles; the first being developed on the columella throughout its entire growth so as to form a continuous winding of spiral plaits around the columella axis, whilst the last are merely developed along the inner side of the columella, on arriving at maturity.

M. Deshayes affirms that notwithstanding this error, Lamarck "has discerned with the greatest sagacity the place which this genus should occupy in the system", and goes on to demonstrate that its affinity with the Mitres is incontestable.

I certainly cannot compete with M. Deshayes on the advantages he has had of examining the *Columbellæ* alive on the shores of the Mediterranean, but I think his opinion of their possessing a more intimate relation with the *Mitreæ* than with the *Ricinulæ*, or Ricinuloid *Purpuræ*, is not borne out by his description of the animal. Like the soft parts of the latter, the head of the *Columbellæ* is flattened and prolonged at each extremity into the tentacles, the proboscis is, moreover, of moderate dimension, for though said to be "very long", it is only described as "often exceeding the length of the aperture of the shell"; and the disk is furnished with a small operculum. The proboscis of the Mitre, as already mentioned at p. 48, is susceptible of very considerable elongation, many times the length of the shell's aperture, and it cannot be supposed that the *Purpuræ* have not the faculty of elongating their proboscis to any greater extent than is represented in the few drawings hitherto obtained of them in a living condition, in some of which it is most probably only partially extended, whilst in others it is altogether retracted.

The following species are chiefly described in a recently published monograph in Mr. Sowerby's 'Thesaurus Conchyliorum'; and it only remains to refer to the admirable figures of that work for illustration.

Species.

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|---------------------------------------|--|---|
| 1. <i>achatina</i> , <i>Sow.</i> | 19. <i>bicanaliculata</i> , <i>Duclos.</i> | 37. <i>costata</i> , <i>Duclos.</i> |
| 2. <i>acleonta</i> , <i>Duclos.</i> | 20. <i>bicanalifera</i> , <i>Sow.</i> | 38. <i>costellata</i> , <i>Sow.</i> |
| 3. <i>acuminata</i> , <i>Nuttall.</i> | 21. <i>bicolor</i> , <i>Kiener.</i> | 39. <i>cibraria</i> , <i>id.</i> |
| 4. <i>adiastina</i> , <i>Duclos.</i> | 22. <i>bidentata</i> , <i>Menke.</i> | 40. <i>daliola</i> , <i>Duclos.</i> |
| 5. <i>albina</i> , <i>Kiener.</i> | 23. <i>blanda</i> , <i>Sow.</i> | 41. <i>decussata</i> , <i>Sow.</i> |
| 6. <i>ambigua</i> , <i>id.</i> | 24. <i>Boivinii</i> , <i>Kiener.</i> | 42. <i>denticulata</i> , <i>Duclos.</i> |
| 7. <i>ampla</i> , <i>Less.</i> | 25. <i>Broderipii</i> , <i>Sow.</i> | 43. <i>dermestoides</i> , <i>Sow.</i> |
| 8. <i>anacteola</i> , <i>Duclos.</i> | 26. <i>Buccinoides</i> , <i>id.</i> | 44. <i>dichroa</i> , <i>id.</i> |
| 9. <i>angularis</i> , <i>Sow.</i> | 27. <i>castanea</i> , <i>id.</i> | 45. <i>digitata</i> , <i>Lesson.</i> |
| 10. <i>aphægera</i> , <i>Less.</i> | 28. <i>catenata</i> , <i>id.</i> | 46. <i>dormitor</i> , <i>Sow.</i> |
| 11. <i>araneosa</i> , <i>Kiener.</i> | 29. <i>chlorostoma</i> , <i>id.</i> | 47. <i>dorsata</i> , <i>id.</i> |
| 12. <i>aspera</i> , <i>Sow.</i> | 30. <i>Chrisopsis</i> , <i>Duclos.</i> | 48. <i>Duclosiana</i> , <i>id.</i> |
| 13. <i>athadona</i> , <i>Duclos.</i> | 31. <i>clathra</i> , <i>Less.</i> | 49. <i>electona</i> , <i>Duclos.</i> |
| 14. <i>atomella</i> , <i>id.</i> | 32. <i>concinna</i> , <i>Sow.</i> | 50. <i>elegans</i> , <i>Sow.</i> |
| 15. <i>atramentaria</i> , <i>Sow.</i> | 33. <i>cornea</i> , <i>Kiener.</i> | 51. <i>fabula</i> , <i>id.</i> |
| 16. <i>aurantia</i> , <i>Duclos.</i> | 34. <i>corniculata</i> , <i>Sow.</i> | 52. <i>faleonta</i> , <i>Duclos.</i> |
| 17. <i>avara</i> , <i>Say.</i> | 35. <i>corniformis</i> , <i>Sow.</i> | 53. <i>fasciata</i> , <i>Sow.</i> |
| 18. <i>azora</i> , <i>Duclos.</i> | 36. <i>coronata</i> , <i>Sow.</i> | 54. <i>festiva</i> , <i>Kiener.</i> |

55. flava, *Lam.*
 56. flexuosa, *Duclos.*
 57. fluctuata, *Sow.*
 58. fulgorans, *Lam.*
 59. fulva, *Sow.*
 60. fuscata, *id.*
 61. fusiformis, *Nuttall.*
 62. fusiformis, *Hinds.*
 63. fustigata, *Kiener.*
 64. gibberula, *Sow.*
 65. gibbosa, *Duclos.*
 66. gibbosula, *Brod.*
 67. Guildingii, *Sow.*
 68. guttata, *id.*
 69. gutturosa, *Duclos.*
 70. hæmastoma, *Sow.*
 71. harpaeformis, *Sow.*
 72. idalina, *Duclos.*
 73. idulia, *id.*
 74. ionida, *id.*
 75. iphis, *id.*
 76. isomella, *id.*
 77. jaspidea, *Sow.*
 78. kirostra, *Duclos.*
 79. Kraussii, *Sow.*
 80. labiosa, *id.*
 81. lactea, *Duclos.*
 82. lævigata, *id.*
 83. lanceolata, *Kiener.*
 84. lentiginosa, *Hinds.*
 85. lepida, *Duclos.*
 86. ligula, *id.*
 87. lineolata, *Kiener.*
 88. livida, *Sow.*
 89. lugubris, *Kiener.*
 90. lunata, *Sow.*
 91. lutea, *Quoy.*
 92. luteola, *Kiener.*
 93. lyrata, *Sow.*
 94. maculosa, *id.*
 95. major, *id.*
 96. marmorata, *Gray.*
 97. maura, *Sow.*
 98. meleagris, *Duclos.*
 99. mercatoria, *id.*
 100. miser, *Sow.*
 101. Mitræformis, *King.*
102. modesta, *Kiener.*
 103. moleculina, *Duclos.*
 104. monilifera, *Sow.*
 105. nana, *Michaud.*
 106. nasioletta, *Duclos.*
 107. naxia, *id.*
 108. nigricans, *Sow.*
 109. nigropunctata, *id.*
 110. nisitella, *Duclos.*
 111. nitida, *Lam.*
 112. nivea, *Sow.*
 113. nodulina, *Duclos.*
 114. nodulosa, *Nuttall.*
 115. nucleus, *Kiener.*
 116. nymphæ, *id.*
 117. obscura, *Sow.*
 118. obtusa, *id.*
 119. oselmonta, *Duclos.*
 120. ovulata, *Lam.*
 121. pacilla, *Sow.*
 122. pandonosta, *Duclos.*
 123. pardalina, *Lam.*
 124. pariolida, *Duclos.*
 125. parva, *Sow.*
 126. pavonina, *Hinds.*
 127. Paytalida, *Duclos.*
 128. Peleei, *Kiener.*
 129. pelotina, *Duclos.*
 130. phasinola, *Duclos.*
 131. Philippinarum, *Reeve.*
 132. procera, *Sow.*
 133. puella, *id.*
 134. pulchella, *id.*
 135. pulcherrima, *id.*
 136. pulicaris, *Less.*
 137. punctata, *Lam.*
 138. pusilla, *Sow.*
 139. pygmea, *id.*
 140. pyrostoma, *id.*
 141. rasolia, *Duclos.*
 142. recurva, *Sow.*
 143. reticulata, *Lam.*
 144. rubicundula, *Quoy.*
 145. rugosa, *Sow.*
 146. rugulosa, *id.*
 147. rustica, *Lam.*
148. sbina, *Kiener.*
 149. scalarina, *Sow.*
 150. scripta, *Lam.*
 151. semiconvexa, *Sow.*
 152. semipunctata, *Lam.*
 153. sertularianum, *D'Orb.*
 154. sordida, *id.*
 155. splendidula, *Sow.*
 156. spongiarum, *Duclos.*
 157. strenella, *id.*
 158. striata, *id.*
 159. Strombiformis, *Lam.*
 160. subulata, *Duclos.*
 161. subulata, *Sow.*
 162. suffusa, *id.*
 163. sulcata, *Duclos.*
 164. sulcosa, *Sow.*
 165. suturalis, *Gray.*
 166. Tamelana, *Duclos.*
 167. Terpsichore, *Leathes.*
 168. testina, *Duclos.*
 169. Ticaonis, *Sow.*
 170. tigrina, *Duclos.*
 171. triga, *id.*
 172. triumphalis, *id.*
 173. tumida, *id.*
 174. turbida, *id.*
 175. turrita, *Sow.*
 176. turturina *Lam.*
 177. Tyleri, *Gray.*
 178. uncinata, *Sow.*
 179. undata, *Duclos.*
 180. unicolor, *Sow.*
 181. unifascialis, *Lam.*
 182. unizonalis, *Gray.*
 183. uvania, *Duclos.*
 184. valveta, *id.*
 185. varia, *Sow.*
 186. varians, *id.*
 187. virginea, *Duclos.*
 188. vulpecula, *Sow.*
 189. xiphitella, *Duclos.*
 190. Yoldina, *id.*
 192. zebra, *Gray.*
 191. zelina, *Duclos.*
 193. zonalis, *Lam.*

Genus 21. RICINULA, Lamarek.

Animal; similar to that of *Purpura*.

Shell; orbicularly or fusiformly ovate, most frequently tuberculated or spined, spire sometimes very short and depressed, sometimes acuminate; aperture rather narrow, columella a little excavated, sometimes wrinkled or toothed, lip toothed within, teeth nodulous or plait-like, edge of the lip sometimes but rarely digitated.

In adopting the genus *Ricinula*, which has been abandoned by several continental authors, I propose to include a much wider range of species than has been hitherto referred to it; namely, that fusiform series distinguished from the true *Buccinum* and *Purpura* by the inner nodulous dentition of the lip, arranged by M. Kiener as a section of the latter genus under the significant title of "Les Pourpres semi-ricinules", and of which the *P. fiscellum* of authors may be regarded as the type. It cannot be disputed that there are species in the genera *Ricinula*, in its limited acceptation, and *Purpura*, in which it is not easy to define any generic difference, as for example, between the *P. hystrix* and the *R. arachnoides*, or between the *P. aperta* and certain varieties of the *R. clathrata*, but the alteration of names in familiar usage should as far as possible be avoided. A large proportion of the species recently characterized by me as *Ricinulæ* were not hitherto named, and their connection with the *Purpuræ* proper is so apparently remote, that I have preferred elevating the genus under consideration into one of more importance, to the creation of a new genus, or to the fusion of the whole into one after the manner of the French naturalists.

The animal of *Ricinula* is similar in most respects to that of *Purpura*, already described, the head being flattened and prolonged at each corner into the tentacles, and bearing a small elliptical operculum at the posterior extremity of the disk.

Species.

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|--------------------------------------|-------------------------------------|----------------------------|
| 1. acuminata, Reeve. | 8. bicatenata, Reeve. | 15. concinna, Reeve. |
| 2. alveolata, (<i>Purp.</i>) Kien. | 9. carbonaria, <i>id.</i> | 16. contracta, <i>id.</i> |
| 3. arachnoides, Lamarek. | 10. cavernosa, <i>id.</i> | 17. crocostoma, <i>id.</i> |
| 4. armillata, Reeve. | 11. chaidea, (<i>Purp.</i>) Duel. | 18. dealbata, <i>id.</i> |
| 5. aspera, Lamarek. | 12. chrysostoma, Deshayes. | 19. deformis, <i>id.</i> |
| 6. astricta, Reeve. | 13. clathrata, Lam. | 20. digitata, Lamarek. |
| 7. bella, <i>id.</i> | 14. concatenata (<i>Mur.</i>), L. | 21. echinata, Reeve. |

| | | |
|---|-------------------------------------|---------------------------------------|
| 22. elata (<i>Purp.</i>), De Blain. | 33. iodostoma, <i>Lesson.</i> | 44. porphyrostoma, <i>Reeve.</i> |
| 23. elegans, <i>Broderip.</i> | 34. iostoma, <i>Reeve.</i> | 45. pulchra, <i>id.</i> |
| 24. elongata (<i>Purp.</i>) De Blain. | 35. lauta, <i>id.</i> | 46. recurva, <i>id.</i> |
| 25. eximia, <i>Reeve.</i> | 36. lineata, <i>id.</i> | 47. rosea, <i>id.</i> |
| 26. ferruginosa, <i>id.</i> | 37. mendicaria (<i>Col.</i>) Lam. | 48. rutila, <i>id.</i> |
| 27. fiscellum (<i>Murex.</i>) Ch. | 38. morus, <i>Lamarck.</i> | 49. siderea, <i>id.</i> |
| 28. forticostata, <i>Reeve.</i> | 39. muricata, <i>Reeve.</i> | 50. spectrum, <i>id.</i> |
| 29. funiculata, <i>id.</i> | 40. mutica, <i>Lamarck.</i> | 51. trifasciata, <i>id.</i> |
| 30. heptagonalis, <i>id.</i> | 41. ocellata, <i>Reeve.</i> | 52. tuberculata, <i>De Blain.</i> |
| 31. histrio, <i>id.</i> | 42. ochrostoma, <i>id.</i> | 53. turbinella (<i>Purp.</i>) Kien. |
| 32. horrida, <i>Lamarck.</i> | 43. parva, <i>id.</i> | 54. zonata, <i>Reeve.</i> |

Figure.

RICINULA IODOSTOMA. Pl. 7. Fig. 32. Front view of the shell, showing the aperture and plait-like denticles of the columella and inner lip.

Genus 22. CASSIS, *Lamarck.*

Animal; disc oval, rather thin, flattened, carrying a small crescent-shaped operculum at the posterior end; head stout, obtuse, prolonged into two slender tentacles, with the eyes on the outer side near the base; respiratory siphon large and elongated, proboscis short, cylindrical.

Shell; ovate or triangularly ovate, terminating at the base with a short peculiarly recurved and ascending canal; spire short, and often crossed at intervals with varices; last whorl of the shell inflated, sometimes remotely strengthened with varices; aperture large, though often narrow; columellar lip frequently wrinkled or granulated, outer lip thickened, reflected and more or less toothed.

The Cassides or Helmets are a strong, muscular, but inactive group of mollusks, whose shell is mainly distinguished by its solid or inflated growth and short spire, and by the abrupt ascending recurvature of the canal, through which the siphon for conveying the water to the breathing organs passes, and is of more than ordinary dimensions. The head is stout and fleshy, and prolonged into the tentacles after the manner of *Purpura* or *Buccinum*, the eyes being situated on the outer surface near the base; it appears, however, from the observations of M. Deshayes, that in the *Cassis sulcosa* they are surmounted on a short pedicle. The calcifying properties of this genus are somewhat vigorously exercised, the mantle which lines the

interior of the shell extends in ample folds about the aperture, and secretes that rich display of enamel which affords so beautiful a material for the engraving of Cameos. The *C. tuberosa* from the West Indies, is the species commonly used for this purpose from its delicate purity of colour; the well-known Bull's Mouth, *Cassis rufa*, is a familiar example of the great power which this genus exhibits in the formation of shell, but the enamel is not so suitable for gem-engraving on account of its deep blood-red colour.

M. Deshayes informs us, from his observations of the *Cassis sulcosa* on the shores of the Mediterranean, that it is very probable the animal lives upon the juices of different Bivalve Mollusks, whose shells it pierces with its probosis after the manner of the *Murices*, being found dwelling in the sand, and just in those places where Bivalves abound; he describes the *Cassis*, however, as not possessing much activity. The operculum, which is rarely obtained with the shell, is horny and of a peculiar crescent shape, crenulated at the edge and rayed with deep striae.

The *Cassides* are not very numerous, they inhabit chiefly the Mauritius, Ceylon, the Philippines and West Indies; two species are found in the Mediterranean, but none on our own coast.

Species.

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|------------------------------|-----------------------------------|--------------------------------|
| 1. abbreviata, <i>Lam.</i> | 13. fimbriata, <i>Quoy.</i> | 24. ringens, <i>Swain.</i> |
| 2. achatina, <i>id.</i> | 14. flammea, <i>Lam.</i> | 25. rufa, <i>Lam.</i> |
| 3. areola, <i>id.</i> | 15. glauca, <i>id.</i> | 26. saburon, <i>id.</i> |
| 4. canaliculata, <i>id.</i> | 16. granulosa, <i>Bruguière.</i> | 27. semigranulosum, <i>id.</i> |
| 5. cicatricosa, <i>Desh.</i> | 17. lactea, <i>Kiener.</i> | 28. sulcosa, <i>id.</i> |
| 6. coarctata, <i>Sow.</i> | 18. Madagascariensis, <i>Lam.</i> | 29. tenuis, <i>Gray,</i> |
| 7. cornuta, <i>Lam.</i> | 19. Massena, <i>Kiener.</i> | 30. testiculus, <i>Lam.</i> |
| 8. coronulata, <i>Sow.</i> | 20. paucirugis, <i>Menke.</i> | 31. tuberosa, <i>id.</i> |
| 9. crumena, <i>Lam.</i> | 21. pennata, <i>Lam.</i> | 32. vibex, <i>id.</i> |
| 10. decussata, <i>id.</i> | 22. plicaria, <i>id.</i> | 33. zebra, <i>id.</i> |
| 11. erinaceus, <i>id.</i> | 23. pyrum, <i>id.</i> | 34. Zelanica, <i>id.</i> |
| 12. fasciata, <i>id.</i> | | |

Figures.

CASSIS GLAUCA. Pl. D. Shell with animal, showing the thin flattened disk with its crescent-shaped radiated operculum, head and tentacles with sessile eyes, proboscis partially withdrawn, and prominently developed respiratory siphon proceeding from a fold in the front edge of the mantle, and passing through the recurved ascending canal of the shell.—
From the 'Voyage de l' Astrolabe.'

CASSIS AREOLA. Pl. 6. Fig. 28. Shell, showing the aperture, varices, and wrinkled structure of the outer and columellar lips.

Genus 23. ONISCIA, Sowerby.

Animal; unknown.

Shell; oblong, somewhat cylindrical, or conical, spire short and depressed, base emarginated and a little recurved; aperture narrow, extending nearly to the apex; columellar lip displayed over the body whorl, more or less profusely covered with small granular pimples; outer lip irregularly denticulated, thickened, sometimes a little contracted in the middle.

This is one of the few genera established by modern authors which it is desirable to maintain; though unacquainted with the soft parts, the shell sufficiently indicates the presence of some concurrent peculiarities worthy of distinction, and I am glad to observe that the scruples formerly entertained by M. Deshayes to the adoption of this genus, noticed by me in the 'Conchologia Systematica', have been removed in the 'Anim. sans vert.' by his unqualified acceptance of it. Even Linnaeus referred the typical species of this group to a different genus from that in which he included the Helmets* and Lamarck in placing it with the *Cassidaria*, describes it as being a "very singular" shell†; Mr. Sowerby first separated it under the above title and it is now universally adopted.

The *Oniscia* are very limited in number; they are most elaborately sculptured, and distinguished chiefly by the profusely granulated character of the columella, which in the species figured, *O. Dennisoni*, is of a remarkably deep scarlet-red colour.

Species.

- | | | |
|-----------------------------|---------------------------------|-----------------------------|
| 1. cancellata, <i>Sow.</i> | 3. oniscus, <i>Sow.</i> | 5. tuberculosa, <i>Sow.</i> |
| 2. Dennisoni, <i>Reeve;</i> | 4. Strombiformis, <i>Reeve.</i> | |
-

Figures.

ONISCIA DENNISONI. Pl. 7. Fig. 35. Shell, *a*, front view, showing the aperture and granulated columella; *b*, back view, showing the rich latticed sculpture.

* M. Deshayes has somewhat inadvertently affirmed, that the shell selected for the type of this genus is not the *Strombus oniscus* of Linnaeus, but one differing even generically from it. "There are two species" says the learned editor of the 'Anim. sans vert.' one of which he retains in *Cassidaria*, whilst he refers the other to *Oniscia* with a complimentary dedication to Lamarck, "closely approximating, which may be easily distinguished by the denticulations of the outer lip and a difference of colour, for whilst Linnaeus characterized the aperture of his species as being white, Lamarck says it is red." These modifications cannot, I think, be accounted of specific, much more of generic value; and I see nothing in the figures of Gualter or Seba to indicate otherwise.

† "Petite coquille assez commune, mais très singulière; car, quoique son ouverture soit celle des Casques, sa queue n'est point brusquement retroussée comme dans ce dernier genre".

Genus 24. CASSIDARIA, Lamarck.

Animal; disc large, oval, slightly truncated in front, with a small oblong horny operculum near the posterior part; head large and thick, prolonged into a pair of elongated tentacles, at the base of which are the eyes; proboscis cylindrical, rather long; respiratory siphon of only moderate length.

Shell; oval, ventricose, contracted towards the base and attenuated into a curved canal which is reflexed posteriorly; columella lip smooth and expanded over the body whorl; outer lip reflected, sometimes crenated.

The *Cassidariae*, distinguished originally by De Montford under the title of *Morio*, and which name according to the strict rules of priority should have been adopted, differ principally from the *Cassis* in the light inflated growth of the shell, with its contracted, attenuated structure towards the base, and recurved folding canal; they approximate in this respect to *Cassis*, partaking somewhat of the character of *Dolium*, for not only is the shell distinguished by the same tenuity as the latter genus, but there is some affinity in the soft parts, to judge by the ample growth of the disk, and length of the proboscis.

The *Onisciae* were referred to the genus *Cassidaria* by Lamarck, but their shell is uniformly of smaller size, and of more solid growth, independently of its granulated columella and other characters just observed under that head; it is likewise highly probable that a difference will be found in the animal of *Oniscia* of sufficient generic importance to confirm the propriety of its being adopted.

Of the following half dozen species hitherto recorded I am only acquainted with three, and of these, *C. striata*, *Tyrrhenia*, and *echinophora*, the last two are regarded by some authors as varieties; I have no doubt, however, myself, of their specific difference.

Species.

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|----------------------------|-------------------------------|----------------------------|
| 1. <i>acuta</i> , Gray. | 3. <i>Deshayesii</i> , Duval. | 5. <i>striata</i> , Lam. |
| 2. <i>cingulata</i> , Lam. | 4. <i>echinophora</i> Lam. | 6. <i>Tyrrhenia</i> , Lam. |
-

Figure.

CASSIDARIA TYRRHENIA. Pl. 6. Fig. 31. Shell, showing the aperture, reflexed folding canal, and expanded columellar lip.

Family 4. ALATA.

Shell; emarginated or channelled at the base, outer lip expanded or digitated at maturity, and more or less sinuated near the base for the passage of the animal's proboscis-like head.

The family *Alata* was instituted by Lamarck for the purpose of associating in one natural group, the three genera *Rostellaria*, *Pterocera*, and *Strombus*, dismembered from the Linnaean genus *Strombus*, and distinguished by that marked peculiarity of growth, which the shell of each exhibits in the wing-like expansion of the outer lip, on arriving at maturity. The researches, of subsequent naturalists, aided by much increased zeal and opportunities of studying the animal, have, however, discovered an affinity with the above-named genera, in species arranged hitherto in a more remote part of the system. The *Aporrhais pes-Pelicanii* has long been generically distinguished, and a difference has been recently observed in the soft parts approximating to *Struthiolaria*, a genus necessarily transported to this family by M. Deshayes upon the discovery of the animal by M. M. Quoy and Gaimard, and I now feel it expedient, as indicating a link between *Struthiolaria* and the *Purpurifera*, to introduce an important genus founded by Dr. Beck, a distinguished naturalist of Copenhagen, under the name of *Priamus*, upon a shell regarded by Lamarck and others as an inhabitant of the land or marshes,* but now strongly suspected, if not ascertained, to be living in the seas of Spain and Portugal. Were it not for the transition afforded by the *Aporrhais occidentalis*, between *Struthiolaria* and the Lamarkian *Alata*, I should have ventured to propose a new family for the reception of that genus with *Priamus*; but as the animal of the latter is still unknown, the grounds for this separation are insufficient.

The genera referable to this family are as follows:—

| | | |
|-----------------------|---------------------|-------------------|
| PRIAMUS. | APORRHAIS. | PTEROCERA. |
| STRUTHIOLARIA. | ROSTELLARIA. | STROMBUS. |

Genus 1. PRIAMUS, Beck.

Animal; unknown.

Shell; oblong-ovate, ventricose, rather thin, diaphonous, somewhat horny or porcellanous, spire exserted, apex obtuse, a little depressed, as if mamillary; columella curved, truncated; outer lip simple, effused, slightly sinuated towards the base.

* *Bulimus Priamus* Bruguière, *Achatina Priamus* Lamarck, *Helix Priamus* Ferussac.

The shell on which this genus is founded, though long known to Conchologists, is one of very rare occurrence; having been described nearly a century since by Meuschen and Gronovius as a *Helix*, in the unlimited sense of that period, its peculiarities were strikingly noticed by the latter in his interrogatory as to its being a river shell*; Favanne mentions it in his Catalogue as a rare *Buccinum* called 'La Chiure de Puce,' and Chemnitz published a formal description of it in the 'Conchylien Cabinet' under the name of *Buccinum stercus-pulicum*. It does not appear to have been known to Linnaeus, the last edition of whose 'Systema Naturæ' appeared simultaneously with the 'Zoophylacium' of Gronovius, but Dillwyn referred the shell under consideration, in his Linnaean arrangement of shells, to the genus *Bulla*; Bruguière consigned it to *Bulimus*, and Lamarck, De Ferussac, and others, adopted the same view, by retaining it with those species subsequently distinguished as *Achatinæ*, on account of the truncature of their columella, and especially with that portion more recently separated under the titles of *Polyphemus* and *Glandina*. The name *Buccinum* used by the original describers of this shell, was thus more in conformity with its present assumed marine character, than that employed by modern writers, the situation to which it has been assigned in the system as the representative of a pulmoniferous air-breathing mollusk, being incompatible with the nature anticipated, on the authority of Dr. Beck, of its being an inhabitant of the seas of Spain and Portugal.†

From the light horny semi-porcellaneous character of this shell, the absence of epidermis, and the wide-spread stain which exhibits its contact with the soft parts, I think it may be anticipated that the animal is of large size, and able to envelope its shell to some considerable extent, it is probably an inhabitant of deep water, and an examination of the microscopic structure of the shell would no doubt detect a larger proportion of membranous tissue and less of calcareous matter than is usually secreted by mollusks of the order to which it is referred. It only remains to urge upon the attention of all who may have an opportunity of dredging the shores of those countries upon which it is supposed to exist, that in the event of their researches after *Priamus* meeting with success, they should be careful to preserve the animal.

Figure.

PRIAMUS STERCUS-PULICUM. Pl. 8. Fig. 39. Shell, showing its curved and truncated columella, and slightly sinuated lip, as in *Struthiolaria*.

* "An fluviatilis?" *Gronovius*, Zoophylacium, Fasc. 3. No. 146

† Deshayes, Anim. sans vert. vol. viii. p. 299, note.

Genus 2. STRUTHIOLARIA, Lamarch.

Animal; disc large, thick, carrying a small horny rudimentary operculum behind, supported in the centre by a stout pedicle which passes into the shell, and serves to support the head; head rather large, prolonged into a cylindrical trunk enclosing the mouth, at the base of which on either side are two long pointed tentacles with eyes at the lower outer side; no respiratory siphon.

Shell; oblong-oval, spire exserted, rather obtuse at the apex; columella curved, truncated at the base, outer lip thickened, slightly sinuated towards the lower part.

A limited genus of mollusks, inhabiting the shores of New Holland, for a description and figure of whose soft parts we are indebted to the researches of M. M. Quoy and Gaimard. Their chief peculiarity consists in the disk being supported on a stout pedicle which passes into the shell, in the truncated proboscisidiform prolongation of the head, indicative of the relation of this mollusk with *Aporrhais*, and in the absence of any respiratory siphon, which is so conspicuous a feature in the *Purpurifera*, and is formed, as observed in treating of that family, by an elongated fold of the mantle, protuding in an erect position through the basal notch of the shell, for the purpose of supplying water to the breathing organs.

From the circumstance of the outer lip of the shell of *Struthiolaria* being unusually thickened and rolled back, whilst a corresponding thickness is displayed in the superincumbent deposit of enamel on the opposite side, described as the columellar lip, the genus was referred by Lamarch to the immediate vicinity of the *Tritons* and *Ranellæ*, regarding this structure as an analogue of the varices by which those genera are characterized; Mr. Gray and M. Deshayes, however, observing the marked resemblance which the shell of *Struthiolaria* presents to that of *Aporrhais* in the sinuated lip and truncature of the columella, removed the genus under consideration, almost simultaneously, to the family *Alata*, and their anticipations of its true character have been confirmed in a striking manner by the observations of Philippi and M. M. Quoy and Gaimard.

Species.

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|-----------------------|---------------------------|------------------------------------|
| 1. crenulata Lam. | 3. papulosa (Buc.) Mart. | 5. straminea (<i>Murex.</i>) Gm. |
| 2. microscopia, Gray. | 4. seutulata (Buc.) Mart. | |

Figure.

STRUTHIOLARIA STRAMINEA. Pl 8. Fig. 38. Shell, showing the thickened outer and columellar lips and truncature of the columella.

Genus 3. APORRHAIS, *De Montford.**

Animal; disc truncated in front, acuminated behind, carrying at the extremity a small oblong horny operculum, head very large, proboscidiform, somewhat cylindrical, obliquely truncated; mouth longitudinal, occupying the length of the truncated portion of the head; tentacles very long and pointed, pedunculated at the base, at the summit of which pedunculated portion is the eye; mantle thin, simple, or lobed.

Shell; elongated, fusiform, slightly canaliculated at the base; columella straight, rather callous; outer lip dilated and thickened, detached from the spire at the upper part, and either simple or expanded into claws, or digitations.

The *Strombus pes-Pelicanus* was set apart as the type of a new genus by De Montford, under the name of *Aporrhais*, by which it had been distinguished in the earliest records of Natural History; and Lamarck, uniting it with the Linnæan *Strombus fusus* and its congeners, proposed a new genus for their reception, under the name of *Rostellaria*; the researches of M. M. Ehrenberg, Quoy and Gaimard, Poli, Deshayes, and Philippi, have, however, demonstrated not only that there is an important generic difference between the animals of the Lamarckian *Rostellarie rectirostrum* (*Strombus fusus*, Linn.), and *pes-Pelicanus*, but that whilst the former is characterized by the same peculiarity of structure as the true *Strombus*, the latter is wanting in that peculiarity and presents an unexpected affinity with *Struthiolaria*, in having a large proboscidiform head and ample mouth, without the bifurcated tentacles and divided disc, which is to be found in *Rostellaria*, *Pterocera*, and *Strombus*.

The mantle of the *Aporrhaides*, as in the remaining genera of *Alata*, is

* The Aristotelian title of *Aporrhais*, adopted by Sowerby after the example of De Montford, has been objected to by Philippi, substituting that of *Chenopus*, on the grounds of its more especial reference to the *Pteroceræ*. It is true that Rondelet, one of the earliest writers on Natural History after the revival of letters, has figured a *P. lambis* for *Aporrhais*; but it seems evident, upon his own testimony, that the name, derived from Ἀπορρέω to flow out in drops, was suggested to the Athenian philosopher by the spouted *A. pes-Pelicanus* of the Mediterranean, from whence the materials for the 'Historia Animalium' of antiquity, were mainly derived:—“Dicam praterea quod suspicionibus et conjecturis tautum inductis de Ἀπορραιδεσ sentio; nimirum Muricuum generis sunt qua vocant Graci Colycia, turbinata aequa sed minora multo”. I consider, therefore, that the word *Aporrhais* may be maintained without prejudice, for the group under consideration, the type of which was, no doubt, the particular shell referred to by the great father of zoology. It should perhaps be added, that the word “Muricum” just cited, is not used in the sense in which we understand it; in Gaza's translation of Aristotle, quoted by Rondelet, the Ἀπορραιδεσ are rendered *Murices*, and the Κύρυχα *Buccina*, including the *Tritons*; while the *Murices* of our own day were the Πορφύρα or *Purple* of the ancients, from the circumstance of their obtaining the Tyrian purple from that genus.

expanded at maturity into a lobe; in one of the three only recent species known, *A. occidentalis*, from the northern shores of Western America, the lobe is simple, in the remaining two *A. pes-Pelicanii*, and *pes-Carbonis* of the Mediterranean, it is digitated, the shell being of a corresponding structure.

Species.

1. *occidentalis*, Beck. 2. *pes-Carbonis*, Brong. 3. *pes-Pelicanii* (*Rost.*) Lam.
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Genus 4. ROSTELLARIA, Lamarck.

Animal; elongated, disc divided into two parts, the posterior cylindrical, obliquely truncated, and carrying a horny unguiform operculum upon the truncature, the anterior flattened and rounded, serving the animal to attach itself to solid bodies; head large and thick, prolonged into a proboscis-shaped muzzle, slit in front; tentacles diverging, cylindrical, two-forked, the inner branch being slim and pointed, the outer truncated at the summit, with the eye situated upon the truncature.

Shell; fusiform, prolonged at the base into a canal which is sometimes very long and slender; whorls slightly convex, sometimes furnished here and there with a varix; lip toothed, or digitated.

It appears from Ehrenberg's characters of the animal above noticed, that the *Rostellariae* whose graceful fusiform shells are so much admired by the collector, and are the pride of his cabinet, have a much closer affinity with the *Pterocerae* and *Strombi*, than with the *Aporrhaides* which have been hitherto associated with them, or the *Fusi*, to which they were approximated by Ferussac and De Blainville. The disc presents the same peculiar modification of structure as in *Pterocera* and *Strombus*; divided into two parts, the animal is said to acquire motion by executing a succession of leaps, instead of the ordinary mode of progressing by dilatation and contraction.

The *Rostellariae* may be easily recognized by the elegant fusiform growth of the shell, with its peculiarly dentated, or finely digitated lip; they are very limited in species, and are principally from China and the Moluccas.

Species.

1. *curta*, Sow. 3. *fissa*, Desh. 5. *Powisii*, Petit.
2. *curvirostrum*, Lam. 4. *fusus* (*Stromb.*), Linn.

Figure.

ROSTELLARIA FUSUS. Plate 7. Fig. 36. Shell, showing its graceful fusiform growth, and digitated lip.—*From the collection of Dr. Knapp, of Edinburgh.*

Genus 5. PTEROCERA, Lamarck.

Animal; similar to that of *Rostellaria*.

Shell; ovately oblong and ventricose, the last whorl being considerably inflated, and ending in an elongated canal of a structure similar to the digitations of the lip; columella and aperture peculiarly ridged; outer lip developed at maturity into a conspicuously clawed or digitated wing, and sinuated towards the lower part.

The soft parts of *Rostellaria*, *Pterocera*, and *Strombus*, are so exactly similar in character, that M. Deshayes almost doubts the propriety of their being divided into separate genera, and more especially as they are distinguished in a notable manner from the proximate kinds by a modification of structure, of which there is no analogy in any other genus of the class. The disc is divided in a manner which obliges the animal to leap*, as it were, instead of to crawl, and the tentacles are curiously two-forked, the stouter branch, a modification of that portion which is commonly pedunculated, being destined for the support of an eye of unusually large proportions.

The eye of these genera appears to be more highly developed than in any other of the Gastropods; it is described as covering the summit of this stout, truncated, tentacular branch, and composed of a transparent horny material containing an iris, differing in colour according to species, for the transmission of rays of light into an inner chamber; an organism plainly adapted for seeing.

The distinguishing peculiarity of this family, as regards the shell, the wing-like expansion of the mature lip, presents itself under such different phases in the genera just spoken of in reference to the animal, that it cannot but be regarded as a feature calling for generic notice, notwithstanding the similarity of the soft parts. In the genus under consideration, the

* With regard to their habits of locomotion, it must not be imagined that the gigantic Strombs and Fountain Shells, with their attendant Spiders and Scorpions, are in the habit of leaping about the shore; they are not remarkable, I conceive, for any such activity; the word "leap" must be understood in a very restricted sense, and only so far as may be necessary to explain a mode of progression differing, to a limited extent, from the ordinary inert method of contraction and dilatation.

mantle when about to suspend its function of calcification, expands itself into several digitations, of considerable length in some species, each secreting a massive claw, which it ultimately fills with calcareous matter, the hinder one being thrown over the spire so as almost to conceal the primitive growth of the shell from the observer; the mantle then withdraws, and subsiding in wrinkles, deposits that richly coloured layer of corresponding wrinkled enamel with which the columella and aperture are always adorned at maturity.

The *Pteroceræ*, or ‘Spider Shells’, are few in number, but well characterized by their distinctions of colour, and the number and growth of their claws; they are all inhabitants of the tropical seas.

Species.

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| 1. aurantia, <i>Lam.</i> | 5. millepeda, <i>Lam.</i> | 8. rugosa, <i>Sow.</i> |
| 2. chiragra, <i>id.</i> | 6. multipes, <i>Desh.</i> | 9. scorpio, <i>Lam.</i> |
| 3. elongata,* <i>Swain.</i> | 7. pseudo-scorpio, <i>Lam.</i> | 10. truncata, <i>id.</i> |
| 4. lambis, <i>Lam.</i> | | |

Figure.

PTEROCERA MULTIPES. Pl. 8. Fig. 40. Shell, showing the digitated expansion of the lip, and wrinkled surface of the aperture.

Genus 6. STROMBUS, *Linnæus.*

Animal; similar to that of *Rostellaria*, and *Pterocera*.

Shell; oblong-ovate, emarginated and recurved at the base; spire conical, somewhat turreted; lip expanded, not digitated, and sinuated towards the base; aperture oblong, rather narrow, slightly emarginated at the upper part.

Regarding the soft parts, the *Strombi* are identical with the *Rostellariæ* and *Pteroceræ* already described, and the peculiarities of which it is unnecessary here to repeat; but the shell presents an uniformity of character sufficiently distinct from either to merit attention. The base is not pro-

* I cannot agree with M. Deshayes in the propriety of naming this shell “*Pterocera novem dactylis*”; the noun-ablative is ungrammatical in the sense required by the binomial form of nomenclature. Chemnitz was undoubtedly the first describer of the species, and a very characteristic figure is it accompanied with; but, as was almost invariably the case with his precursor Martini, he omitted to distinguish it by any specific name. The words above quoted, form part of Chemnitz’s description,—“*Strombus novem dactylis instructus*”, &c., and Swainson is therefore justly entitled to the priority of having named the species.

longed into a slender channel or claw, but is short, and suddenly curved back, whilst the winged expansion of the lip is simple, though developed in a variety of ways in different species. Even the early Greek fathers of zoology distinguished the *Strombi* from the *Pteroceræ*, separating the latter as *Aporraides*, so called in recent times by Lister, Gualter, and Aldrovandi, notwithstanding the *A. pes-Pelicanæ* must have been alone the subject to which Aristotle originally applied the term Ἀπορραιδεῖς.* Lamarck is clearly the first author who may be said to have published the genus *Strombus* in its integrity; Linnaeus, as M. Deshayes observes, included several shells under this head, independent of the *Aporrhædes* of antiquity, which have proved to belong to mollusks of different organization and habits; such, for example, as a *Melanopsis* which had, nevertheless, been noted as a fresh-water *Buccinum*; a *Pleurotoma* is also to be found among the Linnaean *Strombi*, an *Oniscia*, a *Volute*, and several *Cerithia*; whilst not one of those enumerated by Lamarck has evoked a claim to any better arrangement.

The *Strombi* are pretty generally distributed throughout the globe; the largest species, the well-known *S. gigas*, is from the West Indies, and several others abound in the same locality; they are also tolerably abundant in the Eastern world, China, Ceylon, the Moluccas, &c.; and we have species from Australia, New Zealand, Peru, California, Sandwich Islands, the Red Sea, and other places equally widely separated. They have been beautifully illustrated by Mr. Sowerby in his 'Thesaurus Conchyliorum'; the figures of which, though much diminished in size, are not the less effective to one familiar with the genus.

Species.

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|--------------------------------|------------------------------|---------------------------------|
| 1. accipitrinus, <i>Lam.</i> | 17. dilatatus, <i>Lam.</i> | 33. hemastoma, <i>Sow.</i> |
| 2. alatus, <i>Gm.</i> | 18. dubius, <i>Sow.</i> | 34. inermis, <i>id.</i> |
| 3. auris-Dianæ, <i>Linn.</i> | 19. elegans, <i>id.</i> | 35. Isabella, <i>Lam.</i> |
| 4. australis, <i>Sow.</i> | 20. epidromis, <i>Linn.</i> | 36. labiosus, <i>Wood.</i> |
| 5. bituberculatus, <i>Lam.</i> | 21. fasciatus, <i>Gm.</i> | 37. laciniatus, <i>Chemn.</i> |
| 6. bubonius, <i>id.</i> | 22. fissurella, <i>Linn.</i> | 38. Lamarckii, <i>Gray.</i> |
| 7. bulbulus, <i>Sow.</i> | 23. floridus, <i>Lam.</i> | 39. latissimus, <i>Linn.</i> |
| 8. Campbelli, <i>Gray.</i> | 24. fusiformis, <i>Sow.</i> | 40. lentiginosus, <i>id.</i> |
| 9. canarium, <i>Linn.</i> | 25. galeatus, <i>Wood.</i> | 41. lineatus, <i>Lam.</i> |
| 10. cancellatus, <i>Lam.</i> | 26. gallus, <i>Linn.</i> | 42. Luhuanus, <i>Linn.</i> |
| 11. columba, <i>id.</i> | 27. gibberulus, <i>id.</i> | 43. maculatus, <i>Nutt.</i> |
| 12. coniformis, <i>Sow.</i> | 28. gigas, <i>id.</i> | 44. marginatus, <i>Linn.</i> |
| 13. crenatus, <i>id.</i> | 29. glabratus, <i>Sow.</i> | 45. Mauritianus, <i>Lam.</i> |
| 14. crispatus, <i>id.</i> | 30. Goliath, <i>Chemn.</i> | 46. melanostoma, <i>Swain.</i> |
| 15. deformis, <i>Gray.</i> | 31. gracilior, <i>Wood.</i> | 47. NovæZelandiæ, <i>Chemn.</i> |
| 16. dentatus, <i>Linn.</i> | 32. granulatus, <i>id.</i> | 48. papilio, <i>id.</i> |

* See note p. 89.

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| 49. Peruvianus, <i>Swain.</i> | 55. Sibbaldii, <i>Sow.</i> | 61. troglodytes, <i>id.</i> |
| 50. plicatus, <i>Lam.</i> | 56. succinctus, <i>Linn.</i> | 62. turritus, <i>id.</i> |
| 51. ponderosus, <i>Phil.</i> | 57. terebellatus, <i>Sow.</i> | 63. urceus, <i>Linn.</i> |
| 52. pugilis, <i>Linn.</i> | 58. Thersites, <i>Gray.</i> | 64. Vanikorensis, <i>Quoy.</i> |
| 53. rugosus, <i>Sow.</i> | 59. tricornis, <i>Lam.</i> | 65. variabilis, <i>Swain.</i> |
| 54. Scalariformis, <i>Ducl.</i> | 60. tridentatus, <i>id.</i> | 66. vittatus, <i>Linn.</i> |

Figure.

STROMBUS NOVÆ ZELANDIÆ. Pl. 8. Fig. 37. Shell, showing its expanded wing-like lip, wrinkled aperture, and sinus.

Family 5. CANALIFERA.

Shell; *canaliculated*, canal sometimes very long, sometimes very short; lip not changing with age.

The family *Canalifera* comprises an extensive range of mollusks whose shells exhibit great diversity of structure, but are all more or less channeled at the base; this channel is, however, extremely variable; in some *Murices*, for example, it almost rivals that of the *Rostellaria fusus* in length and tenuity, whilst in most of the *Ranellæ* and *Cancellariæ* it is comparatively obsolete. There are other characters of no less importance distinctive of groups; the genera *Fusciolaria*, *Cancellaria* and *Turbinella* are characterized by a row of oblique plaits on the columella somewhat after the manner of the *Volutes* and *Mitres*; and the *Tritons*, *Murices* and *Ranellæ*, are distinguished by a system of varicose growth, developed with a regularity which is not to be found in any other genus.

The animals of the different genera referred to this family, so far as they are at present known, are, with certain modifications, the same throughout; characterized by a short stout disk, truncated head, and fine pointed tentacles, such as are represented in the *Triton tuberosus* (Plate G.), the chief variation consists in the developement of the mantle, which in some genera, and even species, is simple, whilst in others, it is furnished with that variety of filamentary processes which secrete the fronds, spines and tubercles.

It has been remarked by M. Deshayes, that the *Cerithia* and *Cancellariae* should not be included in the present family, because they do not strictly come within the category of the flesh-eating tribe; the former have been described to be of phytiphagous habit, and of the latter M. Deshayes observes, that a species inhabiting the shores of the Mediterranean is invariably attached to plants; has it been demonstrated, however, that they are *not* carnivorous? This is a question that remains open to future observers,

though not very likely, when determined, to evoke any change in the classification; the alimentary system not being so much influenced by the difference between digesting animal and vegetable matter, as is the respiratory system by the difference of inhaling air and water.

Sixteen genera may now be referred to this family, including one which I have found it necessary to propose under the name of *Fastigiella*.

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| TRITON. | CANCELLARIA. | TURBINELLA. |
| RANELLA. | PLEUROTOMA. | FASTIGIELLA. |
| MUREX. | MANGELIA. | CERITHIUM. |
| TYPHIS. | FUSUS. | CYRTULUS. |
| PYRULA. | FASCIOLARIA. | TRIPHORIS. |
| FICUS. | | |

Genus 1. TRITON, *De Montford.*

Animal; disc oval, short, thick, carrying a smooth oblong operculum, mostly fitting the aperture of the shell; head stout and rather prominent, somewhat square, with a pair of long slender pointed tentacles, protruding from the front corners, having the eye placed upon the outer side near the base; at the under part of the head is a small slit, through which a proboscis is exserted for the capture of prey; respiratory siphon varying in length according to species.

Shell; oblong or rounded, with the canal sometimes very short, sometimes long, and a little recurved, covered in some instances with a strong bristly, hairy epidermis; whorls crossed with a single solitary varix on each, but very irregularly, and it is occasionally wanting; lip thickened and crenulated, sometimes channelled at the upper part.

The genus *Triton* includes a considerable portion of that extensive and much-admired series of *Canalifera*, whose shells exhibit a peculiarity in their mode of formation which is supposed to indicate periods of rest in the calcifying functions of their animal inhabitant. It consists of the deposit of a marginal ridge, with all its varieties of structural embellishment, at intervals, as highly finished, and in as perfect condition, as Nature, in the beauty and harmony of her operations, would lead us to anticipate only at maturity. These varices of fronds, spines, laminae, or tubercles are secreted by certain filamentary processes, which are exserted, it is assumed, along the edge of the mantle, anterior to a season of rest; that is, the animal has

the faculty of suspending the function of its calcifying organ at different intervals in the course of its growth, at the same particular periods in each species, in a manner exactly similar to that which induces the formation of claws just described in the mature *Pterocera*. In that genus there is no appearance of this defensive architectural border until the animal is engaged in the completion of its edifice, a natural effort for the attainment of that symmetry and finish by which the works of the Invisible are characterized; but in the *Tritons*, *Ranellæ*, and *Murices*, it occurs at a very early stage of growth, the even tenour of the shell is renewed, and the varix is repeated at successive intervals. In *Murex* there are three or more in every whorl; in *Ranella*, one in every half-whorl; whilst in *Triton*, the periodical development of a varix occurs less than twice in a whorl, the genus including, not only those having a varix in every whorl, but those in which a varix occurs on the last whorl only. Some species are found occasionally without any varix at all, but this is merely a fortuitous variation of growth.

Such is the arrangement of the varicose *Canalifera* in popular use; several genera have been proposed for further subdividing them, the most plausible of which is the genus *Persona* of De Montford, for the *Tritones annus*, *mulus*, &c.; whilst Dr. Pfeiffer, on the other hand, unites the *Ranellæ* and *Tritons* into one. All were included by Linnaeus under the head of *Murex*, and there is little or no difference of generic value in the soft parts; it has been observed, however, by M. Deshayes, that the animals of the different species of *Triton*, excepting the great Trumpet shell* (*Triton variegatus*), and one or two large allied species, are distinguished by an ocellated pattern of colouring as in the *T. tuberosus* here figured.

The *Tritons* have shells of more solid structure than the *Murices* or *Ranellæ*, and of more simple growth. They are not furnished with fronds or spines, nor have they any ramified branches like the *Murices*; the rude manner in which the whorls are convoluted seems rather to indicate that their animal inhabitant, though possessing abundant power of calcification, is of somewhat sluggish growth. The epidermis of the *Tritons* is often remarkably thick, hairy, and bristly, and is sometimes accompanied with bristles in small tufts. Another curious peculiarity in these shells is the structure of the apex; it appears in numerous instances to be formed of a horny substance, thinly plated with shelly matter, and it is not an uncommon thing to find examples in which the calcareous plating is broken off so as to expose the horny cast underneath. The columella of the *Tritons* is gene-

* In the early ages of Greece, it was customary for the Κῆρος, or common erier, to introduce himself to the notice of the people by lustily blowing through a shell. We learn from tradition, as well as history, that the *Triton variegatus* or Trumpet-Shell (*Murex Tritonis*, Linn.) was the one commonly selected for that purpose; but it is more probable that the shells of many other *Canalifera* were used. Be that as it may, it is certain that the word *Kerix* was applied by Aristotle from that circumstance to all the canalculated shells with which he was acquainted, and it appears to have passed by a strange process of corruption, into that of *Murex*.—*Conch. Syst.* vol. ii. p. 191.

rally covered with a bright coat of wrinkled enamel, and the outer lip becomes thickened in a manner somewhat curious; upon arriving at maturity the lip curls under so as to form a deep broad channel or gutter, which is then filled up to form the thickened lip. The varices are all constructed in the same manner, each forming for a time the margin of the aperture, and destined, it is conjectured, to protect the lip during a season of rest in the manner already described; as a question for the curious it would be interesting to know what length of time ordinarily elapses between the formation or deposit of a varix, and the renewal of growth. The elegant margin of the *T. femorale* is celebrated as having furnished the original model of the gadroon border so frequently used by the silversmith in the decoration of plate; and the common Trumpet of the Mediterranean, *T. nodiferns*, may be noticed as affording an occasional meal for the Neapolitan fisherman, which, in the absence of more delicate food, is said to be much relished.

The *Tritons* appear to be widely distributed over the globe: of a hundred species recently illustrated in the 'Conchologia Iconica', the chief portion are from the Molucca and Philippine Islands; some few are from the western coast of America, some from China, several from New Holland, Ceylon, and Mozambique; and there are also one or two from the Mediterranean, the Cape of Good Hope, the West Indies, and the United States.

Species.

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| 1. acuminata, <i>Reeve.</i> | 22. concinnus, <i>Reeve.</i> | 43. ficooides, <i>Reeve.</i> |
| 2. aegrotus, <i>id.</i> | 23. constrictus, <i>Brod.</i> | 44. fictilis, <i>Hinds.</i> |
| 3. amictus, <i>id.</i> | 24. convolutus, <i>id.</i> | 45. fusiformis, <i>Kiener.</i> |
| 4. angulatus, <i>id.</i> | 25. corrugatus, <i>Lam.</i> | 46. gallinago, <i>Reeve.</i> |
| 5. anomalus, <i>Hinds.</i> | 26. crispus, <i>Reeve.</i> | 47. gemmatus, <i>id.</i> |
| 6. antiquatus, <i>id.</i> | 27. cutaceus, <i>Lam.</i> | 48. gibbosa, <i>Brod.</i> |
| 7. anus, <i>Lam.</i> | 28. cynocephalus, <i>Lam.</i> | 49. gracilis, <i>Reeve.</i> |
| 8. aquatilis, <i>Reeve.</i> | 29. decapitatus, <i>Reeve.</i> | 50. grandimaculatus, <i>id.</i> |
| 9. australis, <i>Lam.</i> | 30. decollatus, <i>Sow.</i> | 51. labiosus, <i>id.</i> |
| 10. bacillum, <i>Reeve,</i> | 31. decipiens, <i>Reeve.</i> | 52. lampas, <i>Lam.</i> |
| 11. bracteatus, <i>Hinds.</i> | 32. digitale, <i>id.</i> | 53. lanceolatus, <i>Kiener.</i> |
| 12. canaliferus, <i>Lam.</i> | 33. distortus, <i>Sch. & Wag.</i> | 54. lativaricosus, <i>Reeve.</i> |
| 13. cancellinus, <i>Desh.</i> | 34. dolarius, <i>Lam.</i> | 55. lignarius, <i>Brod.</i> |
| 14. carduus, <i>Reeve.</i> | 35. eburneus, <i>Reeve.</i> | 56. lineatus, <i>Brod.</i> |
| 15. Ceylonensis, <i>Sow.</i> | 36. egregius, <i>id.</i> | 57. lotorium, <i>Lam.</i> |
| 16. Chemnitzii, <i>Gray.</i> | 37. elongatus, <i>id.</i> | 58. maculosus, <i>id.</i> |
| 17. chlorostoma, <i>Lam.</i> | 38. encausticus, <i>id.</i> | 59. Mediterraneanus, <i>Sow.</i> |
| 18. cingulatus, <i>Pfeiffer.</i> | 39. exaratus, <i>id.</i> | 60. moritinctus, <i>Reeve.</i> |
| 19. clandestinus, <i>Lam.</i> | 40. exilis, <i>id.</i> | 61. Nassoides, <i>id.</i> |
| 20. clathratus, <i>Sow.</i> | 41. eximus, <i>id.</i> | 62. nitidulus, <i>Sow.</i> |
| 21. clavator, <i>Lam.</i> | 42. femorale, <i>Lam.</i> | 63. niveus, <i>Pfeiffer.</i> |

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| 64. nodiferus, <i>Lam.</i> | 78. rubecula, <i>Lam.</i> | 91. tessellatus, <i>Reeve.</i> |
| 65. obscurus, <i>Reeve.</i> | 79. rufus, <i>Brod.</i> | 92. Thersites, <i>id.</i> |
| 66. clearium, <i>Desh.</i> | 80. sarcostoma, <i>Reeve.</i> | 93. triginus, <i>Brod.</i> |
| 67. pagodus, <i>Reeve.</i> | 81. Sauliae, <i>id.</i> | 94. tortuosus, <i>Reeve.</i> |
| 68. Pfeifferianus, <i>id.</i> | 82. scabra, <i>King.</i> | 95. Tranquebaricus, <i>Lam.</i> |
| 69. pictus, <i>id.</i> | 83. Scalariformis, <i>Brod.</i> | 96. trilineatus, <i>Reeve.</i> |
| 70. pilareis, <i>Lam.</i> | 84. serobiculator, <i>Lam.</i> | 97. tripus, <i>Lam.</i> |
| 71. pygmæus, <i>Pfeiffer.</i> | 85. sculptilis, <i>id.</i> | 98. truncatus, <i>Hinds.</i> |
| 72. pyrum, <i>Lam.</i> | 86. Sinensis, <i>id.</i> | 99. tuberosus, <i>Lam.</i> |
| 73. Quoyi, <i>Reeve.</i> | 87. siphonatus, <i>id.</i> | 100. variegatus, <i>id.</i> |
| 74. Ranelloides, <i>id.</i> | 88. Soverbiæ, <i>id.</i> | 101. verrucosus, <i>Reeve.</i> |
| 75. reticulatus, <i>Blain.</i> | 89. Spengleri, <i>Lam.</i> | 102. vespaeus, <i>Lam.</i> |
| 76. retusus, <i>Lam.</i> | 90. subdistortus, <i>id.</i> | 103. vestitus, <i>Hinds.</i> |
| 77. ridens, <i>Reeve.</i> | | |

Figures.

TRITON TUBEROSUS. Pl. G.—Shell with animal, showing its short disc, truncated head, pointed tentacles and ocellated painting.—*From the 'Voyage de l'Astrolabe.'*

TRITON TIGRINUS. Pl. 9. Fig. 43. Shell (diminished two-thirds), showing a strong varix on the left side.—*From Mr. Cuming's collection.*

Genus 2. RANELLA, Lamarck.

Animal; similar to that of Triton.

Shell; ovate or oblong-ovate, with the spire more or less acuminate; varices mostly oblique, deposited one on every half-whorl, forming a longitudinal row on each side; canal sometimes very short, sometimes rather long; aperture ovate, generally canaliculated at both ends.

The genus *Ranella* was founded by Lamarck upon a peculiarity manifested in the arrangement of the varices, by which the shell acquires a depressed two-edged structure. The animal varies in no respect from *Triton*, except in the mode in which it forms its shell; the varices or marginal borders, resulting from a periodical function of the mantle, are deposited exactly one on every half-volution, ranging therefore on either side of the shell, like a continuous wing-like appendage from the apex to nearly the base.

Having treated of the mode in which this function is exercised, under the head of *Triton*, it may here be noticed that De Blainville assumed them to indicate periods of gestation; but M. Deshayes observes, in reply to this, that, "the varices being deposited from the earliest formation of the shell, it is quite unnatural to suppose, that the animal has the faculty of employing

that function so soon after its ejection from the ovary". It has been imagined also, that the periodical development of varices indicates the changes of the seasons; but, repeats M. Deshayes, "the canaliferous tribes dwell in a climate where there is scarcely any variation of season, and the temperature of the waters the same all the year round".

Although the genus *Ranella* has no very high claim to distinction, there is no group in the series whose generic aspect appears more accurately defined to the eye of the common observer; the lateral continuity of the varices imparts a peculiarity to the shell not easily confounded with any other. The species assimilate very much in sculpture; the rarest and most exquisite in form is the well-known 'Finned Frog' *Ranella pulchra*.

The monograph of this genus published in the 'Conchologia Iconica' includes fifty species; the greater portion inhabit the eastern seas, the Philippine and Molucca Islands, some are from California and the West Coast of South America, but the largest, singularly enough, exists at the northern limit of the genus, in the Mediterranean.

Species.

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| 1. <i>affinis</i> , Brod. | 19. <i>gigantea</i> , Lam. | 36. <i>pusilla</i> , Brod. |
| 2. <i>albifasciata</i> , Sow. | 20. <i>granifera</i> , id. | 37. <i>pustulosa</i> , Reeve. |
| 3. <i>albivaricosa</i> , Reeve. | 21. <i>gyrimus</i> , Desh. | 38. <i>pyramidalis</i> , Brod. |
| 4. <i>aneeps</i> , Lam. | 22. <i>hastula</i> , Reeve. | 39. <i>rhodostoma</i> , Beck. |
| 5. <i>argus</i> , id. | 23. <i>leucostoma</i> , id. | 40. <i>rosea</i> , Reeve. |
| 6. <i>bitubercularis</i> , id. | 24. <i>livida</i> , Reeve. | 41. <i>rugosa</i> , Sow. |
| 7. <i>bifonia</i> , id. | 25. <i>laevigata</i> , Lam. | 42. <i>semigranosa</i> , Lam. |
| 8. <i>cælata</i> , Brod. | 26. <i>margaritula</i> , Desh. | 43. <i>siphonata</i> , Reeve. |
| 9. <i>Californica</i> , Hinds. | 27. <i>Muriciformis</i> , Brod. | 44. <i>spinosa</i> , Lam. |
| 10. <i>candidata</i> , Lam. | 28. <i>nana</i> , Sow. | 45. <i>subgranosa</i> , Beck. |
| 11. <i>caudata</i> , Say. | 29. <i>neglecta</i> , id. | 46. <i>triquetra</i> , Reeve. |
| 12. <i>coriacea</i> , Reeve. | 30. <i>nitida</i> , Brod. | 47. <i>tuberculata</i> , Brod. |
| 13. <i>crassa</i> , Desh. | 31. <i>nobilis</i> , Reeve. | 48. <i>tuberosissima</i> , Reeve. |
| 14. <i>cruentata</i> , Sow. | 32. <i>pectinata</i> , Hinds. | 49. <i>ventricosa</i> , Brod. |
| 15. <i>crumena</i> , Lam. | 33. <i>plicata</i> , Reeve. | 50. <i>venustula</i> , Reeve. |
| 16. <i>cuspidata</i> , Reeve. | 34. <i>ponderosa</i> , id. | 51. <i>verrucosa</i> , Sow. |
| 17. <i>elegans</i> , Beck. | 35. <i>pulchra</i> , Gray. | 52. <i>vexillum</i> , id. |
| 18. <i>foliata</i> , Brod. | | |

Figure.

RANELLA FOLIATA. Plate 9. Fig. 44.—Shell showing the continuous arrangement of the varices from the apex downwards on either side.—
From Mr. Cuming's collection.

Genus 3. MUREX, *Linnæus.*

Animal; similar to that of Triton.

Shell; ovate or oblong, generally pyriform, or more or less fusiform, spire somewhat angularly turreted; whorls slightly ventricose, varicose, varices three or more on a whorl, variously ornamented with branched foliated or spinous fronds; columella smooth, arched, ending in a canal which is sometimes very short and recurved, sometimes very long and tubulous; aperture nearly orbicular, outer lip generally denticulated or crenated, and sometimes armed with an erect prominent tooth. Operculum horny.

Though somewhat numerous in species, the genus *Murex*, in its present limited acceptation, retains few originally referred to it by its founder. After being freely dismembered by Bruguière and Lamarck for the genera *Cerithium*, *Turbinella*, *Fusus*, *Fasciolaria*, *Pleurotomaria*, *Cancellaria* and *Pyrula*, there yet remained an extensive series to be distinguished according to their varieties of varicose growth in the manner described under the genera *Triton* and *Ranella*, and of these the largest proportion of species falls to the present genus, because it includes all those whose shell is characterized by the presence of more than two varices on a whorl.

The number of varices displayed, by what may be termed the typical species of the genus is three, imparting a triangular structure to the shell, which has been likened to the calthrop of the ancients; an instrument of war which was scattered on the field of battle for the purpose of wounding the enemies' horse*.

Beyond the number of three, the varices are irregular, following each other in such rapid succession as almost to lose their distinctive character; the genus now merges into *Fusus*, and it is at this point of contact that many synomyms have arisen, on account of the differences of opinion as to which of the two genera, a species should be referred.

The *Murices* are greatly distinguished by the beautiful varieties of structure which are developed on the varices, presenting in some species most elaborate leaf-like fronds, in others a succession of fimbriated laminæ, in others a row of long tubular spines: these variations of ornamental growth serve as characters for the subdivision of the genus. The profuse enamelling of the aperture is also striking, exhibiting colours in that purity and brightness which no effort of the pencil can imitate.

* The calthrop was a small three-sided weapon with a row of sharp spikes down each angle, such as is represented in the structure of the three-varicose *Murex*; discharged over the enemy's quarters, upon whatever side it fell, a row of spikes would be uppermost.

It is stated in a former page of this work, that the Romans obtained their celebrated dye, from the expressed juice of the *Murex trunculus*, inhabiting the Mediterranean and shores of Tyre; the *Murex brandaris* seems also to have been called into requisition for this purpose, and M. Deshayes attempts to show that remains of this species, in consolidated heaps, are still to be found on the coast, denoting ancient stations for the extraction of purple.*

The genus *Murex* includes many species of more or less rarity; of these the *M. bipinnatus* and *clarus* are distinguished by an elongated peculiarity of growth different from that of any other kind; the *M. spinicostata* is a species of rare occurrence in fine condition; the *M. monodou* remarkable on account of the elegantly prolonged curvature of the fronds. The *M. alabaster* of which only a single specimen has been seen, is a huge curiosity of its kind and forms a striking contrast, in comparison with the refined disposition of sculpture in the *M. fenestratus*; the *M. Stainforthii* must not be omitted in this category of rarities, nor the *M. crispatus*, both of which species are equally distinguished for the peculiar and manifold beauty of the fronds. Among the canalculated species the *M. trigonulus*, *elegans* and *motacilla* are worthy of notice; the *M. Zelandicus*, *florifer*, *rubridentatus*, *territus* and *eurypteron* are of diversified beauty and interest; whilst among the smaller gems of the genus may be enumerated the *M. hexagonus*, *mactropteron*, *Norrisii*, *gravidus*, *octogonus*, *cirrosus*, and a few others.

The *Murices* are very generally distributed throughout the regions of animal life; they are represented on our own shores by the *M. erinaceus* and in the Mediterranean by one or two small species in addition to those just spoken of; in California by the magnificent *M. erythrostoma*, and in Panama by the *M. regius* whose meretricious glow of colours and elaborate structure have long rendered it an object of attraction to the amateur. In the Eastern Seas we find the noble *M. ramosus* and *saxatilis* in abundance, with numerous other species, among which the well-known ‘Venus’s comb’ *M. tenuispina*, in which all deficiency of beauty in colour is so fully compensated by the delicacy and extraordinary character of its structure.

The following list of species are described and illustrated in the ‘*Conchologia Iconica*’.

* “Numerous dissertations upon the Purple of the ancients have served to show that the colour the most esteemed was obtained from the *Murex brandaris*. Rondelet was the first to hold this opinion, and it has been singularly confirmed in recent times by the researches of our learned friend M. Boblaye. Forming part of the scientific expedition to the Morea, he was astonished to find, in places not very remote from the sea, considerable heaps of the remains of this single species, *Murex brandaris*; he at first regarded them as evidences of some geological phenomenon, but upon a careful examination of the places and accompanying circumstances, he discovered that these depots of fragments of shell were always situated in the vicinity of some ancient ruins, among which sufficient vestiges were to be found of their having been formerly stations for the manufacture of Purple”.—*Anim. sans, vert. v. ix. p. 550.*

Species.

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| 1. acanthopterus, <i>Lam.</i> | 47. crocatus, <i>Reeve.</i> |
| 2. aculeatus, <i>id.</i> | 48. cyclostoma, <i>Sow.</i> |
| 3. adunco-spinosus, <i>Beck.</i> | 49. decussatus, <i>Reeve.</i> |
| 4. adustus, <i>Lam.</i> | 50. digitatus, <i>Sow.</i> |
| 5. affinis, <i>Reeve.</i> | 51. dipsacus, <i>Brod.</i> |
| 6. alabaster, <i>Reeve.</i> | 52. distinctus, <i>Christ.</i> |
| 7. alveatus, <i>Kiener.</i> | 53. dubius, <i>Sow.</i> |
| 8. ambiguus, <i>Reeve.</i> | 54. Edwardsii, <i>Menke.</i> |
| 9. angularis, <i>Lam.</i> | 55. elegans, <i>Beck.</i> |
| 10. anguliferus, <i>id.</i> | 56. elongatus, <i>Lam.</i> |
| 11. axicornis, <i>id.</i> | 57. emarginatus, <i>Sow.</i> |
| 12. badius, <i>Reeve.</i> | 58. endivia, <i>Lam.</i> |
| 13. bæticus, <i>id.</i> | 59. erinaceus, <i>Linn.</i> |
| 14. balteatus, <i>Beck.</i> | 60. erosus, <i>Brod.</i> |
| 15. Banksii, <i>Sow.</i> | 61. eurypteron, <i>Reeve.</i> |
| 16. bellus, <i>Reeve.</i> | 62. falcatus, <i>Sow.</i> |
| 17. bicolor, <i>Valen.</i> | 63. fasciatus, <i>id.</i> |
| 18. bipinnatus, <i>Reeve.</i> | 64. fenestratus, <i>Chemn.</i> |
| 19. Blainvillii, <i>Payraud.</i> | 65. festivus, <i>Hinds.</i> |
| 20. borealis, <i>Reeve.</i> | 66. fiscellum, <i>Chemn.</i> |
| 21. brandaris, <i>Linn.</i> | 67. florifer, <i>Reeve.</i> |
| 22. brassica, <i>Lam.</i> | 68. foliatus, <i>Gmelin.</i> |
| 23. brevispina, <i>Lam.</i> | 69. foveolatus, <i>Hinds.</i> |
| 24. buxeus, <i>Brod.</i> | 70. funiculatus, <i>Reeve.</i> |
| 25. calcar, <i>Kiener.</i> | 71. Gambiensis, <i>id.</i> |
| 26. calcitrapa, <i>Lam.</i> | 72. gravidus, <i>Hinds.</i> |
| 27. Californicus, <i>Hinds.</i> | 73. gyratus (<i>Trophon</i>), <i>H.</i> |
| 28. caliginosus, <i>Reeve.</i> | 74. hamatus, <i>Hinds.</i> |
| 29. cancellatus, <i>Sow.</i> | 75. haustellum, <i>Linn.</i> |
| 30. Capensis, <i>id.</i> | 76. hemitripterus, <i>Lam.</i> |
| 31. Capucinus, <i>Chemn.</i> | 77. hexagonus, <i>id.</i> |
| 32. carduus, <i>Brod.</i> | 78. horridus, <i>Brod.</i> |
| 33. cariniferus (<i>Fusus</i>), <i>So.</i> | 79. humilius, <i>id.</i> |
| 34. centrifuga, <i>Hinds.</i> | 80. imperialis, <i>Swain.</i> |
| 35. cervicornis, <i>Lam.</i> | 81. incisus, <i>Brod.</i> |
| 36. chrysostoma, <i>Gray.</i> | 82. inconspicuus, <i>Sow.</i> |
| 37. cirrosus, <i>Hinds.</i> | 83. inermis, <i>id.</i> |
| 38. clathratus, <i>Reeve.</i> | 84. Kieneri, <i>Reeve.</i> |
| 39. clavus, <i>Kiener.</i> | 85. laciniatus, <i>Sow.</i> |
| 40. concinnus, <i>Reeve.</i> | 86. laminiferus, <i>Reeve.</i> |
| 41. cornutus, <i>Linn.</i> | 87. lappa, <i>Brod.</i> |
| 42. corrugatus, <i>Sow.</i> | 88. laqueatus, <i>Sow.</i> |
| 43. crassilabrum, <i>Gray.</i> | 89. lepidus, <i>Reeve.</i> |
| 44. crassivaricosa, <i>Reeve.</i> | 90. lingua-vervecina, <i>Ch.</i> |
| 45. crispus, <i>Brod.</i> | 91. luculentus, <i>Reeve.</i> |
| 46. cristatus, <i>Brocchi.</i> | 92. lugubris, <i>Brod.</i> |
| | 93. macropteron, <i>Desh.</i> |
| | 94. maculatus, <i>Reeve.</i> |
| | 95. margariticola, <i>Brod.</i> |
| | 96. Martinianus, <i>Reeve.</i> |
| | 97. maurus, <i>Brod.</i> |
| | 98. megacerus, <i>Sow.</i> |
| | 99. melanomathos, <i>Gme.</i> |
| | 100. messorius, <i>Sow.</i> |
| | 101. microphyllus, <i>Lam.</i> |
| | 102. Mindanensis, <i>Sow.</i> |
| | 103. Monoceros, <i>Sow.</i> |
| | 104. monodon, <i>Sow.</i> |
| | 105. motacilla, <i>Chemn.</i> <i>H.</i> |
| | 106. mundus, <i>Reeve.</i> |
| | 107. muricatus (<i>Trop.</i>). |
| | 108. nigrescens, <i>Sow.</i> |
| | 109. nigrispinosus, <i>Reeve.</i> |
| | 110. nigritus, <i>Phil.</i> |
| | 111. nitidus, <i>Brod.</i> |
| | 112. nodatus, <i>Reeve.</i> |
| | 113. noduliferus, <i>Sow.</i> |
| | 114. Norrisii, <i>Reeve.</i> |
| | 115. nucula, <i>id.</i> |
| | 116. nux, <i>id.</i> |
| | 117. occa, <i>Sow.</i> |
| | 118. octogonus, <i>Quoy.</i> |
| | 119. oculatus, <i>Reeve.</i> |
| | 120. osseus, <i>id.</i> |
| | 121. oxyacantha, <i>Brod.</i> |
| | 122. palma-rosea, <i>Lam.</i> |
| | 123. palmiferus, <i>Sow.</i> |
| | 124. pellucidus, <i>Reeve.</i> |
| | 125. peritus, <i>Hinds.</i> |
| | 126. phyllopterus, <i>Lam.</i> |
| | 127. pinnatus, <i>Wood.</i> |
| | 128. pinniger, <i>Brod.</i> |
| | 129. pistacia, <i>Reeve.</i> |
| | 130. plamiliratus, <i>id.</i> |
| | 131. Pleurotomoides, <i>id.</i> |
| | 132. pliciferus, <i>Sow.</i> |
| | 133. polygonulus, <i>Lam.</i> |
| | 134. pomum, <i>Gmelin.</i> |
| | 135. princeps, <i>Brod.</i> |
| | 136. pudicus, <i>Reeve.</i> |
| | 137. pudoricolor, <i>id.</i> |
| | 138. Purpura, <i>Chemn.</i> |

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| 139. purpuratus, <i>Reeve.</i> | 156. <i>Sauliae, Sow.</i> | 173. <i>torosus, Lam.</i> |
| 140. <i>Purpuroides, Dunk.</i> | 157. <i>saxatilis, Linn.</i> | 174. <i>torrefactus, Sow.</i> |
| 141. <i>radicatus, Hinds.</i> | 158. <i>scolopax, Dillwyn.</i> | 175. <i>tribulus, Linn.</i> |
| 142. <i>radix, Gmelin.</i> | 159. <i>scorpio, Linn.</i> | 176. <i>triformis, Reeve.</i> |
| 143. <i>ramosus, Linn.</i> | 160. <i>secundus, Lam.</i> | 177. <i>trigonulus, Lam.</i> |
| 144. <i>rarispina, Lam.</i> | 161. <i>Senegalensis, Gmelin.</i> | 178. <i>trilineatus, Reeve</i> |
| 145. <i>rectirostris, Sow.</i> | 162. <i>similis, Sow.</i> | 179. <i>tripterus, Born.</i> |
| 146. <i>recurvirostris, Brod.</i> | 163. <i>Sinensis, Reeve.</i> | 180. <i>triqueter, id.</i> |
| 147. <i>regius, Wood.</i> | 164. <i>spectrum, Reeve.</i> | 181. <i>trunculus, Linn.</i> |
| 148. <i>rosarium, Chemn.</i> | 165. <i>spinicostata, Valen.</i> | 182. <i>tumulosus, Sow.</i> |
| 149. <i>rota, Sow.</i> | 166. <i>squamulosus, (Fusus.)</i> | 183. <i>turbanatus, Lam.</i> |
| 150. <i>rubescens, Brod.</i> | 167. <i>Stainforthii, Reeve.</i> | 184. <i>uncinarius, Lam.</i> |
| 151. <i>rubiginosus, Reeve.</i> | 168. <i>Steeriæ, id.</i> | 185. <i>varicosus, Sow.</i> |
| 152. <i>rubridentatus, id.</i> | 169. <i>tenuispina, Lam.</i> | 186. <i>varius, Sow.</i> |
| 153. <i>rufus, Lam.</i> | 170. <i>ternispina, id.</i> | 187. <i>vibex, Brod.</i> |
| 154. <i>rusticus, Reeve.</i> | 171. <i>territus, Reeve.</i> | 188. <i>vittatus, id.</i> |
| 155. <i>salebrosus, King.</i> | 172. <i>tetragonus, Brod.</i> | 189. <i>Zelandicus, Quoy.</i> |

Figure.

MUREX FLORIFER. Plate 9. Fig. 42.—A new species, recently collected on the shores of Honduras by Mr. Dyson, in which the varices present a characteristic row of leaf-like fronds.—*From Mr. Cuming's collection.*

Genus 4. TYPHIS, *De Montford.*

Animal; unknown.

Shell; small, *Murex*-shaped, mostly trivaricose, with a hollow spouted tube protruding from the upper part of the whorl, in the centre of the area between the varices; spire rather short, sometimes elongated; columella smooth, aperture small, rounded. Operculum horny.

When treating of this singular group in the 'Conchologia Systematica' I inclined to believe with M. Deshayes that it was sufficient to regard it as a sectional division of the preceding genus; I now, however, appreciate the character by which the *Typhides* are distinguished, as one peculiarly generic, inasmuch as it is not the modification of a spine, nor has it an analogous representative in any other genus.

The shell of *Typhis* is similar in form and general aspect to that of *Murex*, but uniformly small; its peculiarity consists in having a more or less elongated spouted tube, in the centre of the area between the varices, in

place of the usual nodule or tubercle. This tube, it will be observed, is not the analogue of a spine; the spines which adorn the varices, so conspicuously developed in the *Murex tenuispina*, and others, being always open on one side, are no other than extreme modifications of scales or fronds, but the tube of *Typhis*, is always closed—the wall of it is entire—and it seems destined for some other purpose than that of ornament. It is a perfectly unique structure; in no other turbinated genus is the least analogy to be found, nor can I trace the gradation which M. Deshayes notices to exist between the tube of the *Typhis* and the spine of the *Murex*.

The genus *Typhis* was founded on a fossil species (*Murex tetrapterus*, Bronn.; *M. fistulosus*, Broc.; *M. pungens*, Band.) subsequently found living in the Mediterranean, described together with four other recent species by Mr. Broderip in 1832 *, of which two were collected by Mr. Cuming at Salango, West Columbia and the Bay of Caraccas, and one by Capt. Sir Edward Belcher at Cape Blanco, West Africa. Three species were then added to the genus, collected by the same illustrious traveller during the voyage of H.M.S. Sulphur, in localities very remote from each other; one was found in from seven to eighteen fathoms water in the Gulf of Nicoya and Bay of Guayaquil, the second was dredged on the l'Agulhas Bank, Cape of Good Hope, at a depth of upwards of fifty fathoms, and the third, the smallest of the series, was found among gravel and coral, in eighteen fathoms water at the straits of Macassar, Indian Archipelago.

Species.

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| 1. <i>arcuatus</i> , <i>Hinds.</i> | 4. <i>Cumingii</i> , <i>Brod.</i> | 7. <i>pinnatus</i> , <i>Brod.</i> |
| 2. <i>Belcheri</i> , <i>Brod.</i> | 5. <i>Sowerbii</i> , <i>Brod.</i> | 8. <i>quadratus</i> , <i>Hinds.</i> |
| 3. <i>coronatus</i> , <i>Brod.</i> | 6. <i>nitens</i> , <i>Hinds.</i> | |

Figure.

TYPHIS SOWERBII. Plate 12. Fig. 54.—Shell showing the spout-like tubes issuing from between the varices.—*From Mr. Cuming's collection.*

* "De Montfort, after referring to *Murex pungens*, Bander, as the type of this genus, adds 'La coquille qui nous sert de type pour l'établissement de ce genre n'est encore bien connue qu'à l'état fossile; quoique Bruguière dise très positivement que son analogue marin existoit à Londres dans le cabinet du Docteur Hunter, fait que malheureusement nous ne pouvons point vérifier, mais qui cependant nous devons adopter d'après les profondes connaissances et la perspicacité qui distinguent si éminemment ce conchyliologue françois'. In the *Dictionnaire des Sciences Naturelles* the statement of Bruguière is noticed; but M. Blainville observes, that he was not fortunate enough to find the shell. I have examined the Hunterian Collection in London, with the assistance of Mr. Clift and Prof. Owen, with no better success. It may, perhaps, have been in the cabinet of Dr. William Hunter, now at Glasgow; but on consulting Captain Laskey's 'General Account of the Hunterian Museum' there, I find no mention of the shell".—W. J. B.

Genus 5. PYRULA, Lamarck.

Animal; similar to that of Triton and Murex.

Shell; somewhat pyriform, spire sometimes exserted, sometimes flatly depressed; columella smooth, canal more or less elongated; lip simple, interior of the aperture sometimes smooth, sometimes radiately ridged or striated. Operculum horny.

The *Pyrulae* were separated from the genus *Fusus* of Bruguière, with little to distinguish them beyond their pear-shaped peculiarity of form, which is certainly characteristic in the typical species; there are, however, many inseparable from these which lead to the confines of the group, and so to *Fusus* by a continuity of character almost imperceptible. The *P. pugilina* and *cochlidium* so nearly allied, even in respect to species, were referred by Lamarck, one to *Pyrula* the other to *Fusus*; the *P. carica*, *canaliculata* and *spirata*, on the other hand, are very peculiar in form, and ought, without doubt, to be distinguished from any of the proximate genera; whilst the *P. papryacea* and *Mawæ* form a division of the group allied to *Purpura* by their very close relation with the *P. galea* and *Scalariformis*.

One division of the Lamarckian *Pyrulae*, commonly known as the 'Figs', has been distinguished as a genus by Swainson under the name of *Ficula*, and the propriety of this change has been recently confirmed by the discovery of the living animal, which proves to be allied rather to *Harpa* and *Dolinum*, and ought properly to have been included in the same family.

The *Pyrulae* thus restricted are somewhat limited in number; they inhabit chiefly the Eastern Seas, with one or two from Mexico, the West Indies, California and the United States.

Species.

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| 1. anomala, Reeve. | 11. corona (<i>Murex</i>), Gmel. | 21. patula, Brod. and Sow. |
| 2. araua (<i>Murex</i>), Linn. | 12. elongata, Lamarck. | 22. perversa, Lamarck. |
| 3. Belcheri (<i>Mur.</i>), Hinds. | 13. galeodes, Lamarck. | 23. pugilina (<i>Murex</i>), Brn. |
| 4. bezoar (<i>Buc.</i>), Linn. | 14. lactea, Reeve. | 24. spirata, Lamarck. |
| 5. bispinosa, Philippi. | 15. lignaria, Reeve. | 25. spirillus (<i>Murex</i>), Lin. |
| 6. bucephala, Lamarck. | 16. lineata, Lam. | 26. rapa, (<i>Bulla</i>), Linn. |
| 7. bulbosa (<i>Murex</i>), Solan. | 17. Mawæ, Gray. | 27. subrostrata, Gray. |
| 8. canaliculata (<i>Murex</i>), L. | 18. melongena (<i>Murex</i>), L. | 28. Ternatana (<i>Murex</i>) Gm. |
| 9. clavella, Reeve. | 19. morio (<i>Murex</i>), Linn. | 29. tuba (<i>Murex</i>); Gmelin. |
| 10. cochlidium (<i>Murex</i>), L. | 20. Paradisiaca, Reeve. | |

Figure.

PYRULA MAWÆ. Pl. 9. Fig. 41. Shell showing the aperture, smooth columella, and large umbilicus.—*From Mr. Cuming's collection.*

Genus 6. *FICULA*, *Swainson.*

Animal; *disk oblong, attenuated posteriorly, rounded in front, with a small acuminate lobe on each side; no operculum; head small, with two small cylindrical tentacles more or less exserted, beneath the base of which on each side is situated the eye, sessile; proboscis capable of considerable elongation; mantle much dilated, expanded throughout the canal, and over all that portion of the body whorl of the shell forming the boundary of the aperture.*

Shell; *pyriform or fig-shaped, light and ventricose, widely channelled at the base, channel more or less prolonged, spire very short; columella slight; aperture large, extending posteriorly to the spire; lip thin, entire.*

The Lamarckian species of *Pyrula*, commonly known as ‘The Figs’, were first distinguished as a genus by Mr. Swainson in his ‘Malacology’, a volume of ‘Lardner’s Cyclopaedia’; founded, not, however, upon any knowledge of the soft parts, but upon the uniform generic affinity of the shells. Only four species are known, and three have been lately taken alive; the *F. ficoides* and *gracilis*, were collected by M. Rousseau, a zealous naturalist attached to the Jardin des Plantes, Paris, during a voyage to Madagascar and the Seychelle Islands, and the *F. lavigata*, was dredged together with the *F. ficoides*, by Mr. Arthur Adams, Assistant Surgeon, R.N., in the Sooloo Seas, during the recent voyage of H.M.S., Samarang.

The generic importance which Mr. Swainson attached to this limited group has been fully confirmed by the peculiarities of the animal; although a canaliculated shell, and so closely allied in form to the *Pyrulae carica*, *spirata* and others, as to induce Martini to distinguish them as subdivisions of a particular group, under the titles of the Light Figs, ‘*Fici tenuis*’, and the Heavy Figs, ‘*Fici ponderosi*’, the animal approaches rather to *Dolium* and *Harpa*, having an elongated proboscis and the same rounded lobate structure of the front portion of the disc.

The *F. gracilis* and *ficoides* have been beautifully illustrated by M. Rousseau under the new generic name *Ficus*, in M. Chenu’s handsome publication, ‘Illustrations Conchyliologiques’; the tentacles are partially

withdrawn, and the disc and mantle somewhat contracted, but the species are represented in an excellent manner *. Mr. Adams possesses a drawing of the *F. laevigata*, taken from the living animal, which will probably appear in the 'Zoology of the Voyage of H.M.S., Samarang'; in the mean time he has kindly furnished me with the following from his note-book:—

"The *Ficula* is a very lively animal when observed in its native element, crawling along with considerable velocity, owing probably to the lightness of its shell, and able to ascend the sides of a glass vessel with facility. The disc is very extensive and not provided with an operculum; it is broad and rounded in front, and acuminate behind, the mantle is thin and expands into two lateral lobes covering a great portion of the sides of the shell, and much more, in the water, than is represented in the handsome figures of M. Rousseau. The proboscis is rarely exserted when the animal is in motion, but the long tapering tentacles are stretched out to their full extent; the eyes are rather large and black."

"In the species I observed (*Ficula laevigata*, Reeve,) the mantle was bright pink, mottled with white and lighter pink; the under surface of the disc was of a dark chocolate colour with yellow scattered spots; the head and neck were pink, and also covered with yellow spots. The specimen was dredged from thirty-five fathoms in the Sooloo Sea."

For figures and a critical analysis of the species, I must refer the reader to the Monograph *Ficula*, in the 'CONCHOLOGIA ICONICA'.

Species.

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| 1. decussata (<i>Bulla.</i>), Wood. | 3. gracilis (<i>Pyrula.</i>), Sowerby. |
| 2. ficoides (<i>Pyrula.</i>), Lamarck. | 4. laevigata, Reeve. |
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Genus 7. CANCELLARIA, Lamarck.

Animal; disc oblong, thin, flattened, slightly truncated anteriorly and extending a little beyond the head; head very large and flat forming the segment of a circle at each corner of the extremity of which rises a slim elongated conical tentacle; eyes situated on the outer side of these at the base where they are a little exserted; proboscis none? Operculum none.

* The term *Ficus* was used by Martini as a common appellative, not in accordance with the prescribed form of nomenclature; it is moreover open to objection in consequence of its being pre-occupied in Botany to distinguish the genus of Figs.

Shell; oval, diversely ribbed and reticulated on the outside, the last whorl being somewhat ventricose and often forming a large umbilicus; columella more or less strongly plaited, ending in a short, sometimes posteriorly recurved canal; aperture ovate or oblong, with the lip a little expanded and often reticulated.

This interesting genus so much appreciated by conchologists on account of the many interesting species added to it within the last few years, has elicited a variety of opinion in the determination of its character, and, consequently, the place which it should occupy in the system. The shell is mainly distinguished by its having the columella strongly plaited and in never being more than slightly channelled at the base. Linnaeus, and even Cuvier, arranged the *Cancellariae* on this account with the *Volutae* and *Mitres*; M. Deshayes, on the other hand, inclines to the opinion that they belong to the family *Plicacea*, consisting of the genera *Pyramidella* and *Tornatella*. To the former of these views it is impossible to assent, because the soft parts differ, whilst the plaited columella less strongly developed, appears throughout, to be rather a modification of the same character in *Turbinella*; in the latter, it is difficult to understand how such an affinity can exist between animals, whose shells afford so great a contrast in substance and structure as those of *Pyramidella* and *Cancellaria*, the one vitreous and polished, the other distinguished by great variety of highly relieved sculpture, and which seems to indicate the same carnivorous habits as the rest of the *Canalifera*. The greatest anomaly in the history of the *Cancellariae*, is that observed by M. Deshayes, of the *C. cancellata* being a vegetable feeder, and it only remains to be seen whether this is the habit of the genus *.

The shell referred to this genus by Lamarck, under the name *C. citharella*, has no plaits on the columella, and will be found to belong to the little group *Mangelia*, following next in order after *Pleurotoma*.

The *Cancellariae* are not of very common occurrence, and inhabit rather a wide range, they are found at Panama, Peru, China, Eastern Archipelago, &c., and their northern limit is in the Mediterranean.

* In order to determine the relation of this genus, it is necessary to become further acquainted with the animal; M. M. Quoy and Gaimard have given a figure of one species, and I have myself had the opportunity of observing another, that which is so abundantly distributed throughout the shores of the Mediterranean. This species differs in some respects from that described by the Zoologists of the 'Astrolabe', but we are unanimous on the subject of there being no operculum. The animal of *C. cancellata* crawls upon a disc almost as long as the shell, thin and flattened with the edge slightly truncated and passing a little beyond the head. The head is very large, flat, thin and sharp, forming the segment of a circle at each corner of the extremity of which rises a slim elongated conical tentacle; the eyes being situated on the outer side of these at the base, where they are slightly projected. I never observed the animal put forth any trunk; and, having found it invariably on marine plants, am disposed to think it nourishes itself by bruising them with a pair of horny jaws similar to those of other vegetable-feeding mollusks. It is very

Species.

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| 1. acuminata, <i>Sow.</i> | 25. crenifera, <i>Sow.</i> | 49. piscatoria, <i>id.</i> |
| 2. albida, <i>Hinds.</i> | 26. crispa, <i>id.</i> | 50. pulchra, <i>id.</i> |
| 3. antiquata, <i>id.</i> | 27. decussata, <i>Sow.</i> | 51. Purpuræformis, <i>Valen.</i> |
| 4. articulatis, <i>Sow.</i> | 28. elata, <i>Hinds.</i> | 52. pusilla, <i>Sow.</i> |
| 5. asperella, <i>Lam.</i> | 29. funiculata, <i>id.</i> | 53. reticulata, <i>Lam.</i> |
| 6. asperula, <i>Desh.</i> | 30. gemmulata, <i>Sow.</i> | 54. rigida, <i>Sow.</i> |
| 7. australis, <i>Sow.</i> | 31. goniostoma, <i>id.</i> | 55. rugosa, <i>Lam.</i> |
| 8. bicolor, <i>Hinds.</i> | 32. granosa, <i>id.</i> | 56. Scalariformis, <i>id.</i> |
| 9. bifasciata, <i>Desh.</i> | 33. hemastoma, <i>id.</i> | 57. scalarina, <i>id.</i> |
| 10. brevis, <i>Sow.</i> | 34. imperialis, <i>Mich.</i> | 58. scalata, <i>Sow.</i> |
| 11. Buccinoides, <i>id.</i> | 35. indentata, <i>Sow.</i> | 59. similis, <i>id.</i> |
| 12. bulbulus, <i>id.</i> | 36. lactea, <i>Desh.</i> | 60. solida, <i>id.</i> |
| 13. bullata, <i>id.</i> | 37. lamellosa, <i>Hinds.</i> | 61. Splengleriana, <i>Desh.</i> |
| 14. cancellata, <i>Lam.</i> | 38. laevigata, <i>Sow.</i> | 62. spirata, <i>Lam.</i> |
| 15. candida, <i>Sow.</i> | 39. Littorinaformis, <i>id.</i> | 63. tessellata, <i>Sow.</i> |
| 16. Cassidiformis, <i>id.</i> | 40. Mitræformis, <i>id.</i> | 64. textilis, <i>Kiener.</i> |
| 17. chrysostoma, <i>id.</i> | 41. multiplicata, <i>Less.</i> | 65. trigonostoma, <i>Desh.</i> |
| 18. clavatula, <i>id.</i> | 42. nassa, <i>Roissy.</i> | 66. Tritonis, <i>Sow.</i> |
| 19. contabulata, <i>id.</i> | 43. nodulifera, <i>Sow.</i> | 67. tuberculosa, <i>id.</i> |
| 20. corrugata, <i>Hinds.</i> | 44. nodulosa, <i>Lam.</i> | 68. uniplicata, <i>id.</i> |
| 21. costata, <i>Gray.</i> | 45. obesa, <i>Sow.</i> | 69. urceolaria, <i>Hinds.</i> |
| 22. costifera, <i>Sow.</i> | 46. obliquata, <i>Lam.</i> | 70. ventricosa, <i>id.</i> |
| 23. Courthouyi, <i>Jay.</i> | 47. obtusa, <i>Desh.</i> | 71. Verreauxii, <i>Kiener.</i> |
| 24. crenata, <i>Hinds.</i> | 48. ovata, <i>Sow.</i> | |

Figure.

CANCELLARIA TRITONIS. Pl. 10. Fig. 47. Shell showing the aperture and strongly plaited columella.—*From Mr. Cuming's collection.*

timid, and, retiring into its shell upon the least movement, re-appears cautiously: differing materially in its mode of progression from the *Buccina*, which exhibit more activity. With these characters the genus *Cancellaria* cannot be allowed to remain in the vicinity of the *Volute*s and *Mitres*; it is known that these are extremely voracious, being provided with a long trunk by the aid of which they attack and suck the juices of the animal selected for prey. Although the absence of an operculum is a negative character of some value, it is not one to be relied on; the *Tuns* and *Harps*, for example, are not provided with any operculum, whilst the *Helmets* and *Buccina*, to which they are intimately allied, are in no instance without one. Notwithstanding our knowledge of the animal of *Cancellaria*, therefore, the place which it should occupy in the system is still uncertain, nor can it be determined until we are more fully acquainted with its internal structure, its respiratory and organs of circulation; until, in short, a full comparison of its organization has been instituted. If, as I believe, the *Cancellariæ* feed only on vegetable matter, it is evident they can no longer be arranged with the *Fusi* and *Turbinellæ*; and it is not improbable that the opinion which I delivered some time since in the ‘Encyclopédie’—that the *Cancellariæ* approximate rather to Lamarek's family ‘Les *Plicacèes*’, will be found nearer the truth than any which has been adopted.—DESHAYES, *Anim. sans vert.* vol. ix. p. 399, 400.

Genus 8. PLEUROTONA, Lamarck.

Animal; "disc short, oval, thin at the margin, at the posterior extremity of which is placed a rather thick horny operculum, similar in most respects to that of *Buccinum*, and consequently not spiral, but terminating behind in a sharp point; head flattened, and from the angles protude two conical pointed tentacles at the base and outer side of which are two eyes; mantle similar to that of *Fusus*, excepting that it has an incision at the side corresponding to the slit in the shell."*

Shell; turreted, fusiform, spire acuminated; columella smooth, ending in a canal, which is sometimes straight and elongated, sometimes short and a little recurved; aperture small, lip simple, emarginated at or below its junction with the body whorl, with a sinus or deep fissure. Operculum horny, acuminated at the lower end.

The genus *Pleurotona* includes a very extensive group of mollusks, mostly small, in which the mantle is slit at the side in such a manner as to impart a corresponding character to the shell, and which may be said to be analogous to the slit in *Siliquaria*, the sinus in *Emarginula*, the foramen in *Haliotis*, &c. It is scarcely necessary to observe that the animal of *Pleurotona* has no affinity with these genera, but is, on the other hand, closely allied to *Fusus* and other *Canalifera*, in which no indication of this character is to be found. The incision in the mantle, which occurs also in *Conus* and in some species of *Melania*, does not therefore seem to be a character of so much generic importance in *Pleurotona*, as the turreted fusiform growth of the shell, by which it is allied to the proximate genera.

The shells of *Pleurotona*, like those of *Turbinella*, have the canal sometimes straight and elongated, sometimes short and recurved, and the species exhibit great variety of sculpture. They are very numerous, widely distributed both in the eastern and western hemispheres, and dwell in comparatively deep water.

Species.

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| 1. abbreviata, <i>Reeve.</i> | 5. æruginosa, <i>id.</i> | 9. albicans (<i>Clav.</i>), <i>Hinds.</i> |
| 2. abyssicola, <i>Forbes.</i> | 6. affinis, <i>Gray.</i> | 10. albicostata, <i>Sow.</i> |
| 3. Ægeensis, <i>id.</i> | 7. alabaster, <i>Reeve.</i> | 11. albifuniculata, <i>Reeve.</i> |
| 4. ægrota, <i>Reeve.</i> | 8. albibalteata, <i>id.</i> | 12. albina, <i>Lam.</i> |

* Deshayes, Anim. sans vert. vol. ix. p. 344.

13. albinodata, *Reeve.* 61. cedo-nulli, *Reeve.* 109. exasperata, *Reeve.*
 14. amabilis (*Clav.*), Hinds. 62. cincta, *Lam.* 110. excentrica, *Sow.*
 15. angicostata, *Reeve.* 63. cinerea (*Clav.*), H. 111. eximia, *Reeve.*
 16. angulifera, *id.* 64. cingulifera, *Lam.* 112. fascialis, *Lam.*
 17. annulata, *id.* 65. clara, *Reeve.* 113. felina, *Hinds.*
 18. apicata, *Gray.* 66. clathrata, *id.* 114. fenestrata, *Reeve.*
 19. aquatilis, *Reeve.* 67. clavata, *Sow.* 115. fimbriata (*Clav.*), H.
 20. arata, *id.* 68. clavulus, *id.* 116. flammea (*Clav.*), *id.*
 21. arctata, *id.* 69. coccinata, *Reeve.* 117. flavescentia, *Reeve.*
 22. arcuata, *id.* 70. collaris, *Sow.* 118. flavidia, *Lam.*
 23. argillacea (*Clav.*), Hds. 71. compta, *Reeve.* 119. Forbesii, *Reeve.*
 24. armillata, *Reeve.* 72. concentricostata, *id.* 120. foraminata, *id.*
 25. aspera (*Clav.*), Hinds. 73. conica, *Enc. Méth.* 121. formicaria, *Sow.*
 26. astricta, *Reeve.* 74. contracta, *Reeve.* 122. formosa, *Reeve.*
 27. aterrima, *Sow.* 75. cornea, *id.* 123. Forthiensis, *id.*
 28. attenuata (*Murex*), Mo. 76. corusca, *id.* 124. fortis, *Forbes.*
 29. aureola, *Reeve.* 77. costata, *Gray.* 125. foveolata, *Reeve.*
 30. auriculifera, *Lam.* 78. crassilabrum, *Reeve.* 126. fragilis, *id.*
 31. australis (*Murex*), Ch. 79. crebriplicata, *id.* 127. fucata, *id.*
 32. axis, *Reeve.* 80. crenularis, *Lam.* 128. fulminata, *Kiener.*
 33. Babylonica, (*Murex*), L. 81. crispa, *id.* 129. fulva (*Clav.*), Hinds.
 34. bætica, *Reeve.* 82. crispata, *Cristof.* 130. funiculata, *Valen.*
 35. Beckii, *id.* 83. crocata, *Reeve.* 131. fuscescens, *Gray.*
 36. bella (*Clav.*), Hinds. 84. cryptorraphe, *Sow.* 132. Fusoides, *Reeve.*
 37. bicanalifera, *Sow.* 85. Cumingii (*Buc.*), Pow. 133. Garnonsii, *id.*
 38. bicolor, *id.* 86. cuprea, *Reeve.* 134. gemmata, *Hinds.*
 39. bijubata, *Reeve.* 87. Cycladensis, *Forbes.* 135. gibbosa (*Murex*), Ch.
 40. bilineata, *id.* 88. dædala, *Reeve.* 136. glumacea (*Clav.*), H.
 41. bimarginata, *Lam.* 89. Daphnelloides, *id.* 137. gracilenta, *Reeve.*
 42. Boholensis, *Reeve.* 90. debilis (*Clav.*), Hin. 138. grandis, *Gray.*
 43. borealis, *id.* 91. decussata, *Macgil.* 139. granicostata, *Reeve.*
 44. brevicaudata, *id.* 92. delicata, *Reeve.* 140. granulosa, *Sow.*
 45. Buccinoides, *Lam.* 93. Delosensis, *id.* 141. Grayi, *Reeve.*
 46. caelata (*Clav.*), Hinds. 94. dentifera (*Clav.*), H. 142. gravis, *Hinds.*
 47. Cagayanensis, *Reeve.* 95. Deshayesii, *Doumet.* 143. Greenlandica, *Reeve.*
 48. callosa, *Valenc.* 96. diadema, *Kiener.* 144. Griffithii, *Gray.*
 49. canaliculata, *Reeve.* 97. digitale, *Reeve.* 145. Guildingii, *Reeve.*
 50. cancellata, *Gray.* 98. discors, *Sow.* 146. Harfordiana, *id.*
 51. candida (*Clav.*), Hinds. 99. donata (*Clav.*), Hinds. 147. harpularia, *D. Moul.*
 52. candidula, *Reeve.* 100. D'Orbignii, *Reeve.* 148. hastula, *Reeve.*
 53. cantharis, *id.* 101. Dorvilliae, *Gray.* 149. hexagona, *Sow.*
 54. carbonaria, *id.* 102. duplicata, *Sow.* 150. hexagonalis, *Reeve.*
 55. cardinalis, *id.* 103. Dysoni, *Reeve.* 151. Hindsii, *id.*
 56. carinata, *Gray.* 104. ebur, *id.* 152. Hondurasensis, *id.*
 57. casta (*Daphn.*), Hinds. 105. echinata, *Lam.* 153. hyalina, *id.*
 58. castanea, *Reeve.* 106. efficta, *Reeve.* 154. igniflua, *id.*
 59. catena, *id.* 107. ericea (*Clav.*), Hinds. 155. imperialis, *Lam.*
 60. cavernosa, *id.* 108. exarata, *Reeve.* 156. implicata, *Reeve.*

157. impressa (*Clav.*), H. 205. nebula (*Murex*), Mo. 253. pseudo-carinata, *Ree.*
 158. incisa, *Reeve.* 206. neglecta (*Clav.*), H. 254. pudica (*Clav.*), Hind.
 159. incrassata, *Sow.* 207. nixa, *Reeve.* 255. pulchella, *Reeve.*
 160. Indica, *Desh.* 208. nigerrima, *Sow.* 256. pulchra, *Gray.*
 161. inermis, *Hinds.* 209. nigrescens, *Gray.* 257. punctata, *Reeve.*
 162. inquinata, *Reeve.* 210. nitens (*Clav.*), Hinds. 258. puncticineta, *id.*
 163. interrupta, *Lam.* 211. nitida, *Kiener.* 259. purpurea, *De Blain.*
 164. Javana (*Murex*), Lin. 212. nodifera, *Lam.* 260. putillus, *Reeve.*
 165. jubata, *Hinds.* 213. Novae Zelandiae, *Ree.* 261. pyramidata, *Valen.*
 166. lactea, *Reeve.* 214. nux, *id.* 262. pyramidula, *Reeve.*
 167. lanceolata, *id.* 215. obeliscus, *id.* 263. pyramis (*Clav.*), H.
 168. languida, *id.* 216. obesa, *id.* 264. quadrata, *Reeve.*
 169. laqueata, *id.* 217. obesicostata, *id.* 265. quadrifasciata, *Gray.*
 170. læta (*Clav.*), Hinds. 218. obliquicostata, *id.* 266. quisqualis (*Clav.*), H.
 171. lævigata, *Philippi.* 219. obtusa, *id.* 267. Quoyi, *Des Moulins.*
 172. leucostoma, *Reeve.* 220. occata (*Clav.*), Hind. 268. radula, *Hinds.*
 173. Leufroyi, *Michaud.* 221. occidentalis, *Reeve.* 269. rava (*Clav.*), Hinds.
 174. linearis (*Murex*), M. 222. olivacea, *Sow.* 270. reflexa, *Reeve.*
 175. lineata, *Lam.* 223. olyra, *Reeve.* 271. regia, *Beck.*
 176. lineolata, *Gray.* 224. ornata (*Daphn.*), H. 272. regularis, *Reeve.*
 177. lirata, *Reeve.* 225. Owenii, *Gray.* 273. reticulata, *Bronn.*
 178. livida, (*Defran.*), Mö. 226. opalis, *Reeve.* 274. retusa (*Clav.*), Hind.
 179. Loeviana, *Forbes.* 227. oxytropis, *Sow.* 275. rigida (*Clav.*), *id.*
 180. luctuosa (*Clav.*), Hin. 228. pagodus, *Reeve.* 276. Rissoides, *Reeve.*
 181. luteo-fasciata, *Reeve.* 229. palliata, *id.* 277. robusta (*Clav.*), H.
 182. lutescens, *id.* 230. pallida, *Sow.* 278. rosacea, *Reeve.*
 183. Lyciaca, *Forbes.* 231. papalis, *Reeve.* 279. rosaria, *id.*
 184. Lymnæiformis, *Kie.* 232. papillaris (*Clav.*), H. 280. rosea, *Sow.*
 185. macrostoma, *Reeve.* 233. Paria, *Reeve.* 281. rubida (*Clav.*), H.
 186. maculosa, *Sow.* 234. pardalis (*Clav.*), Hi. 282. rubiginosa (*Clav.*), *id.*
 187. major, *Gray.* 235. partita (*Conopl.*), *id.* 283. rubinicolor, *Reeve.*
 188. margaritifera, *id.* 236. patula, *Reeve.* 284. rubricata, *id.*
 189. marmorata, *Lam.* 237. parvula, *id.* 285. rubrifasciata, *id.*
 190. maura, *Sow.* 238. paxillus, *id.* 286. rudis, *Sow.*
 191. merita (*Clav.*), Hind. 239. pentagonalis, *Gray.* 287. rugifera, *id.*
 192. Metcalfiana, *Reeve.* 240. pessulata, *Reeve.* 288. rugulatus (*Def.*), Mö.
 193. metula (*Clav.*), Hind. 241. pellis-phœœ, *id.* 289. rustica, *Sow.*
 194. micans (*Clav.*), *id.* 242. Perronii (*Murex*), Ch. 290. sacerdos, *Reeve.*
 195. militaris (*Clav.*), *id.* 243. Philberti, *Michaud.* 291. sacra, *id.*
 196. minuta, *Forbes.* 244. Philippensis, *Reeve.* 292. saturata, *id.*
 197. Mitræformis (*M.*), W. 245. pica, *id.* 293. scalaris (*Clav.*), H.
 198. Möllerii, *Reeve.* 246. picta, *Beck.* 294. scalpta, *Reeve.*
 199. monile, *Valen.* 247. planilabrum, *Reeve.* 295. scarabæus, *id.*
 200. mucronata, *Reeve.* 248. plumbea (*Clav.*), H. 296. sculpta (*Clav.*), H.
 201. multiplicata, *id.* 249. pluricarinata, *Reeve.* 297. semen, *Reeve.*
 202. muricata, *Lam.* 250. pluteata, *id.* 298. semicostata, *Kiener.*
 203. mystica, *Reeve.* 251. polita (*Clav.*), Hinds. 299. semigranosa, *Reeve.*
 204. Nassoides, *Gray.* 252. Polynesiensis, *Reeve.* 300. septangularis (*M.*), M.

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| 301. <i>sigillata</i> , <i>Reeve.</i> | 322. <i>teres</i> , <i>Forbes.</i> | 343. <i>unizonalis</i> , <i>Lam.</i> |
| 302. <i>Sinensis</i> (<i>Clav.</i>), <i>H.</i> | 323. <i>tessellata</i> (<i>Clav.</i>), <i>Hi.</i> | 344. <i>urnula</i> , <i>Reeve.</i> |
| 303. <i>sinistralis</i> , <i>Petit.</i> | 324. <i>Ticaonica</i> , <i>Reeve.</i> | 345. <i>ustulata</i> , <i>id.</i> |
| 304. <i>sinuosa</i> , <i>Gray.</i> | 325. <i>tigrina</i> , <i>Lam.</i> | 346. <i>Vahlii</i> (<i>Defr.</i>), <i>Möl.</i> |
| 305. <i>sordida</i> , <i>Reeve.</i> | 326. <i>tincta</i> , <i>Reeve.</i> | 347. <i>varicosa</i> , <i>Reeve.</i> |
| 306. <i>speciosa</i> , <i>id.</i> | 327. <i>tricarinata</i> , <i>Valen.</i> | 348. <i>varieulosa</i> , <i>Sow.</i> |
| 307. <i>spectabilis</i> , <i>id.</i> | 328. <i>trifasciata</i> , <i>Gray.</i> | 349. <i>variegata</i> , <i>Kiener.</i> |
| 308. <i>spectrum</i> , <i>id.</i> | 329. <i>triticea</i> , <i>Kiener.</i> | 350. <i>Vauquelini</i> , <i>Payrau.</i> |
| 309. <i>spicata</i> (<i>Clav.</i>), <i>Hin.</i> | 330. <i>Tritonoides</i> , <i>Reeve.</i> | 351. <i>vexillum</i> , <i>Reeve.</i> |
| 310. <i>spirata</i> , <i>Lam.</i> | 331. <i>tuberculata</i> , <i>Gray.</i> | 352. <i>venusta</i> , <i>id.</i> |
| 311. <i>splendidula</i> , <i>Sow.</i> | 332. <i>tuberculifera</i> , <i>Brod.</i> | 353. <i>vidua</i> , <i>id.</i> |
| 312. <i>spurca</i> (<i>Clav.</i>), <i>Hin.</i> | 333. <i>Turbinelloides</i> , <i>Reeve.</i> | 354. <i>violacea</i> , <i>Hinds.</i> |
| 313. <i>stolida</i> , <i>Hinds.</i> | 334. <i>turgida</i> , <i>Forbes.</i> | 355. <i>virginea</i> , <i>Beck.</i> |
| 314. <i>striata</i> , <i>Kiener.</i> | 335. <i>turricula</i> (<i>Murex</i>), <i>G.</i> | 356. <i>virgo</i> , <i>Lam.</i> |
| 315. <i>striolata</i> , <i>Scacchi.</i> | 336. <i>turris</i> , <i>Reeve.</i> | 357. <i>viridula</i> (<i>Defr.</i>), <i>Möl.</i> |
| 316. <i>Stromboides</i> , <i>Sow.</i> | 337. <i>umbilicata</i> (<i>Dril.</i>), <i>M.</i> | 358. <i>vitrea</i> , <i>Reeve.</i> |
| 317. <i>subula</i> , <i>Reeve.</i> | 338. <i>undaticostata</i> , <i>Reeve.</i> | 359. <i>vittata</i> , <i>id.</i> |
| 318. <i>suturalis</i> , <i>Bronn.</i> | 339. <i>undosa</i> , <i>Lam.</i> | 360. <i>vultuosa</i> , <i>id.</i> |
| 319. <i>symmetrica</i> , <i>Reeve.</i> | 340. <i>unedo</i> , <i>Valen.</i> | 361. <i>zebra</i> (<i>Buc.</i>), <i>Lam.</i> |
| 320. <i>taxus</i> (<i>Murex</i>), <i>Chem.</i> | 341. <i>unicolor</i> , <i>Sow.</i> | 362. <i>zonata</i> , <i>Gray.</i> |
| 321. <i>Tayloriana</i> , <i>Reeve.</i> | 342. <i>unimaculata</i> , <i>Sow.</i> | 363. <i>zonulata</i> , <i>Reeve.</i> |

Figure.

PLEUROTOMA CRYPTORRHAPHE. Pl. 11. Fig. 50. Shell showing the aperture and fissure in the lip.—*From Mr. Norris's collection.*

Genus 9. MANGELIA, Leach.

Animal; *undescribed.*

Shell; *Marginella-shaped or fusiform, mostly longitudinally ribbed, spire sometimes short, sometimes acuminately turrited; lip and columella very finely rugosely denticulated, lip thickened, slightly sinuated at the upper part; canal very short, more or less truncated.*

M. Deshayes passes a severe and somewhat merited reprimand upon M. Kiener, for having, in genus *Cancellaria* of his 'Iconographie,' which professes to illustrate the shells contained in the Lamarekian collection, omitted mention of the *C. citharella* of that illustrious author, notwithstanding the

authority "mon cabinet" attached to that species in the 'Animaux sans vertèbres.'* It would certainly have been desirable if M. Kiener had published his reasons for this omission, for they were probably founded on the discovery that the shell in question is not only no *Cancellaria* at all, but that it is not referable to any genus hitherto established. Mr. Sowerby had already intimated that this shell belongs to another genus; and M. Deshayes erroneously thinks, from Martini's figure, that it may be the young of *Strombus plicatus*.

This "*Fusus ad formam citharæ compositus*" of Martini, *Cancellaria citharella* of Lamarck, has been collected in various states by Mr. Cuming, at the Philippine Islands, together with upwards of fifty other closely allied species, the whole of which are new, and display a very striking association of character. In addition to these I have a new one from Australia, one from Sicily, some from the West Indies, collected by the Rev. Lansdowne Guilding, and five collected by Sir. E. Belcher, during the surveying expedition of the 'Sulphur,' described and figured by Mr. Hinds in the Zoology of that voyage; all of which have been published in the 'Conchologia Iconica,' under the head of *Mangelia*, a genus proposed some years since, in manuscript, by the late Dr. Leach of the British Museum, of which I find no published record.

The *Manglia* are nearest allied to those aberrant species of *Pleurotoma* in which the predominant character of that genus, the fissure in the upper extremity of the lip, becomes modified into a somewhat obscure sinus. Their general aspect is that of a more or less fusiform *Marginella* without plaits or polished exterior; distinguished, on the other hand, by a row of faint wrinkle-like denticulations on the inner surface of the lip and columella, and a gutter-like sinus in the lip, at its junction with the body-whorl, in a manner similar to that of the *Pleurotomæ* above referred to.

It is rarely an author has the pleasure of introducing a whole genus of seventy new species, but such is the opportunity which the indefatigable exertions of Mr. Cuming have afforded me, with the exception of the one included by Lamarck with the *Cancellariæ*, and the five published by Mr.

* "Il y a une autre coquille, la *Cancellaria citharella* de Lamarck, et dont M. Kiener ne parle pas dans sa *Monographie*. Une telle lacune est fâcheuse dans un ouvrage aussi spécialement consacré à l'illustration de la partie conchyliologique des animaux sans vertèbres. M. Sowerby suppose que cette coquille appartient à un autre genre, et si l'on s'en rapporte à la figure citée de Martini, elle ne serait en effet qu'un jeune Strombe. Il appartenait donc à M. Kiener d'éclairer la science à ce sujet."

And again, "M. Kiener nous laisse dans l'ignorance la plus complète à l'égard de cette espèce de Lamarck. Nous avons toujours cru que l'un des buts que se proposait l'auteur du *Species* des coquilles, était de donner des renseignements positifs sur les espèces de Lamarck, mises à sa disposition. En s'abstenant, M. Kiener ôte gratuitement à son ouvrage ce qui lui aurait donné le plus d'intérêt, non-seulement aux yeux des simples amateurs, qui tous consultent les travaux de Lamarck, mais aussi à ceux des personnes qui font de la science d'une manière sérieuse et qui recherchent avec avidité tout ce qui peut les éclairer sur les espèces de Lamarck. Cette *Cancellaria citharella*, d'après la figure de Martini, nous semble une jeune *Strombus plicatus* de Lamarck."—DESHAYES, *Animaux sans vertèbres*, vol. ix. p. 401 and 407.

Hinds in the 'Zoology of the Sulphur.' They were found by that eminent traveller under various circumstances, some on the reefs, some in concealed situations under stones, and some at depths varying from three to twenty-five fathoms.

Species.

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|---------------------------------------|--------------------------------|-----------------------------|
| 1. abyssicola, <i>Reeve.</i> | 25. Dysoni, <i>Reeve.</i> | 48. obesa, <i>Reeve.</i> |
| 2. angulata, <i>id.</i> | 26. elegans, <i>id.</i> | 49. oryza, <i>Hinds.</i> |
| 3. Antillarum, <i>id.</i> | 27. fasciata, <i>id.</i> | 50. pallida, <i>Reeve.</i> |
| 4. astricta, <i>id.</i> | 28. funebris, <i>id.</i> | 51. pellucida, <i>id.</i> |
| 5. badia, <i>id.</i> | 29. funiculata, <i>id.</i> | 52. pessulata, <i>id.</i> |
| 6. balteata, <i>id.</i> | 30. fusiformis, <i>id.</i> | 53. planilabrum, <i>id.</i> |
| 7. Bertrandi (<i>Pleur.</i>), Pa. | 31. gibbosa, <i>id.</i> | 54. ponderosa, <i>id.</i> |
| 8. bicolor, <i>Reeve.</i> | 32. Goodallii, <i>Gray.</i> | 55. pulchella, <i>id.</i> |
| 9. capillacea, <i>id.</i> | 33. gracilis, <i>Reeve.</i> | 56. pura, <i>id.</i> |
| 10. casta, <i>id.</i> | 34. Ginnannmia, <i>Risso.</i> | 57. pusilla, <i>id.</i> |
| 11. castanea, <i>id.</i> | 35. Hornbeckii, <i>Reeve.</i> | 58. pyramidalis, <i>id.</i> |
| 12. cavernosa, <i>id.</i> | 36. interrupta, <i>id.</i> | 59. reticulata, <i>id.</i> |
| 13. Celebensis, <i>Hinds.</i> | 37. lineata, <i>id.</i> | 60. rigida, <i>id.</i> |
| 14. cincta, <i>Reeve.</i> | 38. lamellata, <i>id.</i> | 61. Sieula, <i>id.</i> |
| 15. cinnamomea, <i>Hinds.</i> | 39. livida, <i>id.</i> | 62. solida, <i>id.</i> |
| 16. citharella (<i>Cancel.</i>), L. | 40. lyra, <i>id.</i> | 63. Stromboides, <i>id.</i> |
| 17. Columbelloides, <i>Reeve.</i> | 41. lyrica, <i>id.</i> | 64. tæniata, <i>id.</i> |
| 18. Coniformis, <i>Gray.</i> | 42. maculata, <i>id.</i> | 65. tenebrosa, <i>id.</i> |
| 19. Conohelicoides, <i>Reeve.</i> | 43. Marginelloides, <i>id.</i> | 66. turricula, <i>id.</i> |
| 20. coronata, <i>Hinds.</i> | 44. marmorosa, <i>id.</i> | 67. vittata, <i>Hinds.</i> |
| 21. crassilabrum, <i>Reeve.</i> | 45. nana, <i>id.</i> | 68. vexillum, <i>Reeve.</i> |
| 22. cylindracea, <i>id.</i> | 46. Novæ-Hollandiæ, <i>id.</i> | 69. Zebuensis, <i>id.</i> |
| 23. derelicta, <i>id.</i> | 47. obeliscus, <i>id.</i> | 70. zonata, <i>id.</i> |
| 24. digitale, <i>id.</i> | | |

Figure.

MANGELIA MARGINELLOIDES. Pl. 11. Fig. 52. Shell showing both back and front views.—*From Mr. Cuming's collection.*

Genus 10. FUSUS, Lamarck.

Animal; disk somewhat square and comparatively small, usually furnished with a horny operculum acuminated towards the head; head very small, with two tentacles of moderate length in which the eyes are placed, sometimes at the base, sometimes towards the middle.

Shell; ovately or elongately fusiform, nerves varicose, canalicated at the base, canal sometimes very short; columella smooth; lip of the aperture generally denticulated.

It is a feature in the canaliferous tribe of mollusks that a much greater variety of character for the formation of genera is presented in the shell than in the animal, and the same may be observed in regard to species. The soft parts of *Fusus* differ in no material degree from those of *Murex*, *Triton*, or *Pleurotoma*, the disk, head, and tentacles having the same general proportions, whilst the operculum of each is acuminated anteriorly in like manner; and in the present genus, though one species may have a long turriculated shell, as in the *F. longissimus*, and another an ovate abbreviated shell, like that of *F. despectus*, there is no particular variation in the animal except in regard to bulk.*

The genus *Fusus* has, on this account, been considered of somewhat doubtful importance; the knowledge of this similitude in the animal has even elicited a sort of negative argument in favour of its abandonment, that might be applied with equal force to any group in the series. "Take away the columellar plaits from the greater portion of the *Turbinella*," says M. Deshayes in the work quoted below, "and you make *Fusi* of them; deprive the *Tritons* of their varices, and they become *Fusi*;" it must, however, be remembered, that the genera of this class, though systematically characterised by the presence or arrangement of the columellar plaits, are further distinguished, each by a distinct association of peculiarities. It needs no examination of the varices to distinguish a *Murex* from a *Triton* or *Ranella*, and still less of the columellar plaits, to discriminate between the solid tuberculated *Turbinellus* and the comparatively delicately nodulous *Fusus*. The typical difference in the shells of *Turbinellus* and *Fusus*, apart from any consideration of the soft parts, must strike every observer; and it

* M. Deshayes inclines to think, from observations he has had an opportunity of making on the living *Fusus*, that there is a difference in the position of the eyes corresponding to these divisions. "If the animals of a larger number of species were known," says that acute observer, "it is probable that the situation of the eyes would afford a character for the distinction of two natural groups, for it may be remarked that in those species which have a narrow elongated canal the eyes are at the base of the tentacles, but in the ovate short-canal species they are upon the middle."—*Anim. sans. vert.* vol. ix. p. 442.

seems natural to conclude that the animal of the former must be of a much more sluggish habit and muscular growth than that of the latter. The *Fasciolariae*, again, are peculiar in their size and appearance, and may be identified by their style of painting, the striae of the aperture for example, as if there were some curious concordance in the distribution of the colouring matter from the calcifying glands of the mantle.

If any subdivision of the genus *Fusus* be admitted, it may be made in favour of that group which includes the *F. despectus*, *antiquus*, and *fornicatus*; these do not, however, appear to have that close affinity with the common Whelk of our shores, *Buccinum undatum*, as observed by Muller, who has brought them together into his genus *Tritonium*. The *F. Nifat*, *buccinatus*, and *aculeiformis* have also a character peculiar to them.

The long Spindle-shaped *Fusi* are of an exceedingly graceful and delicate structure, and this, it may be presumed, the great Author of their existence intended should compensate for the absence of bright colours or variety of sculpture; all being merely more or less tinged with rust-brown, and strongly or faintly keeled and nodulous. One Spindle-shaped species is nevertheless distinguished as an exception by the pre-eminent beauty of its structure, in having each whorl surmounted by a diadem of erect, compressed scales.*

The elongated *Fusi* are principally from the Eastern Seas, China, and New Holland; the ovate species are from a colder region, and mostly European.

Species.

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|------------------------------------|---|--|
| 1. acus, <i>Adams & Reeve.</i> | 17. candelabrum, <i>A. & R.</i> | 33. deformis, <i>Reeve.</i> |
| 2. Afer, <i>Lam.</i> | 18. cinereus, <i>Say.</i> | 34. despectus, <i>Lam.</i> |
| 3. alternatus, <i>Phil.</i> | 19. cinnamomeus, <i>Reeve.</i> | 35. dilatatus, <i>Quoy & Gaim.</i> |
| 4. angulatus, <i>Gray.</i> | 20. clathratus, <i>id.</i> | 36. distans, <i>Lam.</i> |
| 5. antiquus, <i>Lam.</i> | 21. clausicaudatus, <i>Hinds.</i> | 37. Dupetit-Thouarsii, <i>Kie.</i> |
| 6. aureus, <i>Reeve.</i> | 22. colosseus, <i>Lam.</i> | 38. exilis, <i>Menke.</i> |
| 7. australis, <i>Quoy.</i> | 23. colus, <i>id.</i> | 39. ficula, <i>Reeve.</i> |
| 8. Bamflius, <i>Brown.</i> | 24. contrarius, <i>id.</i> | 40. Fontainci, <i>D'Orb.</i> |
| 9. Beckii, <i>Reeve.</i> | 25. corallinus (<i>Mur.</i>) <i>Scac.</i> | 41. fornicatus, <i>Gray.</i> |
| 10. Blainvillii, <i>Marav.</i> | 26. corneus, <i>Desh.</i> | 42. fragosus, <i>Reeve.</i> |
| 11. Blosvillei, <i>Desh.</i> | 27. costatus, <i>Pennant.</i> | 43. funiculatus, <i>Lesson.</i> |
| 12. brevicaudata, <i>id.</i> | 28. craticulatus, <i>De Blain.</i> | 44. Geversianus, <i>Desh.</i> |
| 13. buxeus, <i>Reeve.</i> | 29. crebricostatus, <i>Lam.</i> | 45. gradatus, <i>Reeve.</i> |
| 14. cælatus, <i>id.</i> | 30. crebriliratus, <i>Reeve.</i> | 46. gracillimus, <i>A. & R.</i> |
| 15. Cancellarioides, <i>id.</i> | 31. cretaceus, <i>id.</i> | 47. heptagonalis, <i>Reeve.</i> |
| 16 cancellatus, <i>id.</i> | 32. Cummingii, <i>Jonas.</i> | 48. incrassatus, <i>Lam.</i> |

* *Fusus pagodus*, Lesson, of which a magnificent specimen, collected by Captain Sir Edward Belcher during the voyage of H.M.S. Samarang, in the Straits of Korea, is figured in 'Conch. Iconica,' *Fusus*, pl. viii. f. 32.

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|---------------------------------|-----------------------------------|--|
| 49. Japonicus, <i>Gray.</i> | 68. nobilis, <i>Reeve.</i> | 86. Sabini, <i>Gray.</i> |
| 50. laciniatus, <i>Desh.</i> | 69. nodosus, <i>Desh.</i> | 87. sinistralis, <i>Lam.</i> |
| 51. lanceola, <i>Reeve.</i> | 70. Norvegicus, <i>Reeve.</i> | 88. spectrum, <i>A. & R.</i> |
| 52. laticostatus, <i>Desh.</i> | 71. Novæ-Hollandiæ, <i>id.</i> | 89. Syracusanus, <i>Lam.</i> |
| 53. lignarius, <i>Lam.</i> | 72. oblitus, <i>id.</i> | 90. tessellatus, <i>Sch. & W.</i> |
| 54. lineatus, <i>Quoy.</i> | 73. ocelliferus, <i>Bory.</i> | 91. toreuma, <i>Lam.</i> |
| 55. lineolatus, <i>Costa.</i> | 74. Oregonensis, <i>Reeve.</i> | 92. torulosus, <i>id.</i> |
| 56. longicauda, <i>Bory.</i> | 75. pagoda, <i>Lesson.</i> | 93. tuberculatus, <i>id.</i> |
| 57. longissimus, <i>Lam.</i> | 76. pallidus, <i>Brod.</i> | 94. tuberosus, <i>Reeve.</i> |
| 58. lyratus, <i>Desh.</i> | 77. pastinaca, <i>Reeve.</i> | 95. Turbinelloides, <i>id.</i> |
| 59. Mandarinus, <i>Ducl.</i> | 78. Pleurotomarius, <i>Court.</i> | 96. turricula, <i>Kiener.</i> |
| 60. marmoratus, <i>Phil.</i> | 79. polygonoides, <i>Lam.</i> | 97. undatus, <i>Desh.</i> |
| 61. Mexicanus, <i>Reeve.</i> | 80. proboscidiferus, <i>id.</i> | 98. ustulatus, <i>Reeve.</i> |
| 62. minutus, <i>Desh.</i> | 81. pulchellus, <i>Phil.</i> | 99. vaginatus, <i>Desh.</i> |
| 63. multicarinatus, <i>Lam.</i> | 82. Purpuroides, <i>D'Orb.</i> | 100. ventricosus, <i>Gray.</i> |
| 64. multicostatus, <i>Gray.</i> | 83. pyrulatus, <i>Reeve.</i> | 101. virga, <i>Gray.</i> |
| 65. myristicus, <i>Reeve.</i> | 84. rubens, <i>Lam.</i> | 102. vittatus, <i>Quoy.</i> |
| 66. Nicobaricus, <i>Lam.</i> | 85. rufus, <i>Reeve.</i> | 103. vulpinus (<i>Mur.</i>), <i>Bor.</i> |
| 67. Nifat, <i>id.</i> | | |
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Figure.

FUSUS NICOBARICUS. Pl. 11. Fig. 53. Shell showing the aperture, smooth columella, and elongate spindle-like canal.—*From Mr. Cuming's collection.*

Genus 11. FASCIOLARIA, *Lamarek.*

Animal; disk oval, truncated in front, and provided at its posterior extremity with a horny acuminated operculum; head rather large, prolonged into a pair of tentacles, at the outer base of which are situated the eyes.

Shell; fusiform, or pear-shaped, sometimes of very large size, more or less channelled at the base, whorls most frequently tuberculated, never varicose; columella more or less plaited at the base, lower plaits the larger, interior of the aperture very closely rayed with prominent elevated striæ.

The *Fasciolaria*, as observed in treating of *Fusus*, are closely allied to that genus in their character and habits, and may be scarcely said to differ, except in being of larger size, and in having a more solid fleshy disk, proportioned to the weight and substance of the shell. Though limited in

species they appear to constitute a very natural genus, distinguished by their large tubercular growth and brilliant display of colours; there is also a character in the style of marking which obtains some importance from the circumstance of its being generally accompanied by numerous transverse lines in a manner peculiar to the genus, whilst the aperture is usually closely radiated with elevated lines. The columnella of the shell is in this genus distinguished by one or two plaits ranging obliquely at the base.

The *Fasciolariae* are pretty generally distributed, being found in Ceylon and the Philippine Islands, Australia, Western Africa, Panama, Mexico, and West Columbia, Honduras and the West Indies, the Mediterranean, Cape de Verd Islands, &c.

Species.

| | | |
|--|---|--|
| 1. aurantiaca, <i>Lam.</i> | 7. granosa, <i>Brod.</i> | 12. porphyrostoma, <i>A. & R.</i> |
| 2. coronata, <i>id.</i> | 8. lignaria (<i>Mur.</i>), <i>Linn.</i> | 13. princeps, <i>Sow.</i> |
| 3. distans, <i>id.</i> | 9. lugubris, <i>A. & R.</i> | 14. salmo, <i>Gray.</i> |
| 4. filamentosa (<i>Fus.</i>), <i>Mart.</i> | 10. papillosa, <i>Sow.</i> | 15. trapezium (<i>Mur.</i>), <i>Lin.</i> |
| 5. fusiformis, <i>Valenc.</i> | 11. Persica, <i>Reeve.</i> | 16. tulipa, <i>Lam.</i> |
| 6. gigantea, <i>Kiener.</i> | | |

Figure.

FASCIOLARIA PERSICA. Pl. 10. Fig. 45. Shell showing the columella with its obliquely descending plaits.—*From the collection of Mr. Cuming.*

Genus 12. TURBINELLA, *Lamarck.*

Animal; disk rather short, thick, muscular, provided with a small horny acuminate operculum; head flattened, terminating with two conical tentacles, which are rather stout at the base, and have the eyes situated at about two-thirds of their length; at the lower part of the head is a slit, through which passes a retractile trunk. The mantle, which lines the interior of the shell in the usual manner, is prolonged into a fleshy siphon, which passes through the sinus at the base of the shell.

Shell; ovate or fusiform, rather solid, often ponderous, spire sometimes short, sometimes elongated, canal now very short and

recurved, now elongated and straight; whorls generally ridged and tubercled, rarely smooth; columella plaited, plaits compressed, one to five inches in number; epidermis horny or fibrous.

Apart from any consideration of the animal, the *Turbinellæ* appear at first sight to be a compound of *Voluta* and *Murex*, the shell having the columella plaited in a manner resembling the former genus, whilst in general aspect it approaches rather to the latter. Linnaeus referred some species to one group, some to the other; but a comparison of the shells with those of *Fusus* and *Fasciolaria* will show a remarkable affinity passing into *Murex*, which is fully confirmed by the similarity in the animals of these genera.

Though comparatively limited in species, the *Turbinellæ* are widely dissimilar in general appearance; some are short and pear-shaped, and others elongated and fusiform; all are characterised by a heavy, solid growth, with considerable depth of colour, and are divisible into five well-defined sections, of which the *T. pyrum*, *cornigera*,* *infundibulum*, *polygona*, and *nassatula*, may be regarded as types. The columnellar plaits are irregular both in number and development, varying from a transverse to the oblique growth noticed in *Fasciolaria*.

As a rare species of the first group above mentioned, the *T. fusus* in the British Museum is worthy of notice; of the second, the *T. muricata*, *cæstus*, and *cassidiformis* are fine examples; of the third, the *T. lanceolata* is an elegant and rare instance; and among the rarities verging upon the fourth and fifth groups may be noticed the *T. verillum* and *rexillulum*, the *T. Australiensis*, the beautiful *T. prismatica*, which on being immersed in water throws out a delicate iridescent lustre, and two beautifully painted species, collected by Sir Edward Belcher, during the recent voyage of H.M.S. Samarang, *T. picta* and *Belcheri*.†

The *Turbinellæ* are pretty widely distributed, but only in very warm climates; none inhabit our own shores, nor do they approach the Mediterranean. The principal localities are the Philippine Islands, the Gallapagos, and other islands of the Pacific, Mauritius, Zanzibar, Panama, Ceylon, Acapulco, Rio Janeiro, and the West Indies.

* The animal of *Turbinella cornigera* is of a deep purple, finely marbled with white, the colours being fainter towards the margin of the foot. The eye is distinct, and well-formed, having a black pupil and iris of a light yellow colour. It crawls with deliberation and apparent difficulty, seeming to labour under the weight of its heavy shell, as a tortoise does under that of its carapace. It is, moreover, of a very timid disposition, shrinking, also, like the tortoise, quickly within its shell on the slightest alarm. The specimen from which the foregoing observations were taken, was procured in about a fathom water from a weedy bottom on the shores of Billiton, an island in the Java Sea, between Borneo and Sumatra.—ADAMS, *Moll. Voy. Samarang*.

† All described and figured in the ‘Conchologia Iconica.’

Species.

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|--------------------------------------|--------------------------------------|-------------------------------------|
| 1. acuminata, Kiener. | 25. fastigium, Reeve. | 49. picta, Reeve. |
| 2. angularis, Reeve. | 26. filosa, Schubert. | 50. polygona (<i>Mur.</i>), Gm. |
| 3. aplustre (<i>Buc.</i>), Mart. | 27. fusus, Sow. | 51. prismatica (<i>Buc.</i>), M. |
| 4. armata, Brod. | 28. gemmata, Reeve. | 52. pulchella, Reeve. |
| 5. attenuata, Reeve. | 29. gibbula (<i>Mur.</i>), Gm. | 53. pyrum (<i>Vol.</i>), Linn. |
| 6. Australiensis, <i>id.</i> | 30. globulus (<i>Vol.</i>), Chem. | 54. rapa, Lam. |
| 7. Barclayi, <i>id.</i> | 31. gracilis, Reeve. | 55. recurvirostris, Schub. |
| 8. Belcheri, <i>id.</i> | 32. imperialis, <i>id.</i> | 56. rhinoceros, Lam. |
| 9. brevicaudata, <i>id.</i> | 33. incarnata, Desh. | 57. rufus, Reeve. |
| 10. cestus, Brod. | 34. infundibulum (<i>Mur.</i>), G. | 58. sanguiflua, <i>id.</i> |
| 11. candelabrum, Reeve. | 35. Knorrii, Desh. | 59. scabrosa, <i>id.</i> |
| 12. capitellum (<i>Vol.</i>), Lin. | 36. lanceolata, Reeve. | 60. scolymos (<i>Mur.</i>), Gm. |
| 13. carinifera, Lam. | 37. lauta, <i>id.</i> | 61. smaragdulus (<i>Buc.</i>), L. |
| 14. Cassidiformis, Valen. | 38. leucozonalis, Lam. | 62. spadicea, Reeve. |
| 15. castanea, Reeve. | 39. lyrata, Reeve. | 63. spinosa (<i>Buc.</i>), Mart. |
| 16. Ceramica (<i>Vol.</i>), Lin. | 40. maculata, <i>id.</i> | 64. tectum (<i>Buc.</i>), Gray. |
| 17. cerata, Gray. | 41. muricata (<i>Vol.</i>), Born. | 65. Thersites, Reeve. |
| 18. cinerea, Reeve. | 42. nana, Reeve. | 66. triserialis, Lam. |
| 19. cingulifera, Lam. | 43. nassatula, Lam. | 67. tuberculata, Brod. |
| 20. concentrica, Reeve. | 44. Nassoides, Reeve. | 68. turrita (<i>Vol.</i>), Guin. |
| 21. cornigera, Lam. | 45. nodata (<i>Buc.</i>), Mart. | 69. ustulata, Reeve. |
| 22. craticulata (<i>Mur.</i>), L. | 46. ocellata, Lam. | 70. varicosa, <i>id.</i> |
| 23. crenulata, Kiener. | 47. ovoidea, Kiener. | 71. vexillulum, <i>id.</i> |
| 24. crocea, Gray. | 48. Philberti, Recluz. | 72. violacea, <i>id.</i> |

Figure.

TURBINELLA IMPERIALIS. Pl. 10. Fig. 48. Shell showing its tubercular structure, and columella distinguished by the transverse arrangement and irregularity of the plaits.—From Mr. Cuming's collection.

Genus 13. CYRTULUS, Hinds.

Animal; unknown.

Shell; stoutly fusiform, solid and ponderous, with the spire acuminate and plicately noduled, last whorl smooth and remarkable for its elevated swollen growth around the upper part, contracted towards the lower, the columella being excavated in a manner to correspond; base emarginated, slightly umbilicated; aperture linear, reaching nearly to the base of the spire.

The rude mis-shapen object for which the present genus was established, partakes of the character of *Fusus*, with a certain degree of resemblance to the *Turbinella pyrum* and its congeners, divested of their columellar plaits. It was collected by Capt. Sir Edward Belcher during the Voyage of H.M.S. *Sulphur*, at Port Anna Maria, Nukuhiva, Marquesas, dredged at a depth of about nine fathoms, and upon its first appearance seemed rather to be a distorted individual of some unknown species of a more symmetrical plan of convolution; it was, however, described as a new genus by Mr. Hinds, Assistant-Surgeon of that Expedition, and, I believe, with correct judgment. Since that period two or three other specimens have presented themselves, each distinguished by the same peculiarity of growth.

It will be observed that the spire of *Cyrtulus* is characterized by a neat display of sculpture, and suddenly acuminate in the same curiously erect manner as in the *Strombus Thersites*; the last whorl then assumes a rude swollen growth; almost belonging, as it were, to another species, smooth, very thick, and ponderous, and rising in such a manner around the base of the spire as to give it a sunken half-buried appearance; as if the calcifying organ of the animal which had elaborated the shell with so much beauty and symmetry in its pubescent state, had suddenly been charged to overflowing, and its architectural faculties, so to speak, become nullified. An indication of this sluggish obesity of growth may be often remarked in specimens of the *Buccinum distortum*.

The specimens hitherto seen are all of one species.

Figure.

CYRTULUS SEROTINUS. Pl. 11. Fig. 49. Shell showing its sharply acuminate sunken spire, and the ponderous obese growth of the last whorl.—*From Sir Edward Belcher's collection.*

Genus 14. FASTIGIELLA, Reeve.

Animal; *unknown*.

Shell; *elongately turreted, contracted and umbilicated at the base, aperture small, canalliculated, canal very short, somewhat twisted.*

This shell, for the reception of which I have found it necessary to institute the present genus, is of an entirely new form, differing generically, as well

as specifically, from any of the class to which it belongs. It is of an elongated, turreted growth, and may be said to partake in almost equal proportions of the characters of two genera somewhat removed from each other in the system, *Turritella* and *Cerithium*. As in *Turritella*, the shell is of a solid, spirally-ribbed structure, without any indication of varices, a condition not to be found in *Cerithium*, whilst it possesses a character which excludes it from the family *Turbinacea* in having a short, umbilicated, twisted canal, different from that of the *Cerithium*, for the passage of an elevated fold of the mantle. At the base the shell is not much unlike some species of *Buccinum*, but it is remarkable for its elongated *Turritella*-like growth. It is, moreover, to all appearance the production of a carnivorous gasteropod, and more strictly referable to the Canaliferous tribe than the *Cerithia*, which, according to Deshayes, are vegetable-feeders, and partake in many instances of the fresh-water habits of the *Melaniae*.

Unfortunately Mr. Cuming is not in possession of any information respecting the shell, either touching the animal or its place of habitation, and it only remains to observe that I have not as yet found a second species.

Figure.

FASTIGIELLA CARINATA. Pl. 10. Fig. 46. Shell showing its umbilicus, short twisted canal and elongated turreted growth.

Genus 15. *CERITHIUM*, Bruguiére.

Animal; disk small, nearly orbicular; head truncated beneath, bordered with a fringe, and furnished with two pointed tentacles bearing the eyes upon a swollen portion of their outer base.

Shell; turreted, prominently channelled at the base, mostly rough or tuberculated, composed of numerous whorls forming a regular spire, often exhibiting an occasional varix, and in fresh-water species, frequently eroded or decollated at the apex; columella arched with sometimes a reflected fold, constituting the edge of the recurved canal.

The genus *Cerithium* is one of rather anomalous character, from the circumstance of some of the species being of marine habit, others of fluviatile;

those which dwell in the sea, constituting the more numerous portion, are of a heavy solid growth, exhibiting a certain delicacy of colour and marking, and are, probably carnivorous; but those which inhabit fresh or brackish water at the mouths of estuaries, or live in swamps among the roots of trees, are of a lighter growth and mostly of a uniform dull brown colour, covered with a horny epidermis. These are herbivorous, and may often be found suspended from the branches of trees by a mass of silken threads, which the animal has the faculty of depositing as a means of attachment. This peculiarity in the habits of *Cerithium* was first observed some time since in the West Indies, by the Rev. Lansdowne Guilding; it has also been described by Dr. Trail in a Natural History Journal recently published at Singapore, and by Mr. Adams during his visit to Borneo in the Samarang.*

The shell of the *Cerithia* is of an elongated lanceolate form, not symmetrically fluted and turbinated like *Turritella*, but of rather rude growth, frequently presenting here and there a varix, and mostly coronated with tubercles or other coarse sculpture; the chief peculiarity in its structure is the strong twisted, recurved growth of the canal. The species are very numerous, and inhabit all climates within the mean temperature of the Mediterranean; in a fossil state they are still more abundant, and afford much research for the geologist.

The magnificent example selected for illustration is of very large size for a marine species; it is extremely rare, and I cannot learn that it has been named or described.

* The characters of the animal recited at the head of this genus are those of Lamarek, the following are of more recent date, and the result of local observation:—

The animal of *Cerithium truncatum* has a broad, suborbicular, and expanded foot, and an elongated, subcylindrical, annulated trunk of a light brown colour, with three rather broad, well-defined, opaque yellow lines extending along its upper surface, the central one of which reaches from the head to very near the extremity of the proboscis, where it is bifid, the two forks diverging. The two lateral lines are shorter, not bifid at their extremities, and extend forward on the head to within a little distance of the origin of the tentacles. The tentacles are very short, annulated with the eyes, which are small, though with a distinct iris and pupil situated at their tip; whereas in all other *Cerithia* that have come under my observation, they are placed on tubercles situated on the outer side of the base of the tentacles, or on the tentacles themselves at a little distance from their origin. The foot is of a light pinky brown on its upper surface, mottled with a deep rich brown, and on the under surface is lilac. It is found generally in brackish water in Mangrove swamps, and the mouths of rivers in Singapore and Borneo. Sometimes they crawl on the stones and leaves in the neighbourhood, and sometimes they are found suspended by glutinous threads to boughs and the roots of the Mangroves. The operculum is round, horny, with a central nucleus and concentric elements; it is semi-transparent, and borne upon the posterior part of the foot at its extreme end. When the animal hibernates, it retracts itself into the shell and brings its operculum to fit closely into the aperture, after having previously affixed sixty or seventy glassy, transparent, glutinous threads to the place of attachment, where they occupy the outer or right lip, and extend half-way around the operculum.

There is another very handsome species, closely allied to the foregoing, which I have frequently found crawling languidly on the leaves of the *Pontedera* and sedges in the fluviatile marshes on the banks of rivers in several parts of Borneo, and many miles in the interior, where the water is perfectly fresh, which has the eyes likewise terminal, and the proboscis marked with crimson and yellow. The foot is very dark brown, and has a vivid scarlet line extending round the lower margin.—ADAMS, *Moll. Voy. Samarang.*

Species.

- | | | |
|---|---------------------------------|--|
| 1. Adansoni, <i>Brug.</i> | 30. granulatum, <i>Kiener.</i> | 59. palustre, <i>Brug.</i> |
| 2. adustum, <i>Kiener.</i> | 31. Guarianum, <i>D'Orb.</i> | 60. perversum, <i>Lam.</i> |
| 3. adversum, <i>Brown.</i> | 32. heteroclites, <i>Lam.</i> | 61. Peruvianum, <i>D'Orb.</i> |
| 4. aluco, <i>Brug.</i> | 33. inflatum, <i>Quoy.</i> | 62. pictum (<i>Mur.</i>), <i>Wood.</i> |
| 5. asperum, <i>id.</i> | 34. laeve, <i>id.</i> | 63. punctatum, <i>Brug.</i> |
| 6. atratum, <i>id.</i> | 35. Lafondi, <i>Michaud.</i> | 64. pusillum, <i>Nuttall.</i> |
| 7. australe, <i>Quoy.</i> | 36. lemniscatum, <i>Quoy.</i> | 65. radix, <i>Duf.</i> |
| 8. breve, <i>id.</i> | 37. lima, <i>Brug.</i> | 66. radula, <i>Brug.</i> |
| 9. breviculum, <i>Sow.</i> | 38. lineatum, <i>Lam.</i> | 67. reticulatum, <i>Totten.</i> |
| 10. Cailliaudi, <i>Pot. & Mic.</i> | 39. literatum, <i>Brug.</i> | 68. rubus, <i>Desh.</i> |
| 11. elava, <i>Brug.</i> | 40. lutulentum, <i>Kiener.</i> | 69. rugosum, <i>Kiener.</i> |
| 12. columna, <i>Sow.</i> | 41. maculosum, <i>id.</i> | 70. semiferrugineum, <i>Lam.</i> |
| 13. conicum, <i>Blain.</i> | 42. Madagascariense, <i>Bl.</i> | 71. semigranosum, <i>id.</i> |
| 14. corallinum, <i>Kiener.</i> | 43. Mediterraneum, <i>Desh.</i> | 72. septemstriatum, <i>Say.</i> |
| 15. crassum, <i>Lam.</i> | 44. microptera, <i>Kiener.</i> | 73. Sowerbyi, <i>Kiener.</i> |
| 16. decollatum, <i>Brug.</i> | 45. minutum, <i>Nuttall.</i> | 74. subulatum, <i>Lam.</i> |
| 17. Diemenense, <i>Quoy.</i> | 46. moniliferum, <i>Kiener.</i> | 75. sulcatum, <i>Brug.</i> |
| 18. dislocatum, <i>Say.</i> | 47. Montagnei, <i>D'Orb.</i> | 76. telescopium, <i>id.</i> |
| 19. ebeninum, <i>Brug.</i> | 48. morus, <i>Lam.</i> | 77. tæniatum, <i>Quoy.</i> |
| 20. eburneum, <i>id.</i> | 49. muricatum, <i>Brug.</i> | 78. torulosum, <i>Brug.</i> |
| 21. echinatum, <i>Lam.</i> | 50. muscarum, <i>Say.</i> | 79. tristoma, <i>Blain.</i> |
| 22. elegans, <i>Blain.</i> | 51. mutatum, <i>Sow.</i> | 80. tuberculatum, <i>Lam.</i> |
| 23. Emersonii, <i>Adams.</i> | 52. nobile, <i>Reeve.</i> | 81. turritella, <i>Quoy.</i> |
| 24. erythraeonense, <i>Lam.</i> | 53. nerinea, <i>Blain.</i> | 82. uncinatum, <i>Desh.</i> |
| 25. fasciatum, <i>Brug.</i> | 54. nodulosa, <i>Brug.</i> | 83. varicosum, <i>Sow.</i> |
| 26. ferrugineum, <i>Say.</i> | 55. obeliscus, <i>Brug.</i> | 84. variegatum, <i>Quoy.</i> |
| 27. fluviatile, <i>Pot. & Mich.</i> | 56. obtusum, <i>Lam.</i> | 85. vertagus, <i>Brug.</i> |
| 28. giganteum, <i>Lam.</i> | 57. ocellatum, <i>Brug.</i> | 86. vulgatum, <i>id.</i> |
| 29. granarium, <i>Kiener.</i> | 58. Pacificum, <i>Sow.</i> | 87. zonale, <i>id.</i> |

Figure.

CERITHIUM NOBILE. Pl. 12. Fig. 59. Shell showing its elongated growth, small aperture, and spouted canal.—*From Mr. Cuming's collection.*

Genus 16. TRIPHORIS, *Deshayes.*

Animal; unknown.

Shell; small, sometimes cylindrically, sometimes pyramidal elongated, sinistral, terminating at the base in a tubular spouted canal, recurved backwards, aperture small and round.

The genus *Triphoris* was instituted by M. Deshayes for the reception of a small fossil *Cerithium*, of which the *C. perversum* of the Mediterranean appears to have been the first-described recent species ; it is, however, to the zeal of Capt. Sir Edward Belcher and the ability of his assistant, Mr. Hinds, during the voyage of H.M.S. Sulphur, that we are mainly indebted for bringing this interesting group into notice. On the occasion of that Expedition visiting the Straits of Malacca, New Guinea, and New Ireland, several important species were obtained, all distinctly characterised in manner following.*

The *Triphores* are small spirally attenuated shells, the species figured being magnified and one of very large size, and nearly all are reversed ; coupled with this peculiarity is that of the canal being prolonged backwards, in the form of a spouted tube, whilst the aperture is extremely small, and closes near the body-whorl in such a manner as to form another minute tube or the rudiment of one. This third aperture, whence the name *Triphoris*, is rarely more than indicated by a sinus or slight fold, and it is probably in consequence of the living species of the Mediterranean and the fossil type of the genus representing the extremes of this character, that M. Deshayes has considered the Lamarckian *Cerithium perversum* inadmissible. The species are distinguished by a remarkable variety of sculpture, developed in most of them with peculiar force and neatness.

In addition to the localities mentioned above, two or three species were collected in the West Indies by the Rev. Lansdowne Guilding ; "on the west of America," says Mr. Hinds, "though much attention was bestowed on small shells during the voyage of the Sulphur, not a single specimen was found."

Species.

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|--|---------------------------------------|--|
| 1. <i>adversus</i> , <i>Deshayes</i> . | 12. <i>concinnus</i> , <i>Hinds</i> . | 22. <i>micans</i> , <i>Hinds</i> . |
| 2. <i>aemulans</i> , <i>Hinds</i> . | 13. <i>concors</i> , <i>id.</i> | 23. <i>monilifer</i> , <i>id.</i> |
| 3. <i>affinis</i> , <i>id.</i> | 14. <i>corrugatus</i> , <i>id.</i> | 24. <i>perversus</i> , <i>Deshayes</i> . |
| 4. <i>asperrimus</i> , <i>id.</i> | 15. <i>elegans</i> , <i>id.</i> | 25. <i>roseus</i> , <i>Hinds</i> . |
| 5. <i>bilix</i> , <i>id.</i> | 16. <i>gigas</i> , <i>id.</i> | 26. <i>ruber</i> , <i>id.</i> |
| 6. <i>cancellatus</i> , <i>id.</i> | 17. <i>Grayii</i> , <i>id.</i> | 27. <i>sculptus</i> , <i>id.</i> |
| 7. <i>candidus</i> , <i>id.</i> | 18. <i>hilaris</i> , <i>id.</i> | 28. <i>tristis</i> , <i>id.</i> |
| 8. <i>Carteretensis</i> , <i>id.</i> | 19. <i>marmoratus</i> , <i>id.</i> | 29. <i>vitreus</i> , <i>id.</i> |
| 9. <i>castus</i> , <i>id.</i> | 20. <i>maxillaris</i> , <i>id.</i> | 30. <i>vittatus</i> , <i>id.</i> |
| 10. <i>clemens</i> , <i>id.</i> | 21. <i>Metcalfei</i> , <i>id.</i> | 31. <i>vulpinus</i> , <i>id.</i> |
| 11. <i>cœlebs</i> , <i>id.</i> | | |

* A few species will be described by Mr. Adams and myself, in addition to these, in the forthcoming 'Mollusca of the Voyage of H.M.S. Samarang.'

Figure.

TRIPHORIS GRANDIS. Pl. 12. Fig. 55. Shell magnified to twice the natural size, showing its reversed growth, rounded aperture, and recurved tubular canal.

Family 6. PARASITICA.

Animal ; marine, parasitic, living imbedded in the soft parts of the Star Fish, and producing a thin hyaline turbinate shell.

The family *Parasitica* is one which I had occasion to propose about five years since, in my ‘Conchologia Systematica,’ for the introduction of a genus, well known to English conchologists but ill-understood on the continent, named *Stilifer*, representing a small pectinibranchiate mollusk, so peculiar in its habits that it could not be referred with propriety to any of the existing groups. Mr. Gray includes the genus in his family *Naticidæ*, but as the shell is very different in its structure and turbinated growth from any of the *Natica* tribe, and the character and affinities of the animal do not appear to be fully comprehended, I shall not at present venture upon any removal.

Of the species known, all appear to belong to one genus though materially differing in the form of the shell, and they are remarkably distinguished by their parasitic habit of growth, living imbedded in the soft parts of the Star Fish, from the juices of which it is believed they obtain nourishment.

Genus 1. STILIFER, Broderip.

Animal ; disk narrow, slender, very much produced beyond the head in front and but little extended behind ; head small, rounded, with two elongate subulate tentacles having the eyes on the outer side of their base ; mantle wholly contained within the shell.

Shell ; extremely thin, hyaline, transparent, either globose consisting of few whorls, or elongated composed of many ; apex elevated, obtuse, and mostly bent or rudely twisted ; aperture entire below, slightly sinnuated at the upper part with the lip extremely thin and delicate.

The interesting little parasite which forms the subject of this genus was

collected by Mr. Cuming at Lord Hood's Island, one of the Gallapagos, imbedded in the soft parts of a Star Fish, and a species has been recently obtained by Mr. Adams, under precisely similar circumstances, on the coast of Borneo. The *Stilifer*, though known for more than half a century by a figure of Chemnitz,* was not described by Lamarck, nor is it mentioned by M. Deshayes in his new edition of that author; it was, however, known by the name of *Phasianella stylifera* to Turton, who found a dozen attached to the spines of an Echinus in Torbay; and Fleming describes it under the head of *Telutina*, whilst recording his opinion that it might be elevated to the rank of a genus with the appellation of *Styliana*. This name being already in use for a genus of polyps, Mr. Broderip, to whose skilful care Mr. Cuming intrusted the Star Fish collected by him with the mollusk *in situ*, adopted the title of *Stilifer*. The description of the animal given by this accomplished naturalist from the dissections of Professor Owen,† varies materially from that of Mr. Adams published in the Proceedings of the Zoological Society; the former describes the mantle as being thick, fleshy, and cup-shaped, completely enveloping the last two or three whorls of the shell;‡ the latter conceives this external organ to be the foot, and the mantle to be very small, concealed within the shell, as described at the head of this genus in his own words.||

As a solitary instance of a mollusk dwelling and propagating within the fleshy substance of another animal, the *Stilifer* is an object of great interest;§ the shell is as delicate and transparent as a glass bubble, and it is curious that whilst one species, *S. Astericola*, should be almost as

* *Helix corallina*, Chemn. Conch. Cab. vol. xi. p. 286. pl. 210. f. 1284-5.

† Conch. Syst. vol. ii. p. 175. pl. 225. f. 8 to 12.

‡ This mantle (which in *Stil. Astericola* is of a green hue,) is thick, fleshy, and cup-shaped, with a small aperture at its base and a free posterior margin, enveloping the soft parts and the last whorls of the shell, which has thus somewhat the appearance of a small acorn set in its cup. On the ventral aspect of this mantle is the rudiment of a foot; and from the small basal aperture a retractile *proboscis* (which when exerted is as long as the whole animal) is protruded. At the base of this *proboscis* are two thick, round, somewhat pointed *tentacula*; and at the base of them are the eyes or rather ocular specks without pedicles. The *branchia* is placed on a single stem. At the base of the *proboscis* is a spherical muscular stomach, and the intestine ascends into the spire of the shell, where it becomes attached to the liver, which, in the present species, is of an orange colour.—*Pro. Zool. Soc.*

|| Mr. Gray noticed in his 'Synopsis' that "what has been called the enlarged mantle appears like the foot," and as Mr. Adams' observations are drawn from the living individual, whilst Mr. Broderip's were from a contracted specimen in spirits, it is highly probable that he is right.

§ Mr. Cuming found this elegant little parasite burrowed in different parts of the rays of the oral disk of *Asterias solaris*, Gray, where it is almost hidden from sight, so deeply does the animal penetrate into the substance of the Star Fish, in which it makes a comfortable cyst for itself, wherein it most probably turns by the aid of its rudimentary foot. All the specimens infested with *Stiliferi* appeared to be in the best health, though there is reason to believe that these *Mollusca* feed upon the juices of the Star Fish. With that instinct of self-preservation imparted to all parasites whose existence depends upon that of their nidus, the *Stilifer*, like the *Ichneumon* among insects, appears to avoid the vital parts; for, in no instance did Mr. Cuming find it imbedded anywhere save in the rays, though some had penetrated at their base and very near the *pelvis*. When extracted, the older shells have much the appearance of a milky-clouded glass bubble: the younger shells are of an unclouded transparency.—*Pro. Zool. Soc.* 1832.

round as a pea, another, *S. subulata*, should be long and tuberculated; both forms, however, exhibit the peculiar elevation of the apex after the manner of a rude mammillary style or column.

Species.

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|--|---------------------------------------|
| 1. <i>Astericola</i> , <i>Broderip.</i> | 3. <i>pyramidalis</i> , <i>Reeve.</i> |
| 2. <i>corallina</i> (<i>Helix</i>), <i>Chemn.</i> | 4. <i>subulata</i> , <i>Sowerby.</i> |
| 5. <i>stylifera</i> (<i>Phasianella</i>), <i>Turton.</i> | |

Figure.

STYLIFER PYRAMIDALIS. Pl. 12. Fig. 56. Shell, showing the aperture and transparent glassy structure.—*From Mr. Cuming's collection.*

Family 7. TURBINACEA.

Shell; *tuberculated, either conical or elongately turriculated, sometimes closely sometimes loosely convoluted; aperture entire at the base, with no indication of any sinus.*

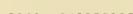
We now pass to a division of the pectinibranchiate order of Gastropods distinguished by their less voracious habits, and the more tubularly convoluted structure of their shell. They are rarely provided with any proboscis like the carnivorous tribes of this order, and exist chiefly, if not altogether, on vegetable matter; hence, as a general rule, their shell is less solid, though rarely fragile.

The genera of this family, amounting to twenty in number, correspond in a manner to the Linnæan *Trochus* and *Turbo*, and the shell is mostly lined with an iridescent pearly nacre. The varieties of coloured beaded sculpture are most diversified in *Trochus*, whilst in *Phasianella* and *Bankivia* a bright array of colours is exhibited on a plane surface, without the aid of sculpture. The resources of architectural ornament are perhaps nowhere more beautifully represented than in *Delphinula*, in one species of which genus the tubercles are prolonged into a lofty diadem of vaulted spines. In *Scalaria* a singular effect is produced by a periodical deposit of the reflected margin of the aperture, leaving the whorl encircled by so many rings. In *Phorus* the animal exercises the remarkable property of agglutinating to the surface of its shell the various debris of corals, shells, or stones it may be in contact with; and each species shows a different modification of this habit.

By far the larger portion of the *Turbinacea* are inhabitants of the Eastern World.

The following is a list of the genera, to which all the species of *Turbinacea* at present known may be referred :—

| | | |
|--------------|-------------|-------------|
| TURRITELLA. | TROCHUS. | DELPHINULA. |
| PHASIANELLA. | TROCHISCUS. | SCALARIA. |
| ELENCHUS. | MONODONTA. | MONOPTIGMA. |
| BANKIVIA. | MORULUS. | EULIMA. |
| LITTORINA. | ROTELLA. | BONELLIA. |
| MARGARITA. | PHORUS. | RISSOA. |
| TURBO. | SOLARIUM. | |



Genus 1. TURRITELLA, Lamarck.

Animal; disk short, oval, surmounted by a stout pedicle which serves as a support for the head and enters the shell; head prolonged into a cylindrical rather flattened trunk, broad at the base and cleft at its anterior extremity; tentacles elongated, with the eyes at the outer base; mantle forming a fringed ring or collar, variously ornamented according to the species, through which the head passes in and out of the shell. Operculum horny, multispiral.

Shell; very long, narrow, turreted; whorls numerous, generally transversely, never longitudinally, ribbed, devoid of spines or tubercles, convoluted into a spiral screw; aperture small, somewhat round, with the margins disjoined, lip sharp, never reflected, broadly sinuated towards the upper part.

In speaking of the genus *Terebra* (ante p. 55), I observed that “the shell of *Turritella* has very much the form of *Terebra*, but the aperture is round and entire; so that *Terebra* may be likened to a very long drawn-out *Buccinum*, and *Turritella* to a similarly elongated *Turbo*.” The comparison cannot, however, be continued with the same force, for the shell of *Turbo* is of a solid pearly composition, whilst that of *Turritella* is not, and the animals are somewhat dissimilar, though the shell of both is alike distinguished by its rounded aperture and by the absence of any basal canal or sinus. It is, indeed, a matter of doubt whether so much importance can be attached, as hitherto, to the canaliculated structure of shells. According to the observations of M. Deshayes and MM. Quoy and Gaimard, there must be a closer relationship than has been yet acknowledged between the *Turritellæ* and the *Cerithia* and *Melaniae*, although the shell of one genus is

simple and entire, whilst that of the other is characterized by a strongly recurved canal.*

The *Turritelle* are apparently a strong muscular group of mollusks, the disk being surmounted by a stout pedicle, by the strength of which the shell is borne up at an angle, and not allowed to trail upon the ground, as in the *Cerithia* and other elongated forms. MM. Quoy and Gaimard also notice a peculiarity in the mantle, which is prolonged into a fringed ring or collar, through which the head passes in and out of the shell.

The genus is somewhat limited in species compared with *Cerithium* or *Terebra*, and the shells exhibit little variation of colour. They are all of a more or less sombre hue, though none are very dark, but may be admired on account of the beautiful symmetry of their graduated screw-like proportions.

The *Turritelle* inhabit both the East and West Indies, and one or two species occur on the coast of Senegal and New Holland.

Species.

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|---------------------------------|--------------------------------|---------------------------------|
| 1. acutangula, <i>Deshayes.</i> | 11. duplicata, <i>Lamarch.</i> | 20. nodulosa, <i>King.</i> |
| 2. alternata, <i>Say.</i> | 12. erosa, <i>Courthouy.</i> | 21. replicata, <i>Lamarch.</i> |
| 3. australis, <i>Lamarch.</i> | 13. exoleta, <i>Lamarch.</i> | 22. rosea, <i>Quoy.</i> |
| 4. bicingulata, <i>Lamarch.</i> | 14. fuscata, <i>Lamarch.</i> | 23. spirata, <i>Sowerby.</i> |
| 5. bisuturalis, <i>Say.</i> | 15. granosa, <i>Quoy.</i> | 24. terebra, <i>Lamarch.</i> |
| 6. brevialis, <i>Lamarch.</i> | 16. imbricata, <i>Lamarch.</i> | 25. tricarinata, <i>King.</i> |
| 7. Broderipiana, <i>D'Orb.</i> | 17. impressa, <i>Say.</i> | 26. trisulcata, <i>Lamarch.</i> |
| 8. carinifera, <i>Lamarch.</i> | 18. ligar, <i>Deshayes.</i> | 27. unguilina, <i>Deshayes.</i> |
| 9. cingulata, <i>Sowerby.</i> | 19. mesal, <i>Deshayes.</i> | 28. virginiana, <i>Lamarch.</i> |
| 10. cornea, <i>Lamarch.</i> | | |
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Figure.

TURRITELLA PICTA. Plate 11. Fig. 51. Shell, showing the symmetrical screw-like convolution of the whorls and rounded aperture, with its margin entire.—*From Mr. Cuming's collection.*

* If we make an actual comparison of the animal of *Turritella* with that of *Turbo* and *Trochus*, we find the differences between them to be too great to allow of their being any longer maintained in the same family. By extending the comparison to the *Cerithia*, we immediately recognise a much closer analogy between *Turritella* and that genus, than could be at first imagined. The *Cerithia* are not zoophagous, as Lamarek believed; their mode of living and organization prove it. The comparison may be further extended to the *Melania* and *Melanopsidea* which inhabit fresh water. I have already indicated (*Encyclopédie Méthodique*) the relation which may be traced between the *Melania* and the *Turritella* and *Cerithia*, and the observations of MM. Quoy and Gaimard are confirmative of this opinion. To explain in a word what I mean by a comparison, which is not, however, altogether exact, I may say that the *Melania* are to the *Turritella* what the *Neritinae* are to the *Neritae*, and the *Melanopsidea* to the *Cerithia*.—DESHAYES, *Anim. sans vert.* vol ix. p. 250.

Genus 2. PHASIANELLA, Lamarck.

Animal; disk narrow, head somewhat prolonged, tentacles long and narrow, with the eyes situated on pedicles at the outer base; mantle ornamented with three pairs of digitated processes, and produced above the head into a conspicuous fringed collar. Operculum calcareous, ear-shaped.

Shell; ovately oblong, smooth, polished, spire regular, columella rounded, aperture oval, lip entire, acute, never reflected.

The genus *Phasianella* includes a small group of mollusks, comprising a few species only, mainly characterized by the peculiar texture and aspect of their shell. The soft parts are not unlike those of the preceding genus of *Turbinacea*, excepting that the distinguishing features of the family are more prominently developed. The fringed collar, described in *Turritella*, forms a striking object in the animal of *Phasianella*, and its narrowed disk is further distinguished by three pairs of digitated processes. The shell is of a very different structure, and has long excited the admiration of collectors, by its highly polished porcelain surface and beautifully variegated painting. The operculum is moreover ear-shaped and calcareous.

The *Phasianellæ* live most abundantly in the situations they inhabit, and all the larger species with which we are familiar are from the continent of New Holland; there is a small species, *P. pulla*, found on our own coast, one, I believe, in the West Indies, and one in the Mediterranean.

Species.

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|---------------------------------|---------------------------------|----------------------------------|
| 1. <i>ambigua</i> , Nuttall. | 9. <i>Mauritiana</i> , Lamarck. | 17. <i>sulcosa</i> , Mighels. |
| 2. <i>angulifera</i> , Lister. | 10. <i>nebulosa</i> , Lamarck. | 18. <i>tenuis</i> , Michaud. |
| 3. <i>brevis</i> , Menke. | 11. <i>perdix</i> , Gray. | 19. <i>varia</i> , Sowerby. |
| 4. <i>elegans</i> , Lamarck. | 12. <i>Preissii</i> , Menke. | 20. <i>variegata</i> , Lamarck. |
| 5. <i>inflexa</i> , Blainville. | 13. <i>pulchella</i> , Récluz. | 21. <i>venusta</i> , Reeve. |
| 6. <i>Lehmanni</i> , Menke. | 14. <i>pulla</i> , Sowerby. | 22. <i>Vieuxii</i> , Payraudeau. |
| 7. <i>lineata</i> , Lamarck. | 15. <i>rubens</i> , Lamarck. | 23. <i>vinctus</i> , Brown. |
| 8. <i>marmorata</i> , Dufos. | 16. <i>solida</i> , Deshayes. | |
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Figure.

PHASIANELLA VENUSTA. Plate 12. Fig. 58. Shell, showing the aperture and variegated porcelain surface.—*From Mr. Cuming's collection.*

Genus 3. ELENCHUS, *Humphrey.*

Animal; —?

Shell; *conical, pyramidal, but not flattened at the base, whorls convex, margins disjoined. Substance of the shell a stout horny periostracum, lined with a thin bright iridescent nacre.*

The term *Elenchus* has been applied for some years past to a group of shells somewhat limited in number, but very deserving of generic honour. Though uniform in shape, the species are perhaps most distinguished for the peculiarity of their composition, being little calcareous and richly iridescent. The typical character of the genus may be recognised in the well-known *Trochus iris*, so remarkable for the brilliant iridescence of its pearly nacre; the species here selected for illustration is another equally distinguished in this respect, and there are several interesting small species, composing Mr. Gray's genus *Thalotia*, from New Holland.

For list of species of this and other imperfectly named genera, which the author proposes to work out in the CONCHOLOGIA ICONICA, see Appendix.

Figure.

ELENCHUS CIRCULATUS. Pl. 12. Fig. 57. Shell, showing its pyramidal ovate form and iridescent interior.—*From Mr. Cuming's collection.*

Genus 4. BANKIVIA, *Deshayes.*

Animal; —?

Shell; *elongated, subulate, with the surface polished, somewhat porcellanous, columella thickened, rolled over, twisted, truncated at the base; aperture rather small, lip thin.*

Such is the generic description of a shell of which there are several differently coloured varieties, but only one species, which has been mixed up along with the *Trochus iris* in the genus *Elenchus*. It appears to have been first distinguished by M. Deshayes in Pl. 70. Fig. 8, of his 'Traité Élémentaire de Conchyliologie' and, as I learn, was intended as the type

of a new genus, for which he proposed the name *Bankivia*. To the great loss of Conchology that important work remains still incomplete, the text never reached so far as to include the present genus, and I am not aware that any publicity has yet been given to it.

The shell of *Bankivia*, it will be observed, has few characters in common with *Elenchus*; it has apparently no epidermis, and is of the same porcellanous structure as *Phasianella*, sometimes banded with deep red and purple, sometimes, as in the variety selected for illustration, painted with fine zigzag lines. The columella presents, however, the most important generic feature, in being thickly rolled and twisted, truncated at its junction with the lip, which is thin and not reflected. The interior of the shell is faintly iridescent.

Figure.

BANKIVIA PURPURASCENS. Pl. 2. Fig. 61. Shell, showing the truncated columella.

Genus 5. LITTORINA, Féruſſac.

Animal; disk small, thin at the edge and nearly circular, almost concealed by the shell, furnished behind with a horny blackish operculum; head somewhat thickened, prolonged into a conical snout, which is transversely wrinkled and cleft at the extremity by the mouth; tentacles conical, broad at the base, at the outer sides of which are situated the eyes.

Shell; turbinated, not pearly, small, mostly rather solid, columella somewhat flattened, arched; aperture rotundately ovate, margins disjoined, lip sharp, sometimes slightly expanded.

The common Periwinkle of our shores, *Littorina vulgaris*, may be referred to as a familiar type of this very natural group, including a multitude of species of which many remain to be described. Lamarck confounded some with the *Turbinæ*, some with the *Phasianellæ*, and even De Féruſſac, after founding the genus, left it not a little confused through the introduction of several *Paludinæ*, which have for the most part thinner shells, and are not of the same marine habits.

The general aspect and composition of the shells of the *Littorinæ* seem to indicate sufficiently that they belong to an animal dissimilar from *Phasianella*, and so it proves to be; it is comparatively smaller, with a

more proboscis-like head, and has no fringed collar or digitated processes. The shell differs from *Phasianella* in not possessing the same beautiful porcelain surface, but on the contrary numerous varieties of sculpture, and from *Turbo* in being of uniformly smaller size, and never pearly.

The *Littorinæ* appear to be very generally distributed in both hemispheres, but it will not be possible to notify their localities, or form an estimate of their number, until the species have been collected and named. "They dwell," says M. Deshayes, "as their title indicates, on the rocks along shore, and are almost always out of the water, placing themselves within reach of the spray."

The miscellaneous assemblage of genera comprehended in the family *Littorinidae* of Mr. Gray's Synopsis, have but a remote affinity with the group represented by the present genus.

For List of Species see Appendix.

Figure.

LITTORINA PULCHRA. Pl. 12. Fig. 60. Shell, showing its rounded-ovate aperture and slightly expanded lip.—*From Mr. Cuming's collection.*

Genus 6. MARGARITA, Leach.

Animal; similar to that of *Trochus*.*

Shell; turbinated, sometimes rather depressed, sometimes largely umbilicated, outer surface smooth, polished, with, in many instances, a shining horny epidermis, inner surface delicately pearly, iridescent; margins disjoined, lip simple, acute. Operculum horny, spiral.

The animal of this genus, according to the testimony of M. Deshayes, differs in no respect from that of *Trochus*, yet the shell presents a singular peculiarity of character, constant alike in all the species. They are, however, susceptible of being divided into two very distinct groups, one of rather light spiral structure, largely umbilicated, of very much the form of *Cyclostoma*, the other, to which the species selected for illustration belongs,

* *Fide* Deshayes. "Grâce à l'extrême obligeance de M. Janelle, nous avons de Spitzberg l'animal d'une espèce qui pourrait entrer dans le genre *Margarita*, et cet animal ne diffère en rien de celui de *Trochus*."—*Anim. sans vert.* vol ix. p. 185.

of more solid growth, having a porcellanous surface with the umbilicus filled up by a callous deposit. The first of these affect a northern latitude, and are amongst the most conspicuous of the molluscous fauna of Greenland and Spitzbergen; they exhibit little variety of colouring and no pattern, being mostly of a uniform yellowish olive or pale brown. The last are apparently inhabitants of a warmer region, of more striking colours and prettily striped; the *M. tæniata*, for example, is encircled by fillets of bright red, and the *M. pulchella* by alternate bands and lines of dark violet blue.

Species.

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|-------------------------------|--------------------------------------|--|
| 1. acuminata, <i>Sowerby.</i> | 7. minutissima, <i>Mighels.</i> | 13. taeniata, <i>Sowerby.</i> |
| 2. arctica, <i>Leach.</i> | 8. pulchella, <i>Reeve.</i> | 14. umbilicalis, <i>Br. & Sow.</i> |
| 3. carnea, <i>Sowerby.</i> | 9. sigaretina, <i>Sowerby.</i> | 15. undulata, <i>Sowerby.</i> |
| 4. costellata, <i>id.</i> | 10. Solariiformis, <i>id.</i> | 16. violacea, <i>King.</i> |
| 5. expansa, <i>id.</i> | 11. striata, <i>Brod. & Sow.</i> | 17. vulgaris, <i>Leach.</i> |
| 6. Groenlandica, <i>Beck.</i> | 12. sulcata, <i>Sowerby.</i> | |
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Figure.

MARGARITA PULCHELLA. Pl. 14. Fig. 69 and 70. Shell, showing the base and callous deposit at the umbilicus.—*From Mr. Cuming's collection.*

Genus 7. TURBO, *Linnæus.*

Animal; disk short, thick, bearing at its hinder extremity sometimes a horny, mostly a calcareous operculum; head cylindraceous, proboscis-shaped and truncated in front, tentacles situated a little in arrear, with the eyes elevated on short pedicles at the outer base.

Shell; turbinated, rather thick, sometimes umbilicated, interior silver-, rarely golden-, pearly, whorls more or less rounded, rough or smooth, mostly spirally ribbed, with the margins disjoined.

The animals of *Turbo*, *Trochus*, *Delphinula*, *Margarita*, and *Monodonta* are so nearly similar that much difference of opinion has prevailed amongst authors as to the propriety of separating them. The head has a blunt proboscis-like form, with the tentacles a little behind, bearing the eyes on

short pedicles at the outer base, and the disk is short and thick, with mostly a calcareous, sometimes a horny operculum. The number of species is, however, very extensive, and the shells of these genera afford sufficient characters to entitle them to be generically distinguished in the manner commonly adopted. Much undue value has been set upon the composition of the operculum, and a new division of the Lamarckian *Trochi* and *Turbines* has been attempted, by throwing the species of these genera together, and re-arranging them according to the operculum, referring those in which it is horny to *Trochus*, and those in which it is calcareous to *Turbo*. Observation tends, however, to show that the operculum is a very subordinate part of the species, and that in *Trochus* and *Turbo*, as in *Natica*, it is sometimes horny, sometimes calcareous, without any corresponding differences in the shell or its animal inhabitant, to support the notion of its indicating a difference of genus.

The opercula of the *Turbinacea* furnish no characters for generic arrangement, but are well worth observing on account of their variation in different species. It is mostly of a solid testaceous substance, sometimes smooth, sometimes granulous; in some species it is deeply circularly grooved, the ridges being granulated or serrated, whilst in others it is composed of a crowded tuft of club-shaped particles. In all these, the inner surface is coated with a horny layer, and in the *T. pica* and one or two other species the operculum consists of a horny lamina only, without any calcareous deposit. Considerable variation will thus be found to occur in the opercula of shells without any corresponding variation in the shell, and shells of very different character have very often the same operculum; the same heavy, stony operculum which is common to *Turbo* is frequent in *Trochus*, and the horny operculum of *Trochus* is to be met with in *Turbo*.

It results from these observations that there can be no true generic distinction between the genera of which we have been treating; the *Trochi* are to the *Turbines* among marine shells, what the *Carocollæ* are to the *Helices* among land shells, the animal in neither case presenting any apparent difference; but for the convenience of reference, and in order not to subvert the names by which the species of this group have been so long familiarly known, the Lamarckian genera may be adopted without prejudice to the laws of classification.

The *Turbines* are sometimes smooth, almost porcellanous, but mostly spirally ribbed or grooved, ornamented with scales or laminæ. The interior layer and chief substance of the shell consists of mother of pearl, often very iridescent and sometimes of a golden hue. The shells are remarkable for their symmetry of form and vivid admixture of colours, they are distinguished by their bold tubular growth, and will not stand pyramidal on their base like the *Trochi*. A complete monograph of the genus published in the 'Conchologia Iconica' comprises sixty species, and shows their

range of habitation to be limited to warm climates, chiefly the islands of the Eastern Archipelago, Australia, and New Zealand, two species being found in the Mediterranean, and one or two in the West Indies, Mexico, and California.

Species.

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| 1. <i>argyrostoma</i> , <i>Linn.</i> | 21. <i>lugubris</i> , <i>Reeve.</i> | 41. <i>rugosus</i> , <i>Linn.</i> |
| 2. <i>articulatus</i> , <i>Reeve.</i> | 22. <i>magnificus</i> , <i>Jonas.</i> | 42. <i>sanguineus</i> , <i>id.</i> |
| 3. <i>canaliculatus</i> , <i>Gmel.</i> | 23. <i>margaritaceus</i> , <i>Linn.</i> | 43. <i>sarmaticus</i> , <i>id.</i> |
| 4. <i>Chemnitzianus</i> , <i>Reeve.</i> | 24. <i>marginatus</i> , <i>Nuttal.</i> | 44. <i>saxosus</i> , <i>Reeve.</i> |
| 5. <i>chrysostoma</i> , <i>Linn.</i> | 25. <i>marmoratus</i> , <i>Linn.</i> | 45. <i>setosus</i> , <i>Gmel.</i> |
| 6. <i>cidaris</i> , <i>Gmel.</i> | 26. <i>militaris</i> , <i>Reeve.</i> | 46. <i>smaragdus</i> , <i>id.</i> |
| 7. <i>circularis</i> , <i>Reeve.</i> | 27. <i>murreus</i> , <i>id.</i> | 47. <i>sparverius</i> , <i>id.</i> |
| 8. <i>corallinus</i> , <i>id.</i> | 28. <i>Natalensis</i> , <i>id.</i> | 48. <i>speciosus</i> , <i>Reeve.</i> |
| 9. <i>cornutus</i> , <i>Gmel.</i> | 29. <i>Nicobaricus</i> , <i>Gmel.</i> | 49. <i>Spenglerianus</i> , <i>Gmel.</i> |
| 10. <i>coronatus</i> , <i>id.</i> | 30. <i>niger</i> , <i>Gray.</i> | 50. <i>spinosus</i> , <i>Reeve.</i> |
| 11. <i>crassus</i> , <i>Gray.</i> | 31. <i>nivosus</i> , <i>Reeve.</i> | 51. <i>squamiger</i> , <i>id.</i> |
| 12. <i>crenulatus</i> , <i>Gmel.</i> | 32. <i>petholatus</i> , <i>Linn.</i> | 52. <i>tessellatus</i> , <i>Kiener.</i> |
| 13. <i>fluctuatus</i> , <i>Reeve.</i> | 33. <i>pica</i> , <i>id.</i> | 53. <i>Ticaonicus</i> , <i>Reeve.</i> |
| 14. <i>gemmaatus</i> , <i>id.</i> | 34. <i>poreatus</i> , <i>Reeve.</i> | 54. <i>torquatus</i> , <i>Gmel.</i> |
| 15. <i>histrio</i> , <i>id.</i> | 35. <i>porphyrites</i> , <i>Gmel.</i> | 55. <i>Trochoides</i> , <i>Reeve.</i> |
| 16. <i>imperialis</i> , <i>Gmel.</i> | 36. <i>pulcher</i> , <i>Reeve.</i> | 56. <i>Tursicus</i> , <i>id.</i> |
| 17. <i>Japonicus</i> , <i>Reeve.</i> | 37. <i>pustulatus</i> , <i>id.</i> | 57. <i>undulatus</i> , <i>Chemn.</i> |
| 18. <i>Jourdani</i> , <i>Kiener.</i> | 38. <i>pyropus</i> , <i>id.</i> | 58. <i>variabilis</i> , <i>Reeve.</i> |
| 19. <i>Lajonkairii</i> (<i>Delph.</i>), D. | 39. <i>radiatus</i> , <i>Gmel.</i> | 59. <i>versicolor</i> , <i>id.</i> |
| 20. <i>laminiferus</i> , <i>Reeve.</i> | 40. <i>rubicundus</i> , <i>Reeve.</i> | |

Figure.

TURBO PETHOLATUS. Pl. 13. Fig. 65. Shell, showing its bold tubular structure and rounded aperture.

Genus 8. TROCHUS, *Linnæus.*

Animal; similar to that of Turbo.

Shell; conical, pyramidal, more or less flattened beneath; whorls rather depressed, mostly angled at the periphery; columella arched, margins disjoined, lip simple.

Having spoken freely of this genus and its affinities under the head of *Turbo*, it only remains to notice the great variety and detail of sculpture

developed in the different species. The shell of *Trochus* seems to exhibit an exuberance of design in this respect, which accompanies its pyramidal form, and offers a generality of character by which to distinguish it from *Turbo*. In every species of *Turbo*, which is not absolutely smooth, the sculpture, be it ribs, or tubercles, or scales, is arranged transversely, but in *Trochus* it is mostly carved longitudinally or obliquely, in patterns more varied and more fanciful. In *T. calcar* the whorls are armed with prominent tufted tubercles, in *T. unguis* with vaulted scales, in *T. undosus* they are bordered with a waving rib, like a twisted cable, in *T. olivaceus* carved with oblique slightly waved ridges, whilst the *T. gemmosus*, *annulatus*, and others, are studded with various designs of beading.

The *Trochi* are numerous in species, and widely and abundantly distributed; they occur on our own coast, also in the Mediterranean, and in all tropical latitudes.

For List of Species see Appendix.

Figure.

TROCHUS MODESTUS. Pl. 13. Fig. 67. Shell, showing its pyramidal form.—*From Mr. Cuming's collection.*

Genus 9. **TROCHISCUS**, Sowerby.

Animal; — ?

Shell; *depressly orbicular, somewhat discoid, largely and deeply umbilicated, rather solid, smooth, pearly within, margins disjoined, lip simple. Operculum horny, internally very smooth and shining, externally set with circular rows of fibrous flakes curled over towards the centre.*

The solitary species which has been erected into a genus under the name of *Trochiscus* is certainly a shell of very anomalous character. It may be described as a compound of *Turbo*, *Trochus*, *Solarium*, and *Rotella*, partaking most of the typical structure of the first of these genera, but scarcely comprehended within the limits assigned to it by Lamarek. The shell is of a heavy *Rotella*-like substance, smooth on the outer surface, and, as in *Solarium*, the umbilicus penetrates inwardly to the apex. The operculum, on the other hand, is more like that of *Delphinula*, with the addition of the prominent circular rows of curled flakes noticed above.

It is a native of New Holland.

Figure.

TROCHUSCUS NORRISII. Pl. 14. Fig. 68. Shell, showing its smooth solid growth, large deep umbilicus and operculum.—*From Mr. Cuming's collection.*

Genus 10. MONODONTA, Lamarck.

Animal; similar to that of *Turbo*.

Shell; rather small, ovate or conoidal, rather solid, columella excavated, truncated and toothed at the base, lip sometimes dentately ridged within, margins disjoined.

The genus *Monodonta* was introduced by Lamarck for the sake of distinguishing a numerous group of *Trochi*, from the typical forms of that genus, on account of the columella being suddenly truncated in a manner so as to present a tooth. It has not, however, been generally adopted on account of the gradual development of this peculiarity commencing in *Trochus*, and rendering it difficult to say exactly where the genus under consideration should commence. In treating of the *Turbinacea* generically in a former work, I came to the same conclusion as M. Deshayes, that the genus *Monodonta* is unnecessary; but upon coming to an examination of the species, so extensive and characteristic a series being conveniently separated under this head, I have not hesitated to follow Lamarck's arrangement of the series for facility of reference.

For List of Species see Appendix.

Figure.

MONODONTA LABEO. Pl. 13. Fig. 64. Shell, showing a characteristic development of the tooth upon the columella.—*From Mr. Cuming's collection.*

Genus 11. MORULUS.

Animal; —?

Shell; extremely variable in form, sometimes ovately turbinated with the apex depressed, sometimes Trochi-form, raised towards the apex into a sharp pyramid, of a peculiar opake white substance more or less stained with brown; columella distinguished by a depressed lamelliform tooth.

It is rarely that colour presents any character of sufficient constancy to be recorded as one of the distinguishing features of a genus. In the present instance the shell is most inconstant in form, for whilst in one instance it is of an ovately turbinated growth like a *Nerita* or *Delphinula*, in another it is of a sharp pyramidal form according to the true type of *Trochus*. In all cases the shell is of a peculiar opake cream-white substance, more or less stained with dark brown, and it is a permanent character of the columella to be furnished with a sharp lamelliform or shelf-like tooth. One of these forms was collected by Mr. Cuming at the Philippine Islands, the other at Panama.

For List of Species see Appendix.

Figure.

MORULUS CIDARIS, Pl. 13. Fig. 63. Shell, showing its dull opake substance and lamellated tooth upon the columella.—*From Mr. Cuming's collection.*

Genus 12. ROTELLA, Lamarck.

Animal ; —— ?

Shell ; *orbicular, smooth, polished, spire very short, base callous, about equally convex with the spire, aperture semicircular.*

The *Rotellæ* form another interesting section of the *Trochus* tribe, of small size, and easily recognised by their lenticular shape and polished surface. The species selected for illustration is one of extreme rarity and extraordinary large size ; few exceeding a half to three quarters of an inch in diameter. It is curious to observe that the *Rotellæ*, with their polished exterior, are never found with any foreign matter attached to them, and M. Deshayes thinks that this indicates a peculiar organization of the animal, in which the mantle is extended over the shell.

Species.

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| 1. <i>costata</i> , Valenciennes. | 4. <i>gigantea</i> , Lesson. | 7. <i>rosea</i> , Lamarck. |
| 2. <i>elegans</i> , Beck. | 5. <i>Javanica</i> , Lamarck. | 8. <i>suturalis</i> , <i>id.</i> |
| 3. <i>Guamensis</i> , Quoy. | 6. <i>monilifera</i> , <i>id.</i> | 9. <i>vestiaria</i> , Sowerby. |
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Genus 13. PHORUS, *De Montford.*

Animal; ——?

Shell; *orbicular, rather conical, sometimes largely umbilicated, spire short, obtuse, whorls regular, more or less covered with agglutinated fragments of stones, shells, &c., sometimes furnished at the periphery with spouted tubes; under surface rather concave, granular, striated or lamellated; aperture somewhat depressed, not pearly, margins disjoined, lip simple and acute. Operculum thin, horny, oval.*

The *Carrier Trochus* shell has always been an object of interest on account of the singular manner in which it is loaded with fragments of stones, shells, corals, or any marine débris with which it may chance to have been in contact. It would appear as though its animal occupant were furnished with a powerful kind of cement, which it exudes during the formation of the shell in such a manner that whatever immediate substances it is able to remove, become firmly agglutinated to it, and cannot afterwards be dislodged without violence; the mollusk seems moreover to mould its shell in a manner to receive them.

For the purpose of distinguishing the Lamarekian *Trochus agglutinans*, long known to amateurs by its soubriquets of 'Mineralogist' and 'Conchologist,' according to whether its burden was composed of stones or shells, De Montford proposed the name of *Phorus*, and several species are now known, in each of which the agglutinating property is differently exercised. The shell varies materially from the *Trochus* type, being almost colourless, not pearly, and of a more fragile texture; one or two species present a somewhat *Calyptrea*-like aspect, but they belong evidently to an animal of locomotive habits, and the whorls are more completely convoluted than in that genus.

The distinction of species, independent of the usual characters of sculpture, &c., is represented in the method of agglutinating as follows:—In the *P. onustus* (*T. agglutinans*, Lamarck) the entire surface is covered indiscriminately with stones, shells, or corals; in the *P. calculiferus* the agglutinating property is limited to the outer edge of the whorls, collecting only very small stones, intermixed with shells, generally valves of *Nucula* or *Pectunculus*. The *P. corrugatus* attaches flat fragments of shell, the *P. Indicus* and *solaris* small pebbles on the first one or two whorls only, and in the *P. exutus* rarely more than the mark of some pebbles having been at one time agglutinated is discernible.

The *P. onustus* is an inhabitant of the West Indies, but all the other species are from the eastern world, Japan, China, and the Philippines.

The beautiful spouted-tubed *P. solaris*, known to Linnaeus, but still of great rarity in fine condition, is from Malacca.

Species.

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|---|---|--|
| 1. <i>calculiferus</i> , <i>Reeve</i> . | 4. <i>exutus</i> , <i>Reeve</i> . | 7. <i>pallidulus</i> , <i>Reeve</i> . |
| 2. <i>cereus</i> , <i>id.</i> | 5. <i>Indicus (Trochus)</i> , <i>W.</i> | 8. <i>solaris (Trochus)</i> , <i>Linn.</i> |
| 3. <i>corrugatus</i> , <i>id.</i> | 6. <i>onustus</i> , <i>Reeve</i> . | 9. <i>Solarioides</i> , <i>Reeve</i> . |
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Figure.

PHORUS ONUSTUS. Pl. 14. Fig. 71. Shell, showing the aperture, with three valves of *Cardium*, one of *Pectunculus*, one of *Area*, and a piece of coral agglutinated to the periphery of the last whorl, which in each instance is moulded to receive them.

Genus 14. SOLARIUM, Lamarck.

Animal; disk small, oval, elevated on a short pedicle, and furnished at its hinder extremity with a small horny spiral operculum, head flattened, and prolonged into two tentacles, at the base of each of which is a short pedicle, supporting the eyes; the mantle is reflected into a collar around the aperture.

Shell; circular, depressely conoid, consisting of a number of whorls closely convoluted together, but in such an annular arrangement as to form a wide perspective umbilicus, outer edge of the whorls sharply angled, imparting a trapeziform shape to the aperture, of which the lip is simple and acute.

The *Stair-case Trochus*, another shell equally well known to collectors with the last, also constitutes the type of a genus to which several interesting species may be referred, and the importance of which has been confirmed by observations on the animal made by MM. Quoy and Gaimard, the eminent naturalists of the Voyage de l' Astrolabe. Elevated on a short pedicle, like the *Turbines* and *Trochi*, and bearing a modified resemblance to those genera in the reflected collar of the mantle, the head is not shaped like a proboscis, but prolonged, somewhat after the manner of *Buccinum* and *Purpura*, into two elongated tentacles.

Species.

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|-----------------------------------|---------------------------------|----------------------------------|
| 1. areola, <i>Deshayes.</i> | 9. fragile, <i>Hinds.</i> | 18. perdix, <i>Hinds.</i> |
| 2. asperum, <i>Hinds.</i> | 10. fulvum, <i>id.</i> | 19. perspectivum, <i>Lam.</i> |
| 3. cælatum, <i>id.</i> | 11. granulatum, <i>Lamarek.</i> | 20. placentale, <i>Hinds.</i> |
| 4. Chemnitzii, <i>Kiener.</i> | 12. hybridum, <i>id.</i> | 21. purpuratum, <i>id.</i> |
| 5. cingulum, <i>id.</i> | 13. quadriceps, <i>Hinds.</i> | 22. stramineum, <i>Lamarek.</i> |
| 6. cylindraceum, <i>Deshayes.</i> | 14. levigatum, <i>Lamarek.</i> | 23. Trochoides, <i>Deshayes.</i> |
| 7. dealbatum, <i>Hinds.</i> | 15. luteum, <i>id.</i> | 24. variegatum, <i>Lamarek.</i> |
| 8. fenestratum, <i>id.</i> | 16. maculatum, <i>Reeve.</i> | 25. virgatum, <i>Hinds.</i> |
| | 17. magnum, <i>Lesueur.</i> | |
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Figure.

SOLARIUM MACULATUM. Pl. 13. Fig. 62. Shell, showing its very depressed lenticular convolution.—*From Mr. Cuming's collection.*

Genus 15. DELPHINULA, *Lamarek.*

Animal; similar to that of *Turbo*.

Shell; turbinated, almost discoid, tubular and somewhat loosely convoluted, mostly ornamented with scales, spines, or tubercles, frequently largely umbilicated; aperture rounded, margins continuous, interior pearly, lip sometimes frilled.

The *Delphinulae*, first distinguished as a genus by Lamarek, are chiefly remarkable on account of their loosely convoluted growth and, so far as regards the typical species, their luxuriant display of scales and tubercles or spines. The shell has consequently a rounded aperture, with no columellar axis, and bears much the same relation to *Turbo* as *Cyclostoma* does to *Helix*, the animal being in either case, with trifling modification, the same. There are, however, two very distinct sections of the genus, one above referred to as comprising the typical species, in which the shell is of larger size, richer in colour, and of more luxuriant growth; and the other in which the shells, extremely delicate and curious in their detail of sculpture, are somewhat stout, whilst others are of comparatively thin texture, and in some of which the interior is not pearly. Allied to these are one or two rather fragile species, partaking in their general aspect of the character of *Cyclostoma* and *Sigaretus*, and belonging probably to a different generic type of which our knowledge is at present insufficient.*

* An interesting example of this group has just been sent me by Mr. Robert Swift, of St. Thomas's, West Indies, described as having been picked up on the sea-beach by the Pastor of the Dutch Reformed Church of that place.

All the *Delphinulae*, excepting those just spoken of, are inhabitants of the eastern world, principally in the vicinity of the Philippine Islands, China, and Malacca; the *D. Tyria*, *incisa*, and *Peronii*, three most characteristic species, are from New Holland.*

Species.

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|------------------------------|---|---|
| 1. aculeata, <i>Reeve.</i> | 10. discoidea, <i>Kiener.</i> | 19. nodosa, <i>Reeve.</i> |
| 2. atrata, <i>id.</i> | 11. distorta (<i>Turbo</i>), Linn. | 20. <i>Peronii</i> , <i>Kiener.</i> |
| 3. australis, <i>Kiener.</i> | 12. evoluta, <i>Reeve.</i> | 21. radiata, <i>id.</i> |
| 4. cancellata, <i>id.</i> | 13. formosa, <i>id.</i> | 22. <i>Reeviana</i> , <i>Hinds.</i> |
| 5. cidaris, <i>Reeve.</i> | 14. imperialis, <i>id.</i> | 23. <i>Scalarioides</i> , <i>Reeve.</i> |
| 6. clathrata, <i>id.</i> | 15. incisa, <i>id.</i> | 24. <i>sphærula</i> , <i>Kiener.</i> |
| 7. Cobijensis, <i>id.</i> | 16. laciinata (<i>Turbo</i>), L. | 25. <i>sydereia</i> , <i>Reeve.</i> |
| 8. crenata, <i>Kiener.</i> | 17. muricata, <i>Reeve.</i> | 26. <i>Tyria</i> , <i>id.</i> |
| 9. depressa, <i>id.</i> | 18. nivea (<i>Turbo</i>), <i>Chemn.</i> | 27. <i>varicosa</i> , <i>id.</i> |

Figure.

DELPHINULA IMPERIALIS. Pl. 15. Fig. 77. Shell, showing its rounded aperture, loosely convoluted tubular structure and luxuriant ramified growth.—*From Mr. Cuming's collection.*

Genus 16. SCALARIA, Lamarch.

Animal; cylindrical, disk short and nearly square; head short, obtuse, flattened, with a pair of small sessile eyes, situated at the outer base of the tentacles. Operculum horny, spiral. Shell; tubularly turreted, the whorls being rarely contiguous and encircled throughout with a greater or less number of elevated ribs; aperture round, margin continuous and reflected.

There are few mollusks which produce a more delicate and beautifully symmetrical shell than the *Scalaria*; no shell has been more highly prized by the amateur than the Wentle-Trap, and none in which the absence of colour is so lavishly compensated by delicacy and variety of sculpture. Although a species inhabits the seas of Europe in tolerable abundance, the soft parts have not been very fully described; sufficient is known of the animal to show that it is closely allied to *Delphinula*, and, as in most

* The small white *Delphinulae* are so far removed from the typical species of the genus, that it would be as well to adopt the genus *Liotia* under which they have been separated by Mr. Gray.

of the genera of this extensive series of vegetable feeders, the foot is limited in size and its operculum is horny.

It is somewhat curious that in a genus numbering nearly a hundred species, of which most are inhabitants of equatorial seas, there is so little indication of colour. Where such exists it is extremely effective, the ground colouring of the whorl being of a rich semitransparent brown, whilst the rings are white, as in the *S. Pallasii*; and it is equally worthy of remark that the most highly coloured species, the *S. communis* of our own shores, is that which inhabits the coldest region.

The species are chiefly characterized by the difference in the number and developement of the rings, which it may be remarked are formed at intervals by the reflected margin of the aperture, and are always alike in individuals of the same. Unlike other shells of this family in which the lip is rarely reflected until the animal arrives at maturity, the formation of rings commences after this manner from a very early period of growth, and these, less complicated in structure, are analogous to the variecs of the canaliferous tribes. In the well-known *Scalaria pretiosa* of the China Seas, the rings or varices are situated at moderate intervals, increasing in area in exact geometrical proportion with the size of the shell; in *S. imperialis* they are of the same comparative substance, but developed at much more frequent intervals; in *S. lyra* they are extremely fine, having almost the appearance of silken threads; in *S. raricostata* they are only deposited at remote intervals, and with considerable irregularity; and in *S. alata* they are characterized at the upper part by the addition of a curious wing-like process, of which there are various indications more or less strongly exhibited in many species. The most aberrant form of the genus is the *S. magnifica*, in which the whorls are contiguous, and the typical peculiarity of the genus seems scarcely to enter into its plan of growth, there being only a few slight rings at irregular intervals on the last two whorls. In composition and texture this shell is, nevertheless, a *Scalaria*, and affords an important link with *Turritella*.

Among the localities noted by Mr. Sowerby in his beautiful monograph of this genus lately published in the 'Thesaurus Conchyliorum,' are the following:—Eastern Seas principally, West Indies, Pacific Islands, California, and New Holland.

Species.

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|-----------------------------|-----------------------------|--------------------------------|
| 1. aciculina, <i>Hinds.</i> | 5. albilineata, <i>Sow.</i> | 9. bicarinata, <i>Sow.</i> |
| 2. aculeata, <i>Sow.</i> | 6. angulata, <i>Say.</i> | 10. bulbulus, <i>id.</i> |
| 3. acuminata, <i>id.</i> | 7. aurita, <i>Sow.</i> | 11. bullata, <i>id.</i> |
| 4. alata, <i>id.</i> | 8. australis, <i>Lam.</i> | 12. Catanauanensis, <i>id.</i> |

| | | |
|-----------------------------------|-----------------------------------|---------------------------------|
| 13. clathratulus, <i>Montagu.</i> | 40. granulosa, <i>Q. & G.</i> | 67. polita, <i>id.</i> |
| 14. clathrus, <i>Kiener.</i> | 41. <i>Groenlandica, Kiener.</i> | 68. porrecta, <i>Hinds.</i> |
| 15. cochlea, <i>Sow.</i> | 42. hexagona, <i>Sow.</i> | 69. pretiosa, <i>Lam.</i> |
| 16. communis, <i>Lam.</i> | 43. hyalina, <i>id.</i> | 70. principalis, <i>Pallas.</i> |
| 17. concinna, <i>Sow.</i> | 44. immaculata, <i>id.</i> | 71. pulcherrima, <i>Sow.</i> |
| 18. connexa, <i>id.</i> | 45. imperialis, <i>id.</i> | 72. pyramidalis, <i>Sow.</i> |
| 19. coronata, <i>Lam.</i> | 46. inconspicua, <i>id.</i> | 73. raricostata, <i>Lam.</i> |
| 20. crassa, <i>Sow.</i> | 47. indistincta, <i>id.</i> | 74. replicata, <i>Sow.</i> |
| 21. crassicostata, <i>id.</i> | 48. irregularis, <i>id.</i> | 75. rubrolineata, <i>id.</i> |
| 22. crassilabrum, <i>id.</i> | 49. laxata, <i>id.</i> | 76. similis, <i>id.</i> |
| 23. creberrima, <i>Hinds.</i> | 50. lineata, <i>Say.</i> | 77. statuminata, <i>id.</i> |
| 24. crenata, <i>Linn.</i> | 51. lineolata, <i>Kiener.</i> | 78. subtilis, <i>id.</i> |
| 25. curvilineata, <i>Sow.</i> | 52. lyra, <i>Sow.</i> | 79. sulcata, <i>id.</i> |
| 26. decussata, <i>Lam.</i> | 53. magnifica, <i>id.</i> | 80. suturalis, <i>Hinds.</i> |
| 27. denticulata, <i>Sow.</i> | 54. marmorata, <i>id.</i> | 81. tenuicostata, <i>Sow.</i> |
| 28. diadema, <i>id.</i> | 55. Martimii, <i>Wood.</i> | 82. tenuis, <i>id.</i> |
| 29. Dianæ, <i>Hinds.</i> | 56. Mindoroensis, <i>Sow.</i> | 83. Trevelyana, <i>Leach.</i> |
| 30. dubia, <i>Sow.</i> | 57. Mitraformis, <i>id.</i> | 84. trifasciata, <i>Sow.</i> |
| 31. Elenensis, <i>id.</i> | 58. multicostata, <i>id.</i> | 85. turricula, <i>id.</i> |
| 32. fasciata, <i>Sow.</i> | 59. muricata, <i>Kiener.</i> | 86. Turtonis, <i>id.</i> |
| 33. fragilis, <i>Hanley.</i> | 60. Novangliae, <i>Courthouy.</i> | 87. undulata, <i>id.</i> |
| 34. friabilis, <i>Sow.</i> | 61. obesa, <i>Sow.</i> | 88. unifasciata, <i>id.</i> |
| 35. fusca, <i>id.</i> | 62. obliqua, <i>id.</i> | 89. varicosa, <i>Lam.</i> |
| 36. Georgettina, <i>Kiener.</i> | 63. obtusa, <i>id.</i> | 90. venosa, <i>Sow.</i> |
| 37. glabrata, <i>Hinds.</i> | 64. ovalis, <i>id.</i> | 91. vestalis, <i>Hinds.</i> |
| 38. gracilis, <i>Sow.</i> | 65. Pallasii, <i>Kiener.</i> | 92. vulpina, <i>id.</i> |
| 39. gradata, <i>Hinds.</i> | 66. Philippinarum, <i>Sow.</i> | |

Figure.

SCALARIA IMPERIALIS. Pl. 15. Fig. 74. Shell, exhibiting its tubular structure and periodical deposit of annular variccs.—*From Mr. Cuming's collection.*

Genus 17. MONOPTYGMA, *Lea.*

Animal; *unknown.*

Shell; *subfusiform or elongately subulate, rounded and imperforated at the base, columella distinguished by an obscure winding plait, aperture small, entire.*

For this genus we are indebted to Mr. Lea of Philadelphia, by whom it was founded, upon a fossil species, in his 'Contributions to Geology,'

p. 185. It has a small oblong aperture, no umbilicus, and the columella is furnished at the upper part with a small winding plait, more or less obscurely developed.

Although Mr. Lea notices a recent species, which he proposes to call *Monoptygma Melanoides*, he does not accompany the name with any description. The species here figured, is a sharp subulate shell, rounded at the base, composed of about ten whorls of a convexly flattened growth, each encircled by six fine equidistant linear grooves. The sutures are somewhat deeply impressed, and there is no indication of any umbilicus. It is of rather solid structure and evidently of marine habits.

Figure.

MONOPTYGMA CINEREA. Pl. 15. Sp. 76. Shell, showing its small entire aperture.—*From Mr. Cuming's collection.*

Genus 18. EULIMA, *Risso.*

Animal; *unknown.*

Shell; *subulate, frequently very peculiarly obliquely distorted, not umbilicated, polished ivory white, shining, whorls generally distinguished by a flattened or channelled varix; columella arched, aperture small, entire, lip simple, obtuse.*

The genus *Eulima*, established by Risso, includes a limited, but extremely natural group of small subulate shells, distinguished by their solid structure and white enamelled surface, shining like porcelain. Many of the species have likewise a curious distorted obliquity of growth, occasioned in some measure by the formation of a row of channelled varices, consisting of one in each whorl deposited a little in advance of that which precedes it.

The typical species of this genus is the *Turbo politus* of Linnaeus, Dillwyn, and Montagu; *Turbo subulatus* of Donovan and Dillwyn is also one of the group, and M. Deshayes refers *Melania nitida* of Lamarck to *Eulima*. Of the species figured under this head in Sowerby's 'Conchological Illustrations,' a portion of them have been separated by M. Deshayes for ample reasons under the title of *Bonellia*, properly *Niso*.

The *Eulimæ* are very distinct in their generic character, having little affinity with *Scalaria* and less with *Melania*; there are one or two species on the southern shores of Europe, one from New Holland, and two or three species inhabit the Pacific Islands.

Species.

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|--------------------------------|-----------------------------------|-------------------------------------|
| 1. articulata, <i>Sowerby.</i> | 5. labiosa, <i>Sowerby.</i> | 8. pusilla, <i>Sowerby.</i> |
| 2. brevis, <i>id.</i> | 6. major, <i>id.</i> | 9. subangulata, <i>id.</i> |
| 3. distorta, <i>Deshayes.</i> | 7. polita (<i>Turbo</i>), Linn. | 10. subulata (<i>Turbo</i>), Don. |
| 4. hastata, <i>Sowerby.</i> | | |
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Figure.

EULIMA MAJOR. Pl. 15. Fig. 78. Shell, of polished porcelain white, showing the aperture and oblique distortion of the spire.—*From Mr. Cuming's collection.*

Genus 19. NISO, *Risso.*

Animal; *unknown.*

Shell; *turruculated, rather solid, polished, apex rather sharply acuminated, whorls turned upon a more or less wide axis, producing a deep umbilicus, columella simple, aperture rather small, angular and slightly channelled at the base; variously painted.*

The genus *Niso* was founded by M. Risso in his ‘Histoire Naturelle de l’Europe Méridionale,’ p. 218, for the purpose of distinguishing a fossil shell agreeing in general character with Lamarck’s *Bulimus terebellatus*, allied to the genus *Eulima*, but differing in having a deep umbilicus, occasioned by the broad axis of volution of the whorls, penetrating nearly to the apex.

Among the shells collected by Mr. Cuming on the shores of Western America, and figured by Mr. Sowerby in his ‘Conchological Illustrations,’ are three, referred to the genus *Eulima*, which present the same remarkable character as that above noted, accompanied by a variegated style of painting and a situated inclination of the aperture. M. Deshayes, perceiving the character by which these are distinguished from *Eulima* to be of importance, arranged them in his edition of Lamarck, together with the fossil *B. terebellatus*, as a new genus under the title of *Bonellia*. Had the genus, however, not been anticipated by M. Risso, the name *Bonellia* could not have been maintained, it being already given to a genus of Echinoderms by M. Rolando, and published in the same work, vol. iii. p. 470.

No observations have been made on the animal of this genus. Of the species collected by Mr. Cuming, the *N. splendidula* and *imbricata* were

obtained at St. Elena, West Columbia, and the *N. interrupta* was dredged in the Gulf of Nicoya. The *N. brunnea* is reported to be from China.

Species.

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|---|-----------------------------------|---|
| 1. <i>brunnea</i> (<i>Eul.</i>), Sow. | 2. <i>imbricata</i> , <i>Sow.</i> | 3. <i>interrupta</i> (<i>Eul.</i>), Sow. |
| 4. <i>marmorata</i> , <i>Sow.</i> | | 5. <i>splendidula</i> (<i>Eul.</i>), Sow. |

Figure.

NISO SPLENDIDULA. Pl. 15. Fig. 79. Shell, showing its sinuated aperture and very deep umbilicus.—*From Mr. Cuming's collection.*

Genus 20. RISSOA, Fréminville.

Animal; disk elongated, somewhat triangular, truncated in front, pointed behind, and furnished with a horny operculum; head cylindrical and proboscis-shaped, having a long pointed tentacle on each side, at the outer base of which are situated the eyes.

Shell; turriculated, enlarged at the base, rarely umbilicated; sometimes short; aperture oval, semilunar, slightly channelled, lip generally thickened and more or less produced.

The species composing this genus being for the most part extremely small, they have been much neglected by conchologists. M. Risso appears to have been the first to observe their claim to rank as a particular genus, when M. Fréminville paid him the compliment of associating them under a new generic type with his name. Lamarck included the few species known to him under the head of *Melania*, but various species have been described since that period by MM. Desmarest, Michaud, and Philippi, including the animal as above described.

Several of these inhabit the Mediterranean, between twenty and thirty have been now observed on the shores of the British Isles, and it is not impossible that the number will be greatly increased, as the same powers of observation become extended to more distant localities.

The shell may be chiefly recognised from its being enlarged at the base, whilst the upper part of the aperture is slightly channelled; the lip is mostly thickened and more or less produced or expanded. The following

list of the species is from the last edition of Lamarck. A monograph of the genus is much needed.

Species.

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|----------------------------------|--|-----------------------------------|
| 1. acicula, <i>Sow.</i> | 23. gracilis, <i>Macgill.</i> | 45. pusilla, <i>Desh.</i> |
| 2. acuta, <i>Desm.</i> | 24. grossa, <i>Michaud.</i> | 46. pygmæa, <i>Michaud.</i> |
| 3. alba, <i>Forbes.</i> | 25. Guerinii, <i>Récluz.</i> | 47. radiata, <i>Phil.</i> |
| 4. arata, <i>Récluz.</i> | 26. hyalina, <i>Desm.</i> | 48. reticulata, <i>Sow.</i> |
| 5. Bruguierei, <i>Payraud.</i> | 27. Inca (<i>Rissoina</i>), <i>D'Or.</i> | 49. rubra, <i>Macgill.</i> |
| 6. Bryerea, <i>Macgill.</i> | 28. interrupta, <i>Johnston.</i> | 50. scalaris, <i>Michaud.</i> |
| 7. Buccinoides, <i>Desh.</i> | 29. labiata, <i>Phil.</i> | 51. semistriata, <i>Johnston.</i> |
| 8. cancellata, <i>Récluz.</i> | 30. lactea, <i>Michaud.</i> | 52. spirata, <i>Sow.</i> |
| 9. Chesnetii, <i>Michaud.</i> | 31. lilacina, <i>Récluz.</i> | 53. Souleyetana, <i>Récluz.</i> |
| 10. cingillata, <i>Macgill.</i> | 32. lineolata, <i>Michaud.</i> | 54. striata, <i>Quoy.</i> |
| 11. cingulus, <i>Michaud.</i> | 33. marginata, <i>id.</i> | 55. striata, <i>Macgill.</i> |
| 12. costata, <i>Récluz.</i> | 34. Matoniana, <i>Récluz.</i> | 56. striatula, <i>Récluz.</i> |
| 13. crenulata, <i>Michaud.</i> | 35. minutissima, <i>Mich.</i> | 57. subumbilicata, <i>Mac.</i> |
| 14. cyclostomata, <i>Récluz.</i> | 36. monodonta, <i>Phil.</i> | 58. tridentata, <i>Michaud.</i> |
| 15. deformis, <i>Sow.</i> | 37. Montagui, <i>Payraud.</i> | 59. tristriata, <i>Thompson.</i> |
| 16. Deshayesiana, <i>Récluz.</i> | 38. muriatica, <i>Macgill.</i> | 60. truncata, <i>Macgill.</i> |
| 17. Desmarestii, <i>id.</i> | 39. oblonga, <i>Desm.</i> | 61. ulvæ, <i>id.</i> |
| 18. elongata, <i>Phil.</i> | 40. parva, <i>Récluz.</i> | 62. unifasciata, <i>Récluz.</i> |
| 19. excavata, <i>id.</i> | 41. præusta, <i>id.</i> | 63. ventricosa, <i>Desm.</i> |
| 20. fragilis, <i>Michaud.</i> | 42. pulchella, <i>Phil.</i> | 64. ventricosa, <i>Macgill.</i> |
| 21. fulva, <i>id.</i> | 43. punctulum, <i>id.</i> | 65. violacea, <i>Desm.</i> |
| 22. Gougeti, <i>id.</i> | 44. puncturata, <i>Macgill.</i> | 66. vittata, <i>Récluz.</i> |
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Figure.

Rissoa Cumingii. Pl. 15. Fig. 75. Shell, showing the aperture with its thickened lip and sinuated formation at the upper part.

Family 8. PLICACEA.

Shell; distinguished by having the columella strongly plaited and the base entire without indication of any sinus, the animal being of marine habits, and furnished with a horny operculum.

Little is known of the soft parts of this family beyond the external form of *Pyramidella* described by M. Quoy in the 'Voyage de l'Astrolabe*.'

* Comme on le voit, rien n'est encore connu sur l'organisation intérieure des Pyramidelles;

The observations of this eminent naturalist are sufficient to show that the animal of that genus is the type of a distinct group, and there is little doubt, from the corresponding structure of the shell, of the immediate affinity of the *Tornatellæ*. Prior to the introduction of the family *Plicacea* by Lamarck, the species of which it is composed were referred to the genera *Voluta*, *Bulimus*, and *Auricula*; the shell will, however, be found to differ in an important degree from the first of these, in wanting the notch at the base which indicates the passage of an uplifted fold of the mantle, used for the conveyance of water to the breathing organs, and from the last by its inhabiting the sea; and even were we unacquainted with the marine habits of the *Plicacea*, it might be presumed from the hard porcelain texture of the shells, that their fabricators are not denizens of the air or of fresh-water.

The genera above mentioned, both very limited in species, are all that can at present be referred to this family; M. Deshayes proposes to include his marine genus *Bonellia* (*Niso*, ante p. 149) with them, but the remarkable umbilicated growth of that shell, and absence of plaits on the columella, are characters of too much importance to be lightly regarded.

PYRAMIDELLA.

TORNATELLA.

Genus 1. PYRAMIDELLA, Lamarck.

Animal; disk short, thick, triangular, furnished at the hinder extremity with a small operculum; head triangular, rather deeply bilobed, bearing at the two lateral points of the angle a rather long tentacle, similar to that of *Aplysia*; eyes small, situated at the inner base of the tentacles.

Shell; pyramidal turreted, composed of numerous whorls forming a sharply acuminated spire; columella mostly three-plaited, sometimes with only two plaits; aperture rather small, rounded at the base, lip slightly expanded.

The genus *Pyramidella* contains those *Plicacea* whose shells are pyramidal turreted, composed of many whorls, forming an acuminated spire, and having a small semi-rounded aperture with the plaits of the columella more than usually transverse. The branchial cavity of this mollusk

il faut encore rechercher si ce genre, ainsi que les *Tornatelles*, appartiennent aux mollusques dioiques, ou s'il est monoïque comme la plupart de ceux qui ont l'ouverture entière.—DESHAYES, *Anim. sans vert.* vol. ix. p. 54.

according to the observations of M. Quoy, is widely open in front; no basal notch or channel is therefore needed in the shell for the passage of that organ, which leads in most of the carnivorous tribes to the respiratory cavity in a more concealed situation.

Among the few species known of this genus, the *P. maculosa* is the largest and most elongated; the *P. dolabrata* is common in the Eastern Seas; the *P. ventricosa* is a fine species from New Holland, and the *P. plicata*, chiefly remarkable for its longitudinally plicated ribs, of which there is no indication in the before-mentioned species, is, according to Lamarck, from Mauritius.

Species.

- | | | |
|-----------------------------------|---------------------------------------|--|
| 1. <i>cincta</i> , <i>Reeve</i> . | 5. <i>gracilis</i> , <i>Brocchi</i> . | . 9. <i>sulcata</i> , <i>Nutt.</i> |
| 2. <i>corrugata</i> , <i>Lam.</i> | 6. <i>maculosa</i> , <i>Lam.</i> | 10. <i>terebellum</i> , <i>Lam.</i> |
| 3. <i>dolabrata</i> , <i>id.</i> | 7. <i>plicata</i> , <i>id.</i> | 11. <i>ventricosa</i> , <i>Guerin.</i> |
| 4. <i>glans</i> , <i>Reeve</i> . | 8. <i>solida</i> , <i>Sow.</i> | |
-

Figure.

PYRAMIDELLA MACULOSA. Pl. 14. Fig. 73. Shell, showing its elongately pyramidal growth, plaited columella, and small aperture.

Genus 2. TORNATELLA, *Lamarck.*

Animal; *unknown*.

Shell; cylindrically oval, with a very short spire, mostly transversely striated, never ribbed, columella strongly two-plaited, sometimes with one plait only, aperture oblong, reaching nearly to the top of the body-whorl.

Although shells of this genus are by no means of rare occurrence, it does not appear that the animal has been yet described. Their typical form is the reverse of that of *Pyramidella*; instead of having a small aperture and long drawn out spire, the shell is of an oval *Bulla* form, has a very short spire, and an oblong aperture reaching nearly to the summit of the body whorl. The plait or plaits of the columella range obliquely, and are strongly developed.

Linnaeus placed the *Tornatellæ* among his *Volutæ*; Bruguière observing the absence of any notch at the base, transferred them to the genus *Bulimus*, where they became associated with a numerous tribe of uncongenial habits, which the sagacity of Lamarck readily detected. They constitute

a very natural family with the *Pyramidellæ*, and, so far as the shell is concerned, agree in character, though differing materially in their plan of convolution. Among the few species known, the *T. coccinata* of the Philippine Islands is the rarest and at the same time the prettiest; the *T. flammea*, *solidula*, *virgata*, *glabra*, *nitidula*, *insculpta* and *oryza* are all from the same locality. To these may be added *T. Sieboldii* from Japan, *T. venusta* from Peru, *T. tessellata* from the Red Sea, and the *T. fasciata* of our own southern shores.

Species.

- | | | |
|-------------------------------------|--|--|
| 1. auricula, <i>Lam.</i> | 7. <i>insculpta</i> , <i>Reeve.</i> | 12. <i>Sieboldii</i> , <i>Reeve.</i> |
| 2. <i>bullata</i> , <i>Kiener.</i> | 8. <i>nitidula</i> , <i>Lam.</i> | 13. <i>solidula</i> , <i>Lam.</i> |
| 3. <i>coccinata</i> , <i>Reeve.</i> | 9. <i>oryza</i> , <i>Reeve.</i> | 14. <i>tessellata</i> , <i>Reeve.</i> |
| 4. <i>fasciata</i> , <i>Lam.</i> | 10. <i>pedipes</i> , <i>Lam.</i> | 15. <i>venusta</i> , <i>D'Orbigny.</i> |
| 5. <i>flammea</i> , <i>id.</i> | 11. <i>punctata</i> , <i>Férussac.</i> | 16. <i>virgata</i> , <i>Reeve.</i> |
| 6. <i>glabra</i> , <i>Reeve.</i> | | |
-

Figure.

TORNATELLA COCCINATA. Pl. 14. Fig. 72. Shell, showing its compressly convoluted growth, strongly plaited columella, and oblong aperture.—*From Mr. Cuming's collection.*

Family 9. IANTHINEA.

Genus IANTHINA, Lamarck.

Animal; head large, prolonged into a short swollen proboscis, having a perpendicular mouth, the lips of which are thickened and furnished with prickly hooks or plates; above the neck on each side is a pair of tentacles of unequal length, the front one being the shorter, at the outer base of which is situated a very small indistinct eye; foot short, having attached to its under surface a broad fin-like appendage with a float of vesicles.

Shell; globose, turbiniform, thin and brittle, with the whorls either rounded or inclined to angular at the periphery; columella long and straight, margin of the aperture thin, never reflected.

The *Ianthina* or Sea-Snail constitutes a type of which there is little approximation in any of the pectinibranchiate genera, though possessing the essential characters of the order. It might be treated rather as the

analogue of an arboreal snail, whose organs and functions are fitted, by an extreme modification of nature, to inhabit the sea. The beautifully reticulated lung of the air-breathing mollusk is transformed into a pectinate gill for the respiration of water, the mouth is furnished with an armature for the comminution of hard flesh-food of marine origin, less easily digested, and to the foot is attached a broad dilated fin and vesicular float, contrived for the purpose of sustaining the animal on the surface of the water. The shell presents also the change that might be expected to result from its difference of habit, being of a thin brittle calcined substance, and not enveloped by any of those hairy, or horny, or hydrophanous kinds of epidermis which are peculiar to the plant-eating snail.

The float of bubbles or vesicles, by which the *Ianthinæ* are more particularly distinguished, has been said to serve a mechanical purpose, by which the animal is enabled to sink or swim at pleasure; there does not, however, appear to be any sufficient testimony to this effect, and it is difficult to imagine that such a use could be made of them; but it has been noticed that the *Ianthinæ* are rarely seen except in calm weather. According to the observations of the eminent naturalists of the 'Voyage de l'Astrolabe,' the *Ianthinæ* deposit their ovaries, filled with minute eggs, in great plenty about the vesicles, which the animal has the faculty of detaching. Notwithstanding that few species are known, they are extremely prolific in the equatorial seas, and, without doubt, as in the case of the surface-swimming *Pteropods*, the predaceous inhabitants of the deep allow them but a limited existence.

One remarkable peculiarity in *Ianthina* is, that in all the species, and I believe six or eight will be found when they come to be examined, the shell is of a uniform colour, a clear intense violet, and it is distinguished more strongly, according to the species, by a close succession of extremely delicate concentric lines of growth. The animal has been observed to eject a violet fluid when alarmed or irritated.

A considerable number of *Ianthinæ* were collected by Capt. Sir Edward Belcher in the South Atlantic Ocean during the voyage of the Samarang,*

* Mr. Arthur Adams, R.N., F.L.S., Assistant-Surgeon of the Samarang, has kindly favoured me with the following interesting observations made by him on this occasion.

"In our passage from the Cape to St. Helena we experienced several days calm, the surface of the South Atlantic being like a sheet of glass, and covered over with innumerable *Ianthinæ*, *Physaliae*, and *Velellaæ*, with parties of Flying-fish and solitary Skip-jacks, emerging suddenly from its depths and disturbing the stillness by their flights and splashes. In the act of swimming, the dilated natatory appendages of *Ianthina*, are kept fully extended, while the vesicular float precedes the shell, and keeps it in a reversed position on the surface of the water. The female evidently has the power of voluntarily detaching certain portions of the float to which any nidiamental sacks are fixed, for among the thousands obtained in the trawls, were several specimens with hardly a remnant left, while isolated floats were also numerous. The high seas appear to be the natural home of these beautiful mollusks, and I have seen a fleet of many hundreds wrecked on the coral reefs of the Meia-co-shima Islands, making the shore quite blue at the water-line. I have taken them up adhering in masses by means of the sucker-like fore-part of the foot; for although alive and uninjured, I never observed them make the slightest effort to crawl, which mode of progression appears to be denied them. They have a habit, when nearly dead, of

some of large size and very deeply coloured, others of smaller size, having a delicate silken appearance from the prominent and very neat succession of concentric striae.

Species.

- | | | |
|--------------------------|-------------------------------|-----------------------------------|
| 1. <i>bifida</i> , Nutt. | 3. <i>fragilis</i> , Bory. | 5. <i>prolongata</i> , Blain. |
| 2. <i>exigua</i> , Lam. | 4. <i>globosa</i> , Swainson. | 6. <i>umbilicata</i> , D'Orbigny. |
-

Figure.

IANTHINA GLOBOSA. Pl. 15. Fig. 80. Shell, showing its light inflated form and violet colour.

Family 10. NERITACEA.

Shell; abruptly transversely convoluted and more or less globose, with the spire short and the last whorl much enlarged.

The *Neritacea* present two very distinct groups, which, but for the similarity in the typical structure of their shells, exhibiting a peculiar transverse form of convolution, might be regarded as separate families. The first, comprising the genera *Navicella*, *Neritina*, and *Nerita*, is an extensive series, not varying materially in size, inhabiting seas and rivers, of which the animal is small, and the shell remarkable for its beautiful varieties of painting. The second group, consisting of the genera *Natica* and *Sigaretus*, the latter of which was until lately associated with *Haliotis*, is characterized by an animal of much larger proportions, generally more or less enveloping the shell by a thickened ridge and dilated extension of the foot. All the species of this division are of marine habits.*

NAVICELLA.

NERITINA.

NERITA.

NATICA.

SIGARETUS.

exserting the end of the long proboscis, which is then seen to be armed with numerous curved hooks; their eyes are very small and indistinct, and are placed on a short peduncle on the outside of the conical tentacles. If injured or irritated in the water, they eject a very pretty violet-coloured fluid, which appears to be evanescent like iodine. These "schools of sea-snails" comprised about four distinct species sailing among themselves in an indiscriminate manner, becoming more numerous towards the evening, and entirely disappearing when the breeze sprang up and ruffled the surface of the sea."

* The genus *Neritopsis*, hitherto referred to this family, is removed, together with the genus *Narica*, to the family of the *Velutinidae*.

Genus 1. NAVICELLA, Lamarck.

Animal; ovately oblong, rather slight, the disk occupying the wide aperture of the shell, with a peculiar quadrangular slightly radiated operculum, insinuated between it and the visceral mass; head flattened and auriculated, with two large subulate tentacles, at the outer base of which are two other short truncated tentacles, bearing the eyes.

Shell; transversely elliptic or oblong, Limpet-shaped, spire very short, columella depressly flattened, forming a transverse shelf, last whorl extremely patent, and marked with two muscular impressions.

A small genus of fresh-water mollusks, whose shells are remarkably depressly convoluted, and very similar in appearance to those of the *Crepidulae* or Slipper-Limpet, the columella being transformed into a flattened septum, forming a shelf, as it were, across one side of the aperture. The *Navicellae* are, however, very distinct from the *Crepidulae*, and have little affinity with any of the Limpet tribe; they are not of the same parasitical habits, and live free in flowing streams. Their shells are of regular symmetrical formation, and not subject to the distorted irregularities of growth which is the common lot of those living attached to the rough-hewn surface of the rocks.

The painting of the *Navicella* shells is generally of a mottled character, in lines or subtriangular patches radiating from the apex, covered with a thin fibrous olive epidermis, and the interior is mostly of a bluish tinge. The operculum is composed of two parts, one of which is internal, imbedded between the middle of the disk and the viscera, occupying the spiral chamber of the shell, the other is of stouter substance and appears to radiate at a right angle with the former.

The *Navicellae* are unknown to Europe and the western Hemisphere; they inhabit the streams of the Philippine and Feejee Islands, and are found in New Guinea, New Ireland, New Holland, and in Mauritius and the neighbouring Isles, where they are said to be eaten by the poorer natives for food. The largest species, selected for illustration, is prettily variegated with yellow upon a dark olive-black ground; for delicacy of form and colouring the *N. lineata* and *Recluzii* are perhaps the most interesting species. These two last mentioned are of a compressly oblong form, resembling a fragile boat, of which the septum forms the poop.

Species.

- | | | |
|--|---|--|
| 1. <i>apiata</i> , <i>Guillou</i> . | 7. <i>Freycineti</i> , <i>Récluz</i> . | 13. <i>porcellana</i> , <i>Desh.</i> |
| 2. <i>atra</i> , <i>Reeve</i> . | 8. <i>Janelli</i> , <i>id.</i> | 14. <i>radiata</i> , <i>Reeve</i> . |
| 3. <i>Bourgainvillei</i> , <i>Récluz</i> . | 9. <i>La Perousei</i> , <i>id.</i> | 15. <i>Recluzii</i> , <i>id.</i> |
| 4. <i>depressa</i> , <i>Lesson</i> . | 10. <i>lineata</i> , <i>Lam.</i> | 16. <i>suborbiculata</i> , <i>Sow.</i> |
| 5. <i>D'Urvillei</i> , <i>Récluz</i> . | 11. <i>Luzonica</i> , <i>Soul.</i> | 17. <i>Suffreni</i> , <i>Récluz</i> . |
| 6. <i>Entrecastauxi</i> , <i>id.</i> | 12. <i>macrocephala</i> , <i>Guill.</i> | 18. <i>tessellata</i> , <i>Lam.</i> |

Figures.

NAVICELLA PORCELLANA. Pl. 16. Fig. 82. Shell, showing at Fig. *a* its widely dilated aperture, lateral muscular impressions, transverse septum and inconspicuous spire, and at Fig. *b* its external variegated painting covered with a dark olive epidermis.—*From Mr. Cuming's collection.*

Genus 2. NERITINA, Lamarck.

Animal; disk triangularly ovate, truncated and thicker towards the front, bearing about the middle a peculiar semilunar calcareous operculum; head large, but little projected, furnished with a dilated labial appendage and having four tentacles, two long and subulate, two short and truncated, on which are situated the eyes.

Shell; ovately globose, with the spire very short and indistinct, and the whorls sometimes armed with hollow spines; columella depressly flattened into a transverse septum, aperture semicircular, lip simple, sometimes dilated on either side; outer surface mostly covered with a dark epidermis.

The *Neritinæ* or Fresh-water Nerites are more stoutly convoluted than the *Navicellæ*, and form an interesting link between them and the *Neritæ* of still more solid growth, inhabiting the sea. There is little difference in the animal beyond that resulting from their different circumstances of habitation. The *Neritinæ* dwell principally on the banks of rivers, and are not unfrequently found upon palms and other fluviatile plants.

Few species of this extensive genus present any variation of sculpture beyond a slightly plicated or granulated surface, with the exception of some which are coronated with a row of hollow spouted spines, short as in

N. brevispinosa, or remarkably long as in *N. corona*. Some of the species are curiously winged on each side, as in the *N. dilatata* and *latissima*.

There is scarcely any limit to the geographical distribution of the *Neritinae*, save in the frigid and cold temperate zones. The genus is represented in an humble, but very prettily painted condition on our own coast, it is plentiful in the West Indies, and is found throughout the great continent of North, South, and Central America. It is not less abundant in the Eastern world. Magnificent specimens were collected by Mr. Cuming in the Philippines, among which the *N. labiosa*, selected for illustration is perhaps the largest. In Sumatra and other Islands of the Oriental Archipelago, in India, and in South Africa, the *Neritinae* are also more or less plentiful.

Species.

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|---|---|--|
| 1. <i>afra</i> , <i>Sow.</i> | 27. <i>intermedia</i> , <i>Sow.</i> | 52. <i>rara</i> , <i>Dufo.</i> |
| 2. <i>alata</i> , <i>Brod</i> & <i>Sow.</i> | 28. <i>Jordani</i> , <i>Butler.</i> | 53. <i>reclivata</i> , <i>Say.</i> |
| 3. <i>atra</i> , <i>Nutt.</i> | 29. <i>labiosa</i> , <i>Sow.</i> | 54. <i>reticularis</i> , <i>Sow.</i> |
| 4. <i>auriculata</i> , <i>Lam.</i> | 30. <i>Lamarckii</i> , <i>Desh.</i> | 55. <i>reticulata</i> , <i>id.</i> |
| 5. <i>bætica</i> , <i>id.</i> | 31. <i>latissima</i> , <i>Brod.</i> | 56. <i>rivalis</i> , <i>Parreys.</i> |
| 6. <i>brevispina</i> , <i>id.</i> | 32. <i>lineolata</i> , <i>Lam.</i> | 57. <i>Sandwichensis</i> , <i>Desh.</i> |
| 7. <i>caffra</i> , <i>Gray.</i> | 33. <i>lugubris</i> , <i>id.</i> | 58. <i>semiconica</i> , <i>Lam.</i> |
| 8. <i>callosa</i> , <i>Desh.</i> | 34. <i>lutescens</i> , <i>Muhlfeld.</i> | 59. <i>serratilinea</i> , <i>Ziegler.</i> |
| 9. <i>canalis</i> , <i>Sow.</i> | 35. <i>meleagris</i> , <i>Lam.</i> | 60. <i>Smithii</i> , <i>Gray.</i> |
| 10. <i>cariosa</i> , <i>Gray.</i> | 36. <i>microptera</i> , <i>Nutt.</i> | 61. <i>spinosa</i> , <i>Sow.</i> |
| 11. <i>cassicum</i> , <i>Sow.</i> | 37. <i>Mittreana</i> , <i>Récluz.</i> | 62. <i>strangulata</i> , <i>Muhlf.</i> |
| 12. <i>chlorostoma</i> , <i>id.</i> | 38. <i>morio</i> , <i>Sow.</i> | 63. <i>strigilata</i> , <i>Lam.</i> |
| 13. <i>convexa</i> , <i>Nutt.</i> | 39. <i>nux</i> , <i>Brod.</i> | 64. <i>subgranosa</i> , <i>Sow.</i> |
| 14. <i>Coromandeliana</i> , <i>Sow.</i> | 40. <i>obtusa</i> , <i>Benson.</i> | 65. <i>subsulcata</i> , <i>Sow.</i> |
| 15. <i>corona</i> , <i>Lam.</i> | 41. <i>Oweniana</i> , <i>Gray.</i> | 66. <i>Sumatrensis</i> , <i>id.</i> |
| 16. <i>crepidularia</i> , <i>id.</i> | 42. <i>perversa</i> , <i>Lam.</i> | 67. <i>transversalis</i> , <i>Ziegler.</i> |
| 17. <i>Dalmatica</i> , <i>Partsch.</i> | 43. <i>Philippinarum</i> , <i>Sow.</i> | 68. <i>triserialis</i> , <i>Sow.</i> |
| 18. <i>Danubialis</i> , <i>Ziegler.</i> | 44. <i>picta</i> , <i>id.</i> | 69. <i>venosa</i> , <i>Menke.</i> |
| 19. <i>dilatata</i> , <i>Brod.</i> | 45. <i>piperina</i> (<i>Nerita</i>), <i>Ch.</i> | 70. <i>vespertina</i> , <i>Nutt.</i> |
| 20. <i>Domingensis</i> , <i>Lam.</i> | 46. <i>pisiformis</i> , <i>Récluz.</i> | 71. <i>violacea</i> , <i>Lam.</i> |
| 21. <i>dubia</i> , <i>id.</i> | 47. <i>Prevostiana</i> , <i>Fér.</i> | 72. <i>virginea</i> , <i>id.</i> |
| 22. <i>faba</i> , <i>Sow.</i> | 48. <i>pulchra</i> , <i>Sow.</i> | 73. <i>viridis</i> , <i>id.</i> |
| 23. <i>fasciata</i> , <i>Lam.</i> | 49. <i>pulligera</i> , <i>Lam.</i> | 74. <i>Waigion</i> , <i>Less.</i> |
| 24. <i>fluvialis</i> , <i>id.</i> | 50. <i>punctulata</i> , <i>id.</i> | 75. <i>zebra</i> , <i>Lam.</i> |
| 25. <i>gagates</i> , <i>id.</i> | 51. <i>pupa</i> , <i>id.</i> | 76. <i>ziczac</i> , <i>id.</i> |
| 26. <i>granosa</i> , <i>Sow.</i> | | |
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Figure.

NERITINA LABIOSA. Pl. 16. Fig. 83. Shell, showing its solid dilated growth, and curious operculum. From Mr. Cuming's collection.

Genus 3. NERITA, *Linnæus.*

Animal; very similar to that of *Neritina*, the disk being rather stouter.

Shell; semiglobose, solid, smooth, sometimes ribbed, spire small and indistinct, columella transversely flattened, sometimes crenulated or toothed, aperture semicircular, frequently grooved within,

The animal of *Nerita* differs so little from *Neritina*, that naturalists have been somewhat divided as to the propriety of separating these genera. The genus *Cerithium* presents an instance in which the changes are considerable in the composition and substance of the shell, arising out of differences of habit, some being marine, others dwelling in estuaries and situations where the water is only brackish, and others again living in the vicinity of springs or stagnant marshes, quite beyond the influence of the tide. So it is with the *Neritæ* and *Neritinæ*, and were it not that collectors are in the habit of distinguishing them, agreeably with the views of Lamarck, since whose time no new facts have been elicited in their natural history, they would have been here fused into one.

The Sea-Nerites construct shells of very solid growth, and paint them with extremely vivid colours; the colours are, moreover, so variable in the same species that it is only by a close observation of form and general design, that their specific relation is understood. With this robust structure and display of colour, the shells of this genus are also characterized by variations of sculpture which are not found in the fresh-water genus. Many of the species are strongly ribbed, the interior of the shell being marked with corresponding grooves, and the edge of the lip more or less strongly crenulated, others have the flat columellar septum granulated, and in some species, such as in that selected for illustration, *N. ornata*, and the well-known Bleeding-tooth, *N. peloronta*, it is dentated.

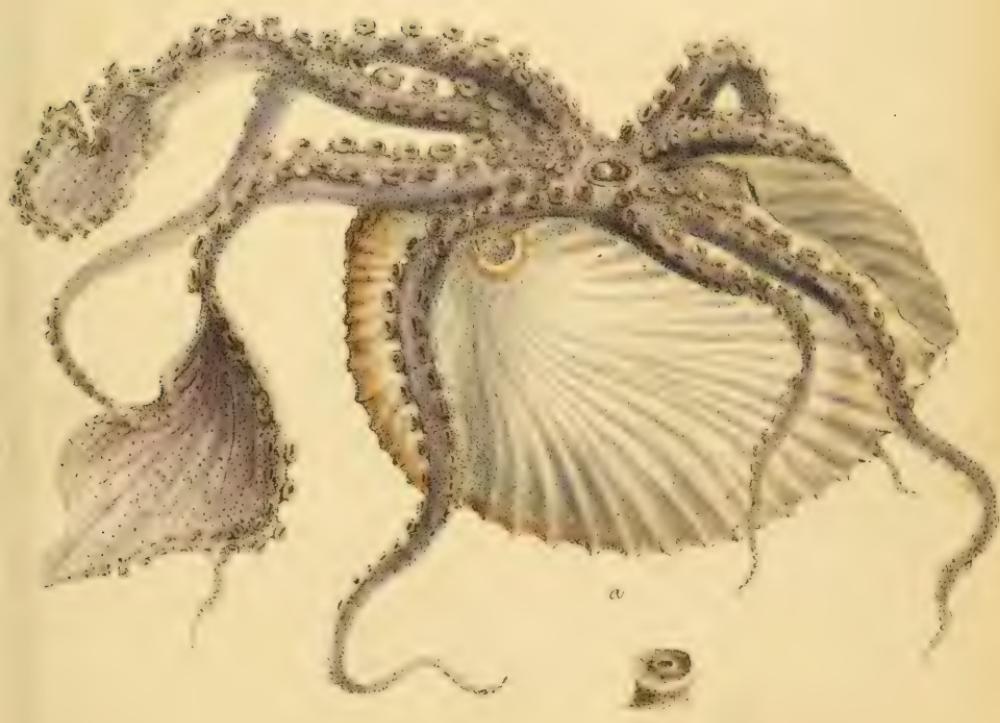
The *Neritæ*, like the *Neritinæ*, are very generally distributed throughout the globe; but are rather more confined to the equatorial regions. Few species, if any, remain undescribed; the entire family of the *Neritacea* has been investigated with minute accuracy by M. Récluz of Paris, to whom Mr. Cuming, with a proper international spirit, forwarded the new species resulting from his researches in the Philippine Islands.

Species.

- | | | |
|-------------------------------|--------------------------------|----------------------------------|
| 1. <i>Adansonia</i> , Récluz. | 4. <i>Antillarum</i> , Gmelin. | 7. <i>argus</i> , Récluz. |
| 2. <i>albicella</i> , Linn. | 5. <i>antiquata</i> , Récluz. | 8. <i>atrata</i> , Chemn. |
| 3. <i>Anatolica</i> , Récluz. | 6. <i>apiata</i> , id. | 9. <i>atropurpurea</i> , Récluz. |



Spirula Peronii. Lamarck.



b

Reeve imp.



Argonauta argo. Line.

Miller, del et lith.

J. Sowerby, Sculps.

Reeve, imp.



Nautilus (?) *imperialis*

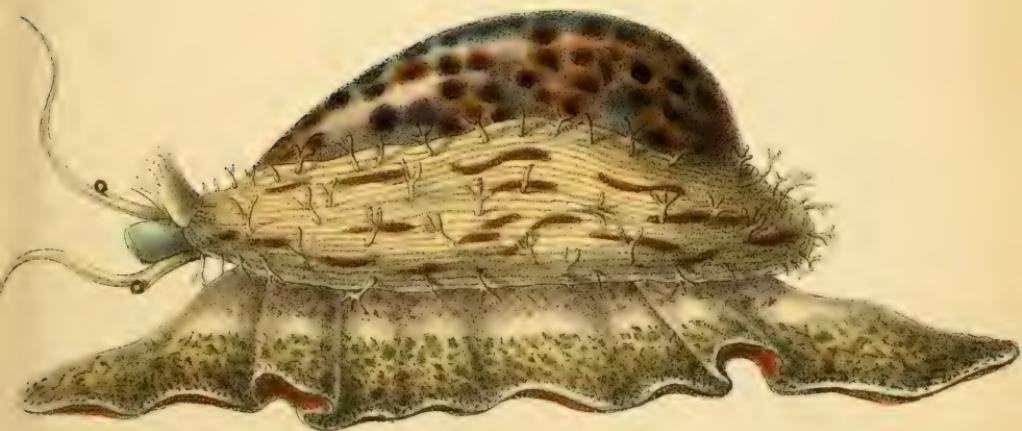
Beech, imp.



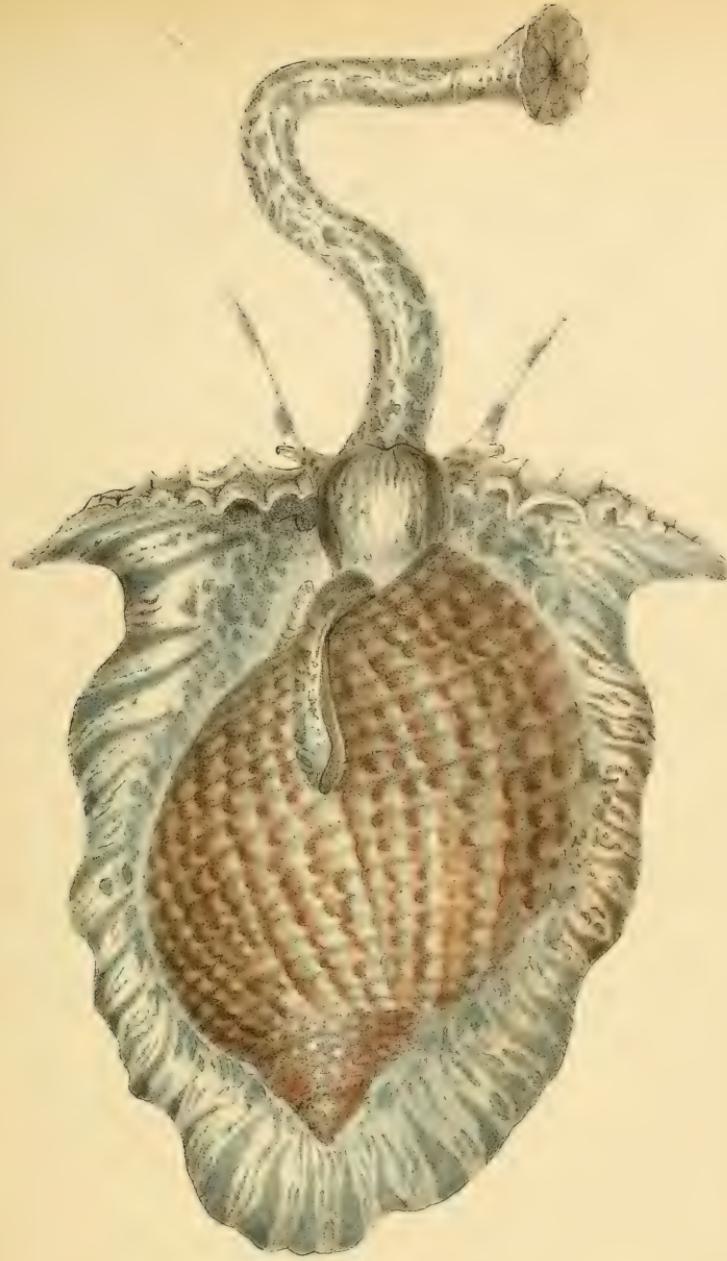
Voluta angulata, Swam



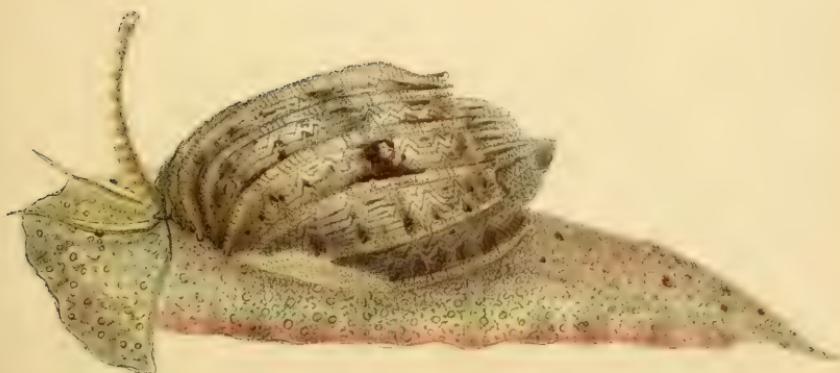
Cassis glauca, Lam



Cypraea tigris, Linn.



Dolium peraix, Lam.



Harpa ventricosa, Lam.

Plate F.



Oliva maura: Lam



Ovulum ovum: Brug



Miller lith

Reeve imp

Conus textile: Linn

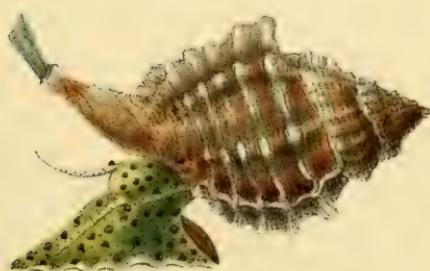
Plate 6.



Dolium pomum: Lam.



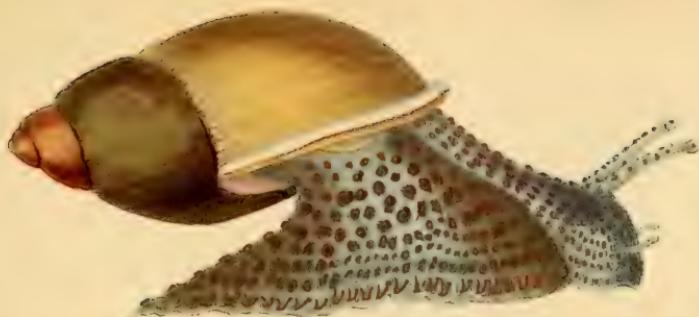
Dolium oleaceum Lam



Miller lith.

Reeve imp

Triton tuberosum: Lam



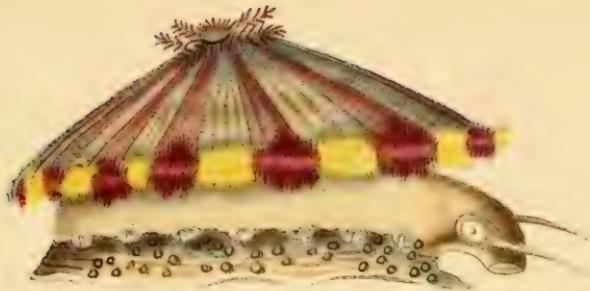
Bulimus rosaceus. King



Bulimus oblonga. Muller



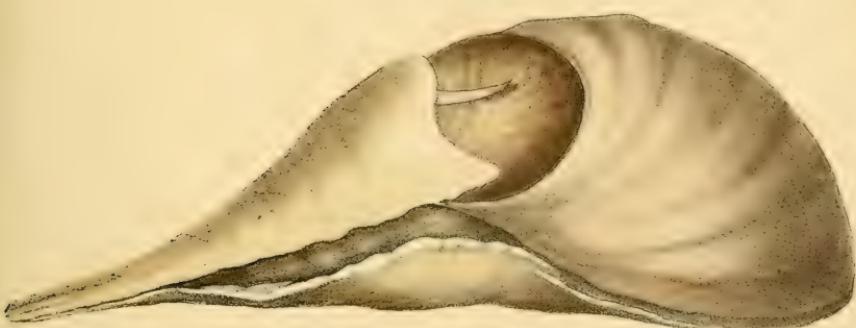
Achatina regina. Lamarck



Fucorella maxima Ring



Fissurella megatrema D'Orbigny



Sigaretus concavus Sowerby

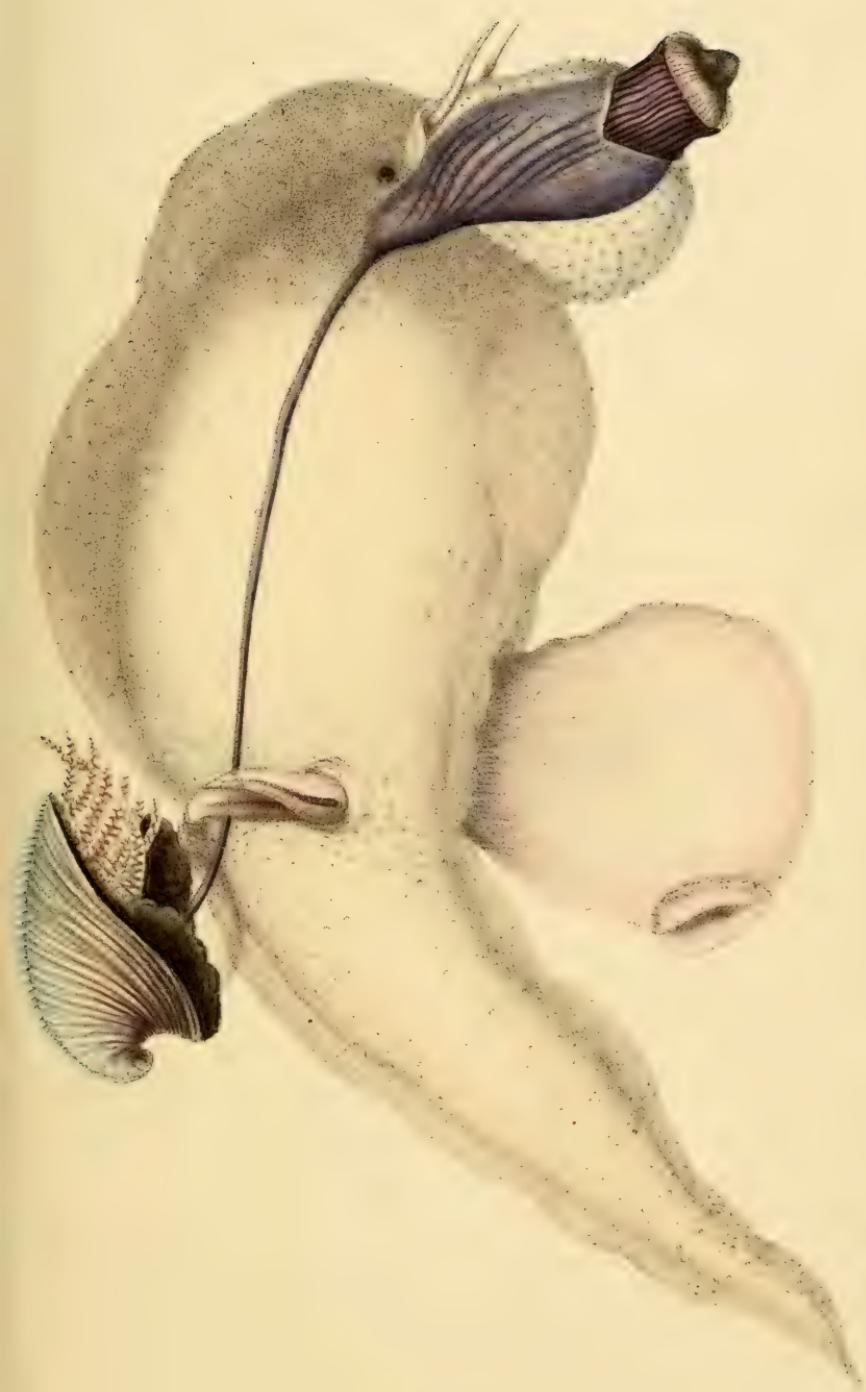


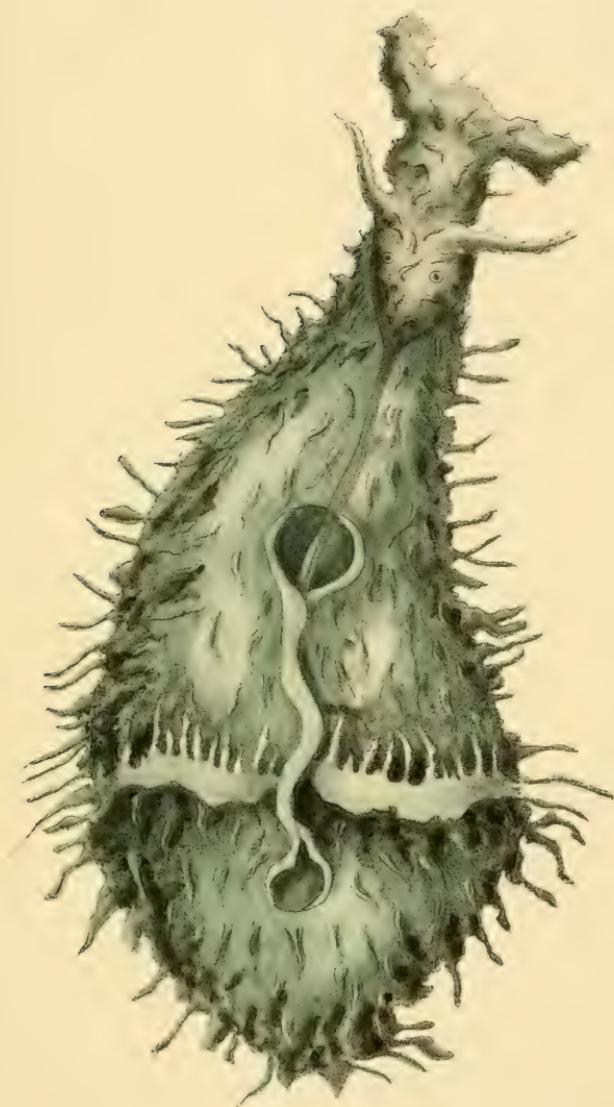
Haliotis tuberculata Linnæus

Miller del et lit.

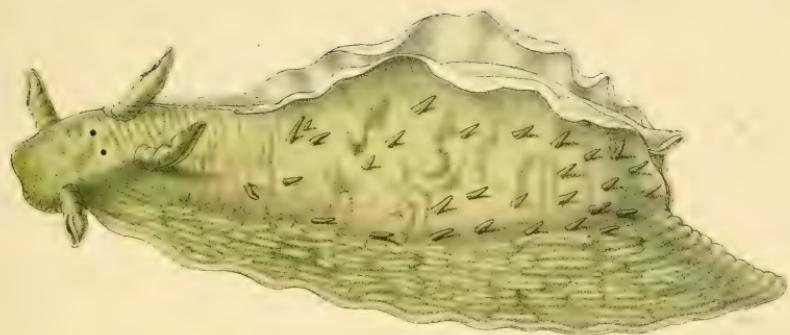
Reeve imp.

Capitaria fragilis, *Berg*.





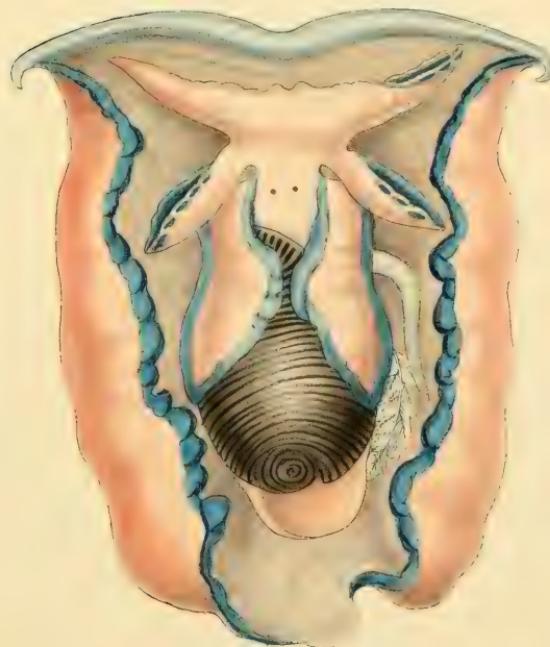
Lophiolella Rumphii. (muraen.)



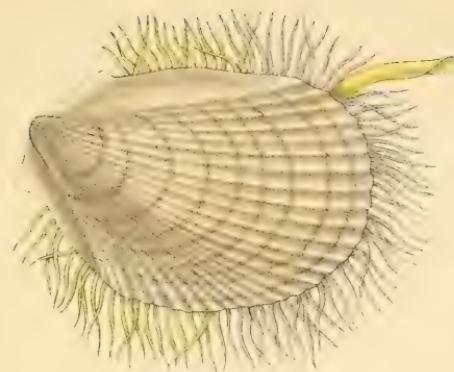
Aplysia viridis Rang



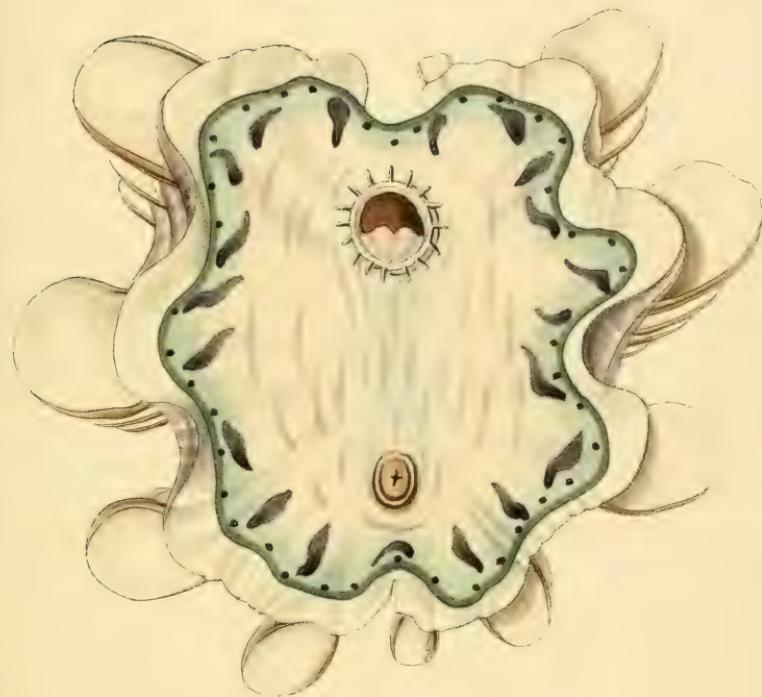
Parmophorus australis, Lamarck



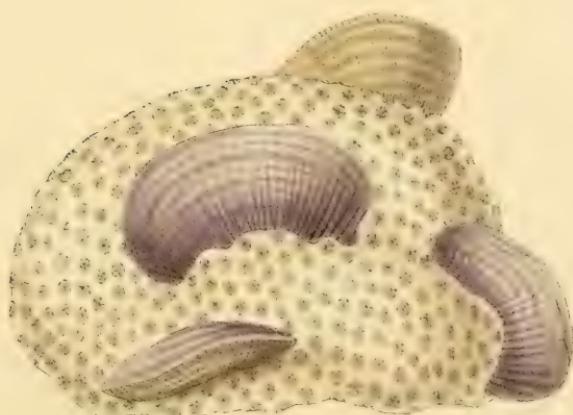
Bulla physis, Linnaeus.



Lima inflata, Lamarck.

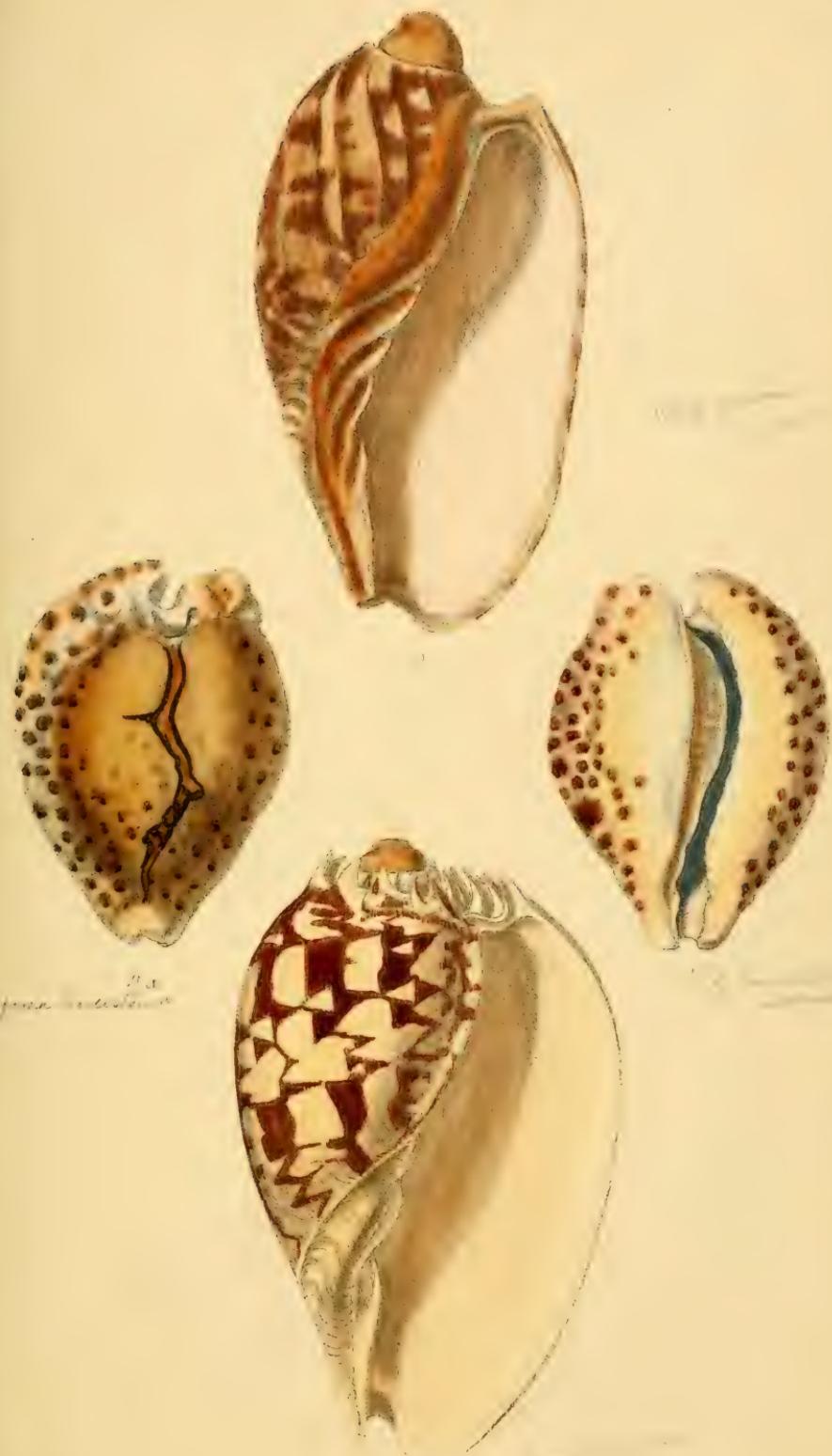


Tridacna squamosa, Lamarck.



Pedum spondyloideum, Lamarck.





Tonna *variolosa*



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18



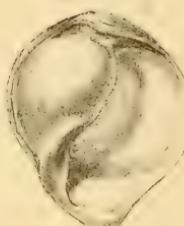
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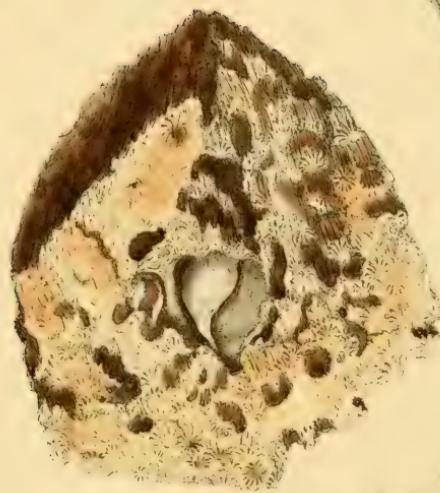
18a



20a



20b



20c



21



19b



22



24



23



25



27

Revolvamp



38



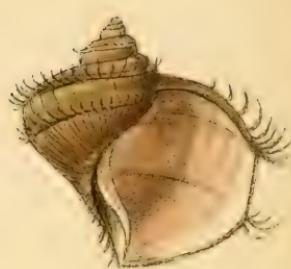
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31



32



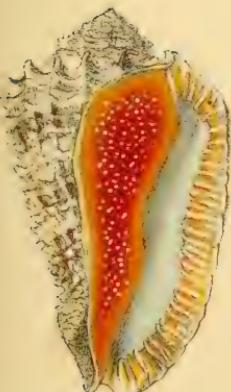
33



34 a



34 b

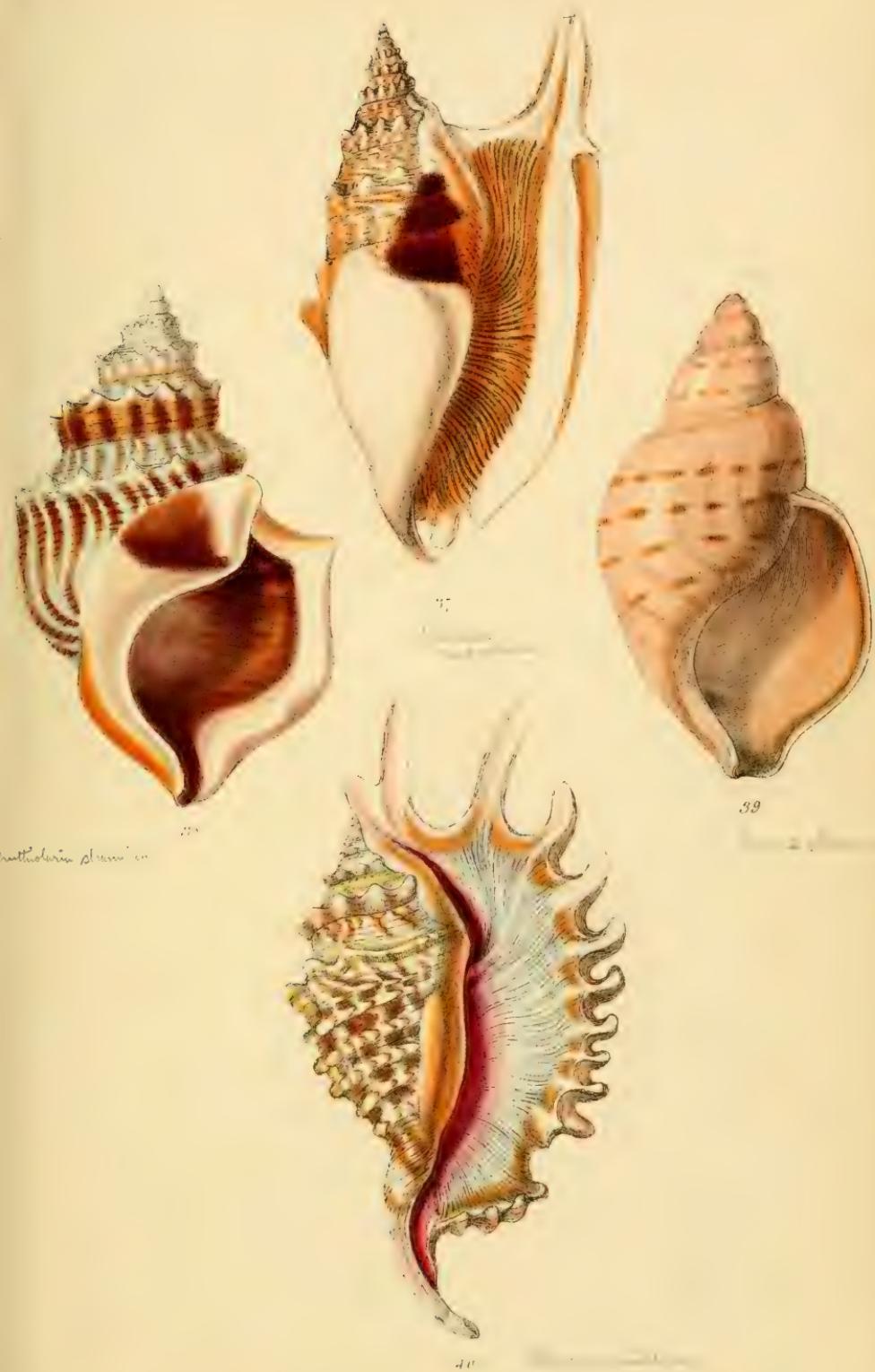


35 a



35 b

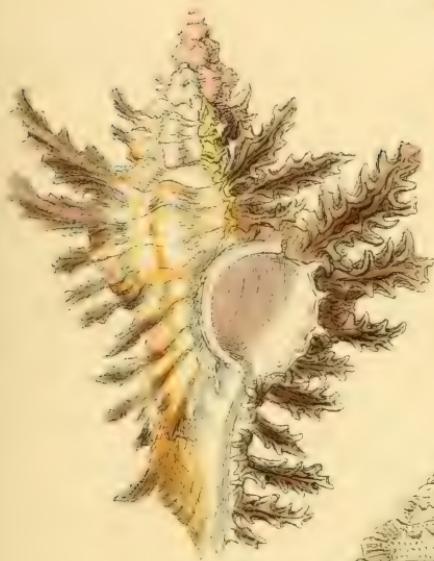




Mutholærin planaria



41



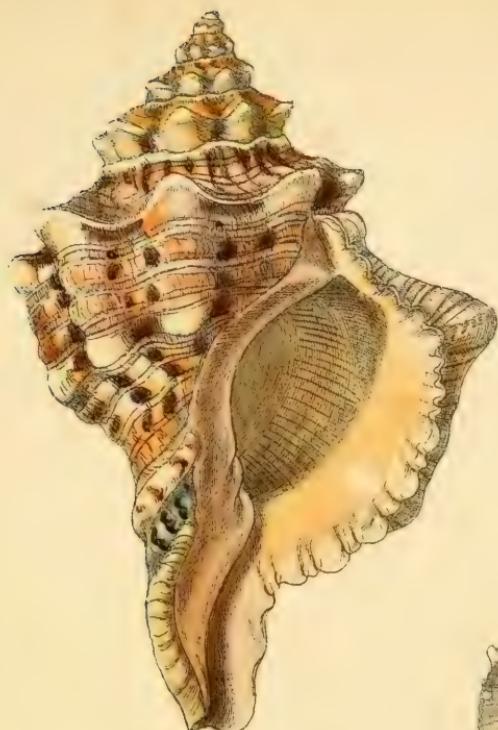
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43



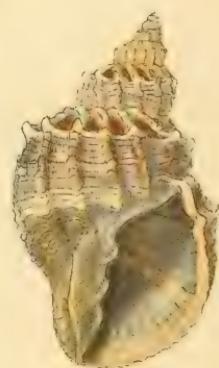
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15

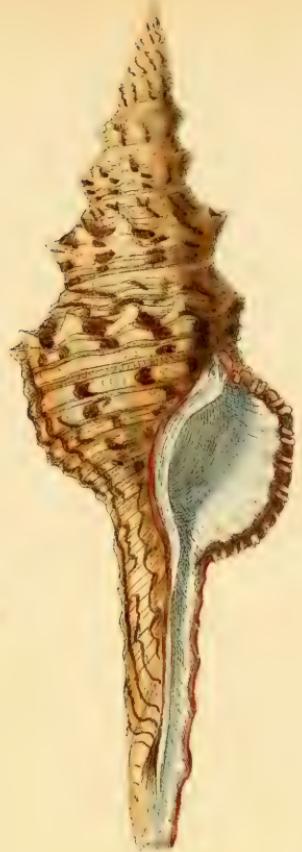


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17





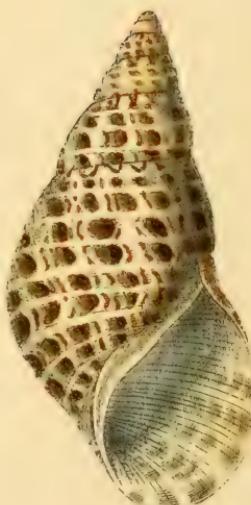


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58



60

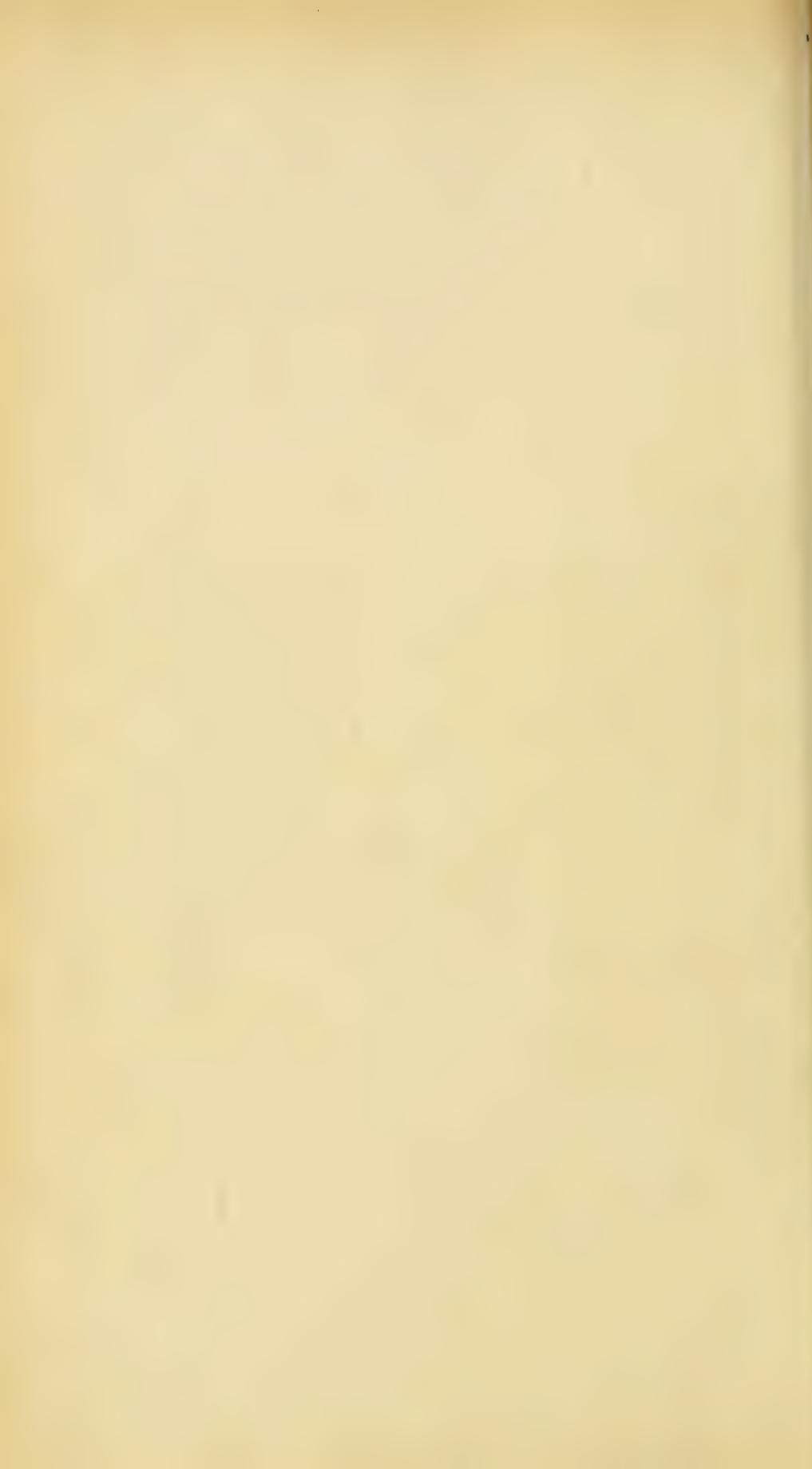


59

Reeve imp

61

Reeve imp







60 &

terby del.

Reeve imp.



74



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77



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87



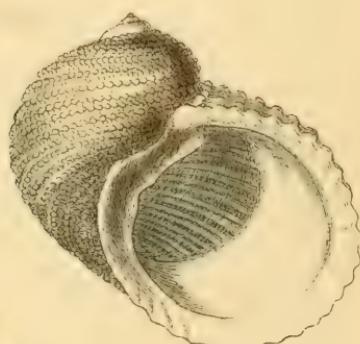
82 b



83



84



85



86

Reeve imp



37



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39



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41



42





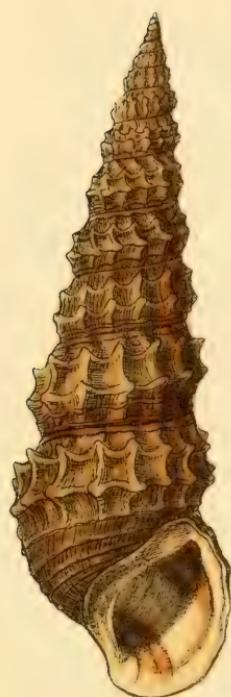
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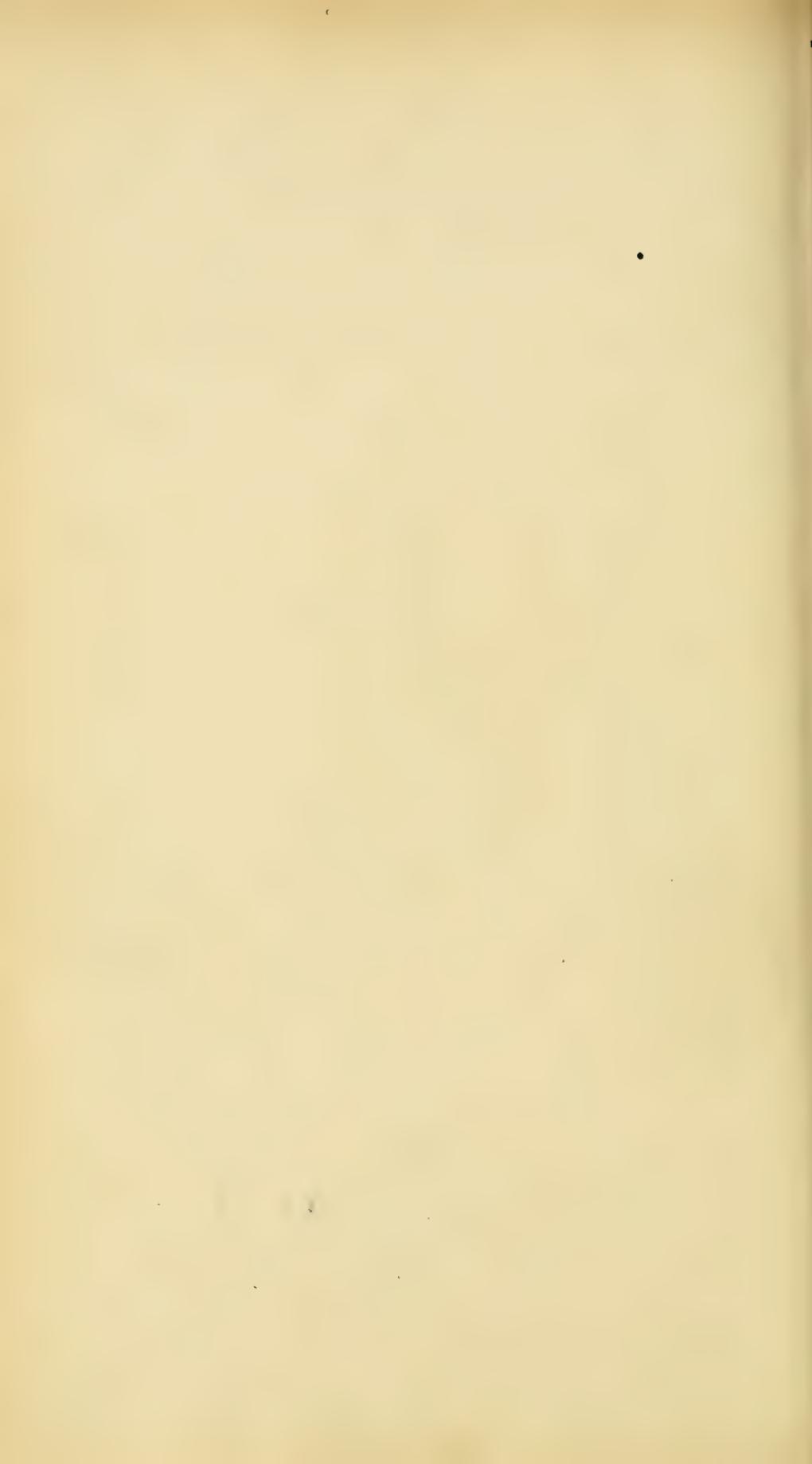
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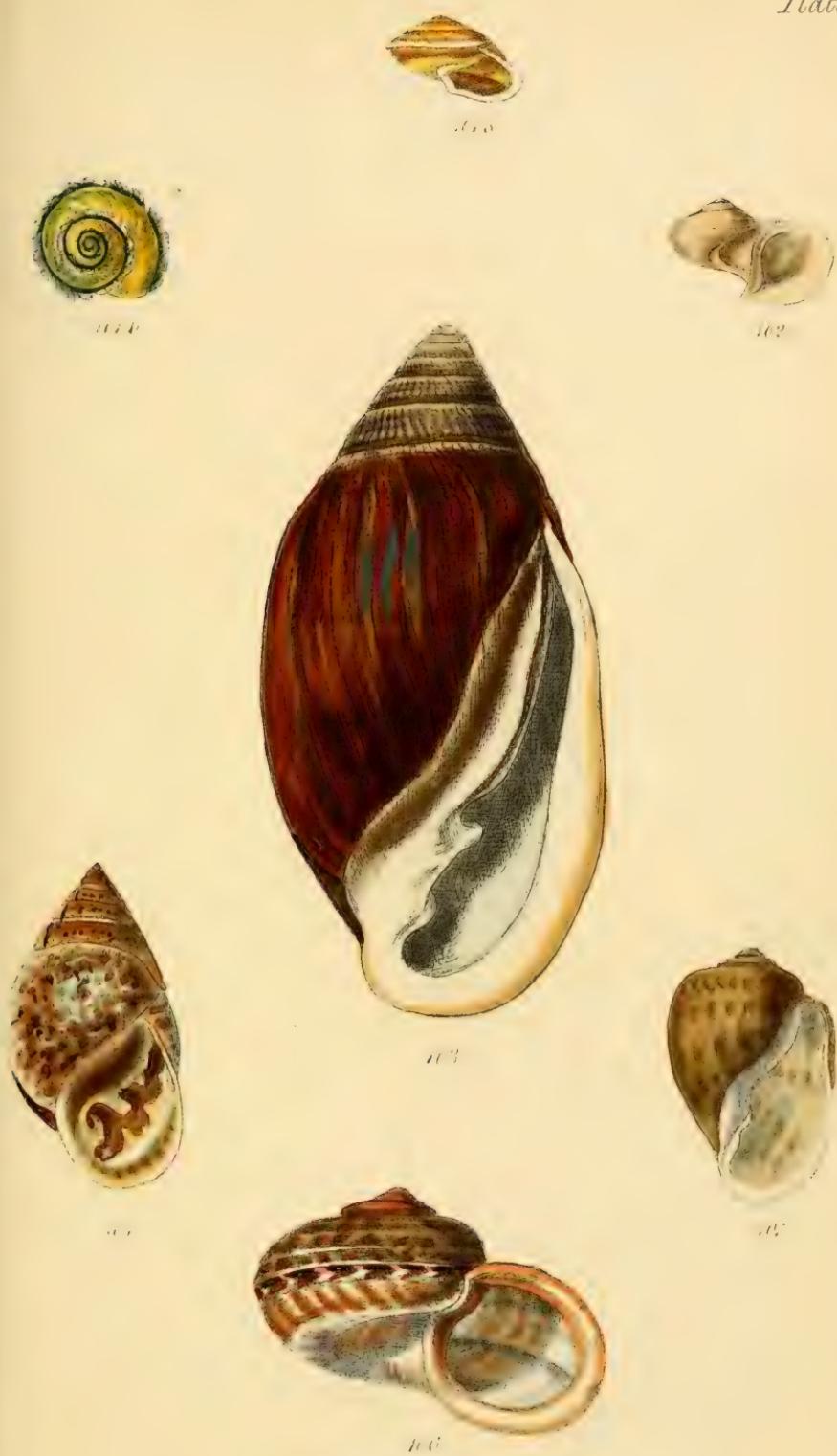


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101







107



108



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110



111



112



113



116



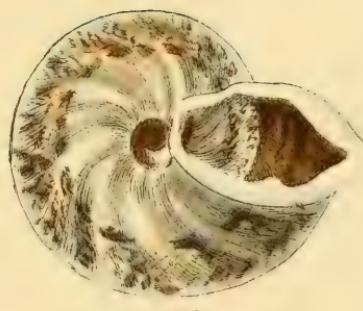
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121



122



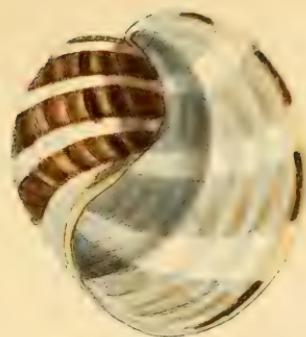
123



124

Sowerby del

Neere imp



124

125

126



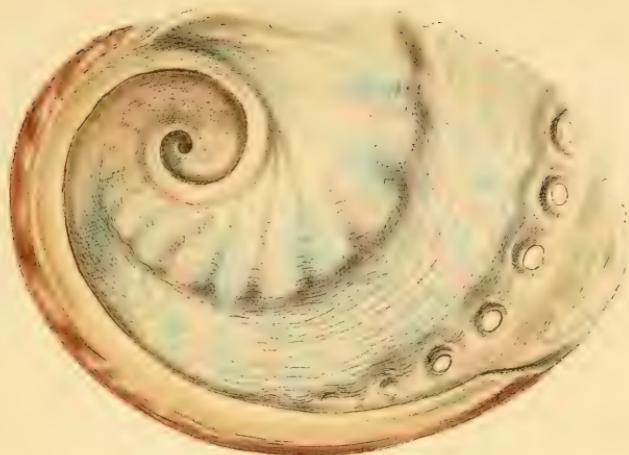
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130



131



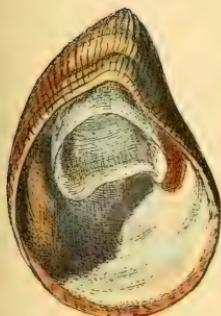
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132



133



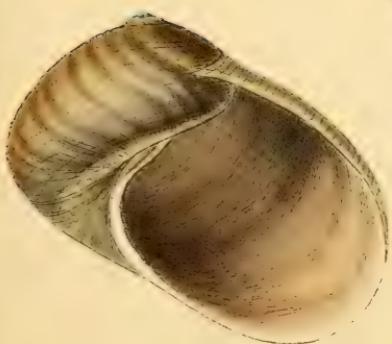
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136



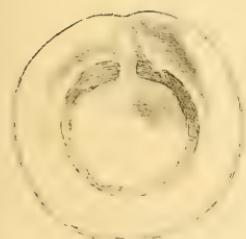
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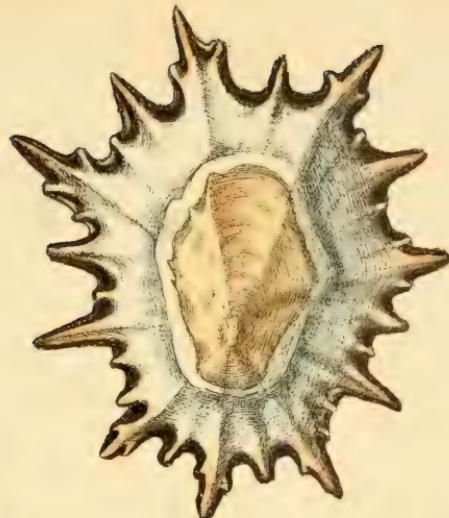


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138

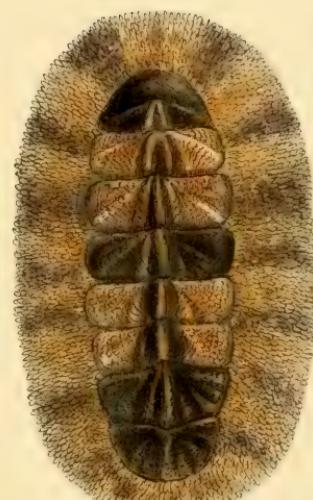




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148



147



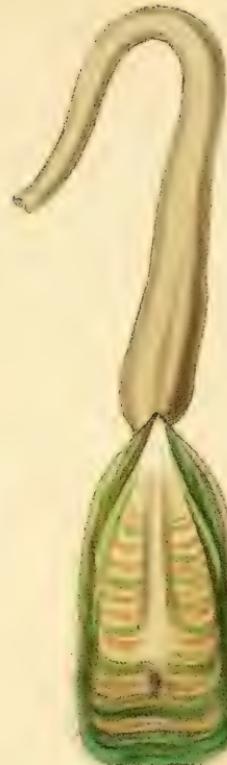
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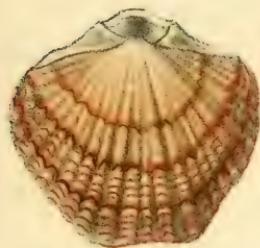
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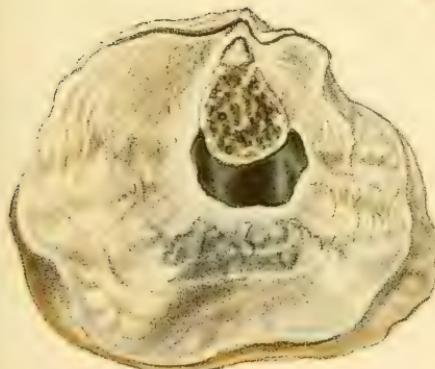
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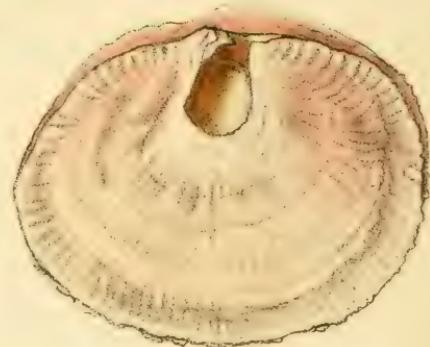
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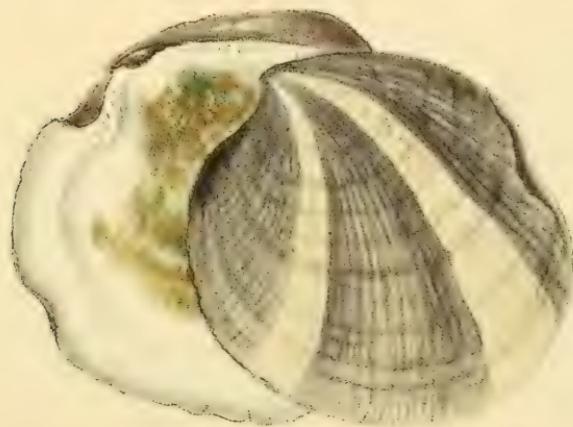
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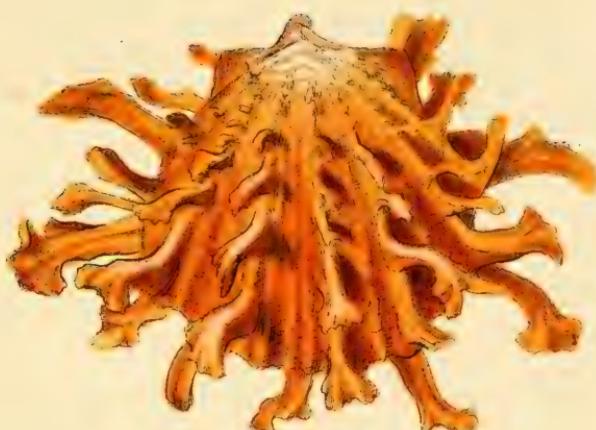
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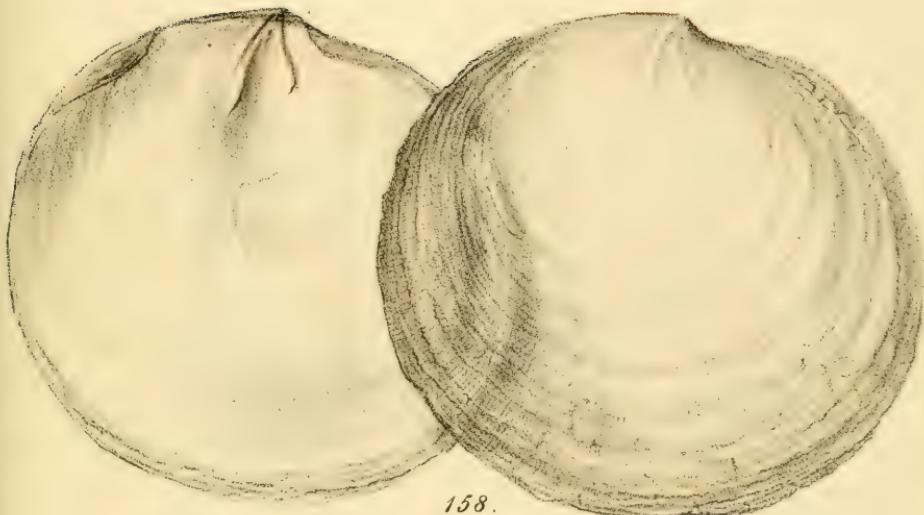
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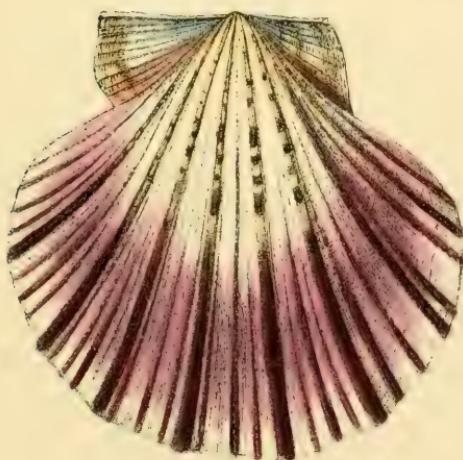
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160.



158.



162.



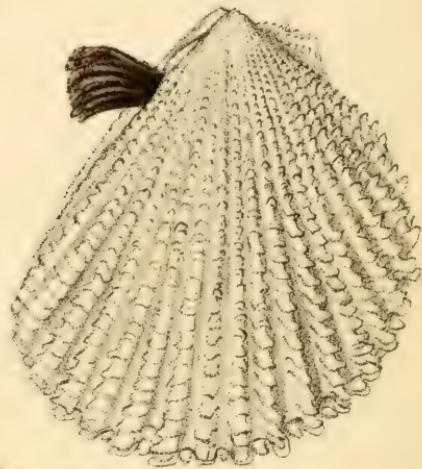
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165.



167.



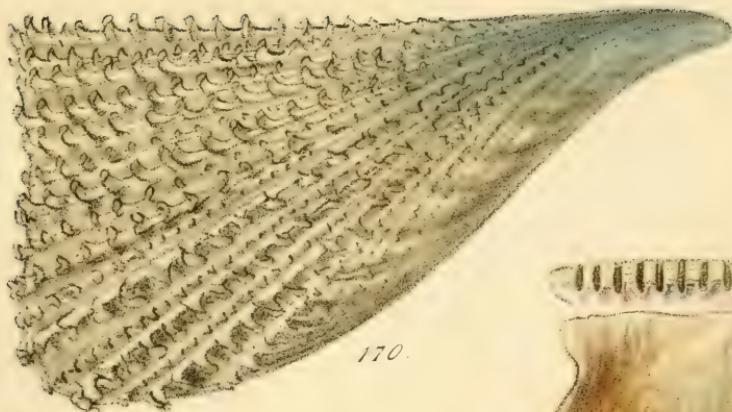
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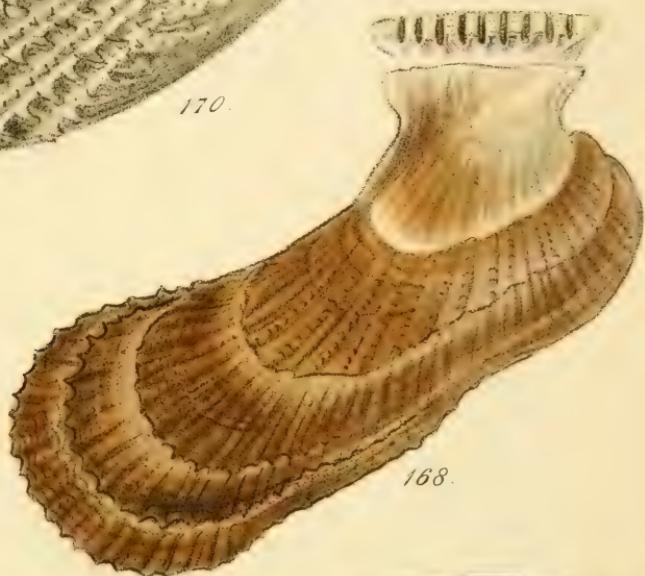
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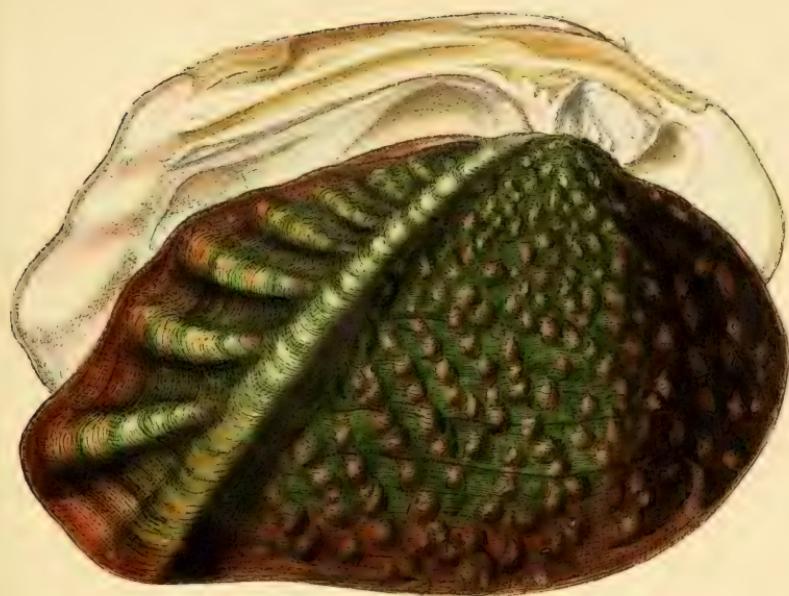
181



182 a



182 n



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185



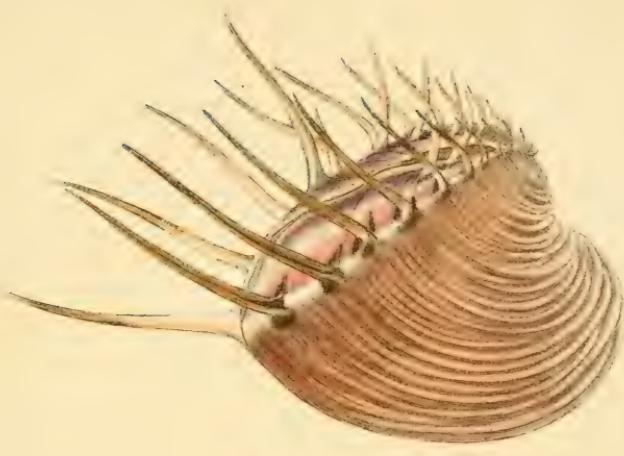
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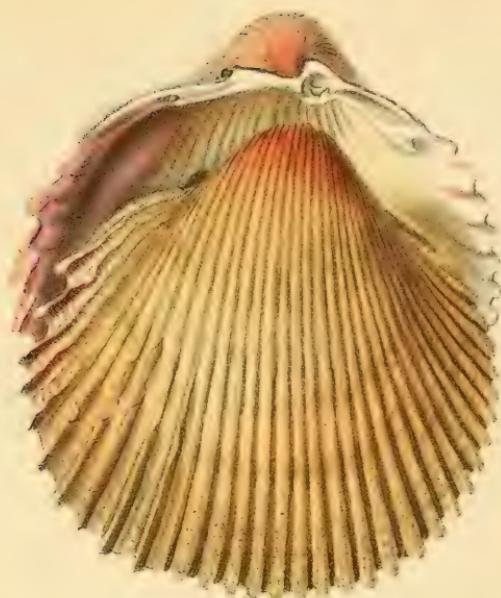
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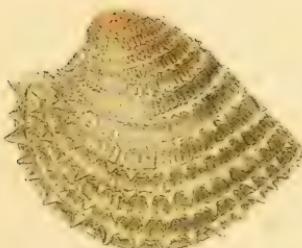
192



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195.



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