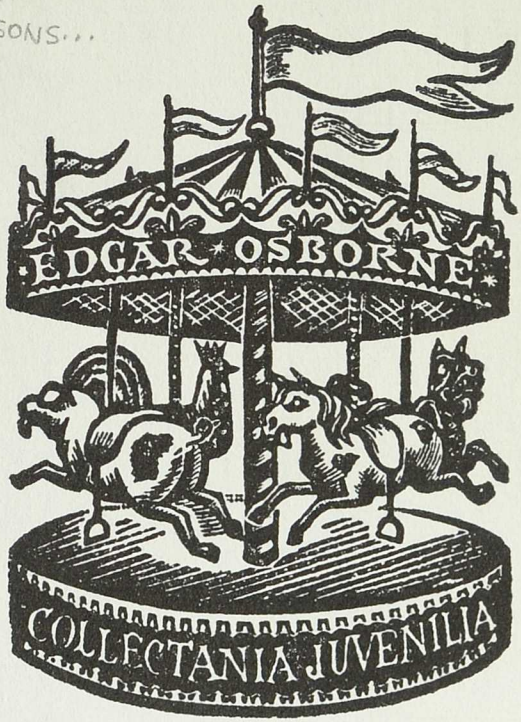

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LESSONS ON SHELLS,

AS GIVEN TO CHILDREN

BETWEEN THE AGES OF EIGHT AND TEN,

IN A PESTALOZZIAN SCHOOL,

At Cheam, Surrey.

BY THE AUTHOR OF "LESSONS ON OBJECTS."

elizabeth Mayo.

ILLUSTRATED BY TEN PLATES, DRAWN FROM NATURE.

SECOND EDITION.

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PREFACE.

Quin ipsis doctoribus hoc esse curæ velim, ut teneras adhuc mentes more nutricum mollius alant, et satiari veluti quodam jucundioris disciplinæ lacte patiantur. Erit illud plenius interim corpus, quod mox adulta ætas adstringat. Hinc spes roboris.

QUINTILIAN.

'LESSONS on Shells' may be considered as a continuation of 'Lessons on Objects;' the principles of teaching illustrated in that little work are here applied to an important and interesting branch of Natural History. It is, like its unpretending predecessor, a transcript of the actual labours of the class-room; and friends who have visited the school, may retrace in the printed work the process of which they were witnesses. The end for which it is now laid before the public is not that it may serve as an instructive and entertaining volume to be placed in the hands of children; this end is sufficiently attained by several works of acknowledged merit; which, in order that the subject may be more familiarly handled and more vividly conceived, represent an imaginary group of pupils

conversing and receiving instruction. The object my sister has proposed to herself is to place a volume in the Teacher's hands which shall help him to re-act with his pupils the scenes that are here described. It is not a drama offered for perusal in the closet, but a manager's copy commended to the conductors of other theatres of education, to enable their liliputian corps dramatiques to assume the same characters, play the same parts, and I will not say, "fret their little hour upon the stage," but enjoy the genuine delight of intellectual activity judiciously directed.

A want of order and arrangement in the early part of 'Lessons on Objects,' has been alleged as a blemish in that work; but, in point of fact, its miscellaneous character was a studied feature, as better suited to the intellectual state of the pupils. Their first step should be the examination of objects as nature presents them, or rather as they see them in nature, that is, either as insulated or as associated only by accidental connection. When ideas are formed and correct expressions familiarized, the business of classification commences, the lessons assume a more scientific character, and the pupils are prepared to enter on the province of Natural History. The training, then, which 'Lessons on Objects' will have supplied for commencing 'Lessons

on Shells,' will consist principally in the improved faculty of observing natural features, in the possession and command of a small vocabulary of scientific terms, in the habit of classification, and in the practice of giving a written summary of the knowledge acquired.

Several circumstances concur to recommend conchology as the first branch of Natural History to be studied by younger pupils. Shells are of themselves interesting, from the peculiarity of their forms and the variety of their colours ; their characteristics are simple and present themselves readily to the eye, and a variety of interesting information may be given respecting the animals which inhabit them. Added to this the greater part of the specimens may be procured at little expence, may be easily preserved, and therefore continually reproduced to the class, and besides may, without fear of damage, be committed to the careless hands of the youngest students.

It will however, I know, be objected by staunch anti-reformers in education, that improve the mode of teaching Natural History as you will, you but teach better that, which had better not be taught at all ; for that whatever abridges the time given to classical instruction, weakens the nerves and sinews of the mind, and but debases the Corinthian

column of ancient lore by introducing the barbarous ornaments of modern science. My answer is, we do not propose to devote a large portion of time to Natural History in ordinary cases, and even this will be taken principally during those early years when very little real progress is made in Greek or Latin. Every age has its intellectual, as well as its moral claims; and though the stern discipline of early classical instruction may offer some advantages, still the hours devoted to the abstractions of grammar, and the puzzling out ideas which have no prototype in the child's mind through the dark mist of a language little akin to his maternal tongue, present very meagre food to that understanding they are supposed to strengthen. If the child must lisp in Latin, let him do so; let his first Gradus ad Parnassum be through the quagmires at its base; the few choice spirits that mount the summit may, perhaps, tread it with firmer step, and enjoy the prospect with keener relish; but that step will not be the less firm, nor that relish the less keen, because a daily hour was abstracted for 'Lessons on Objects,' or 'Lessons on Shells.' Not only are the sciences so linked together that each gives each a double charm, but the faculties of the mind are so constituted, as that the vigour of each is promoted by the due developement of the rest.

And there is a harmony as truly existing in a properly educated mind, as in a well-formed and well-exercised body, though the harmony of the former may not be so easily discerned as that of the latter.

As years advance, the study of Natural History may be confined to those who manifest a peculiar taste for it, or who exhibit little disposition for classical pursuits. For, as every age has its intellectual claims, so also has every grade of talent. The schools of the highest reputation have generally been conducted too exclusively to the advantage of the superior class of minds. The fine porcelain has been beautifully moulded and delicately pencilled, but the coarser clay has been almost entirely neglected. Yet many a young man who will never shine in the Senate House or the Schools, may yet pursue Natural History with success, and find in such pursuits improvement for his mind, a refuge from ennui, and a substitute for sensual pleasures. There is much truth as well as benevolence in a remark, I once heard from an amiable coadjutor of Pestalozzi ; "Tout terrain est bon si l'on sait le cultiver."

Much of the instruction thus communicated, will doubtless fade from the mind ; but not with it will pass away all the benefits arising from these studies. In after years they may be recom-

menced with greater facility, in consequence of the early training; and every incidental reference to these subjects, which conversation or literature may present, will be more readily seized, and more clearly comprehended. And may it not be anticipated, that through the judicious introduction of these branches of education into our schools, the latent powers of genius may be kindled, and talents elicited that shall push forward the limits of science,* and force the Proteus nature to reveal still more of her secret truths?

C. Mayo.

Cheam, June 15, 1832.

* In confirmation of this idea it may be stated, that a very ingenious improvement of the dissecting microscope, which has merited a reward from the Society of Arts, has been invented by a very young person brought up on these principles. I have the more unmixed pleasure and honest pride in mentioning this fact, as it refers not to a pupil of my own, but to one educated at Stanmore.

PREFACE TO THE SECOND EDITION.

It has been objected to these Lessons, that the children are instructed in the system of Linnæus, one confessedly imperfect, instead of that of Lamarck, which has been drawn out since the science has been enriched by modern discoveries. This objection would be most reasonable if the chief aim proposed in the work had been to teach the science of conchology,—but it is in fact simply what its name imports, Lessons on Shells; having for its object, to develope children's powers of observation, comparison, and classification: and to cultivate habits and tastes, which may in after life lead to a more correct and scientific study of the subject. Intellectual power and not knowledge, being the desideratum, that system should be pursued, which the children can work out; and there can be no doubt that the Linnæan is the best adapted for this purpose. The genera of Lamarck are principally determined by the animal which the children could not, with the exception of a very

few instances, have the opportunity of examining —indeed many of the shells composing his genera are very rare, and they could only know them by pictures; the generic distinctions also are often so minute that they would elude the observations of minds unpractised in scientific details. There is on the contrary something in the simplicity and clearness with which the great Swede seized and defined the broad outlines of nature peculiarly suited to the capacities of the young; and they may be led with very little assistance, to group the shells according to his arrangement, and to draw out from their own observation the generic characters. Nor will an acquaintance with the Linnæan system be without its value, when they may desire to study a more perfect classification than his; they will find the task of subdividing, separating, and arranging very much more easy than if they had to work upon materials altogether new to them; —they will have points established in their minds to which they may compare and attach the new ideas presented; their perceptions will be quickened to discover similarities and differences; and they will find many of the difficulties that embarrass the student at the very threshold of science, overcome by their previous lessons. Some again have objected to the subject of the lessons, as being so much less interesting than

that of plants or animals. This, however, is a mistake;—the well-defined, and varied forms of shells, their beautiful colours and markings, render them particularly attractive, and afford better opportunities than any other branch of natural history, for calling into action the perceptive powers. They are well suited to succeed "Lessons on Objects;"—the specimens may be examined in the same manner, and their parts and qualities described, and no other science present the same facilities of bringing before children, and exercising them in, the principles of classification. An additional interest is given to the study, when the accordance of the shell with the habits of its animal can be traced.

In drawing out '*Lessons on Shells*,' the following works have been consulted, and extracts made from them.

Burrows' Elements of Conchology..
Turton's Conchological Dictionary.
Turton's Bivalve Shells of the British Isles.
Mawe's Conchology.
Montagu's Testacea Britannica.
Flemming's Philosophy of Zoology.
Lamark's Historie Naturelle des animaux sans Vertébres.
The Conchologist's Companion.
Shaw's Nature displayed.
Sowerby's Genera of Recent and Fossil Shells.
Dillwyn's Descriptive Catalogue of Recent Shells,

The plates which illustrate this work, have been drawn from specimens actually presented to the class; they are intended as an assistant to the teacher, but not as a substitute for the shells themselves in the instruction of pupils.

LESSONS ON SHELLS.

LESSON I.

ON THE MOLLUSCA.

Teacher. Do you know what these things are which I have brought in as the subject of our lesson to-day ?

Child. They are shells.

Teacher. Describe to me what you mean by a shell.

Child. Oh, a shell is that which covers a snail.

Teacher. Very true ; a snail has a shell, but in saying this you do not explain to me the nature of a shell. When you attempt to describe anything, you should give such an account as would instruct a person altogether ignorant on the subject. Try again, and tell me what a shell is.

Child. A shell is a hard covering or house belonging to animals resembling slugs.

Teacher. Of what use do you suppose shells to be ?

Child. They must be a defence and protection to the animals which they cover.

Teacher. Yes: shells are the hard coverings of certain animals called mollusca, or mollusks; a name derived from mol*lis*, soft; and esca, flesh; if you call to mind the animals enclosed in these cases, you will not fail to observe how applicable this term is to them. Give me some example to prove that this name is well chosen.

Child. The snail has a very soft fleshy body.

Teacher. Yes, and the mollusks in this respect are all alike. I have brought you some to examine; look at them well, and try and discover the characteristics which distinguish them from other animals. Here are a snail, an oyster, a muscle, and a slug.

Child. We shall not be able to say much about such animals as these, they are so shapeless and uninteresting in their appearance.

Teacher. Do not form so hasty a judgment. I hope soon to convince you that it is your ignorance alone which causes you to view them with indifference. There is not any part of the creation which you can study, that will not repay you for your labour; and when you become better acquainted with the different kingdoms of nature, you will experience an increased pleasure in your walks; and objects that you have hitherto passed heedlessly by, will rivet your attention by the wonders they unfold to you;

above all, my desire is that you should be led to trace in all that nature presents, the hand of an Almighty and beneficent Creator. When you are struck with the organization of a plant, fitting it for some particular purpose, or see the means of defence possessed by one animal, of attack by another, should your admiration rest in these instruments, whilst you forget Him who prepared and fitted the instrument for its appointed work? Suppose that you have yourself made or done anything very nicely and with great pains for a friend, would you feel satisfied, or think it just, if, whilst your *performance* was admired, *you* were forgotten?

Child. I should consider such conduct very unjust.

Teacher. And what lesson do you suppose that I wish to teach you by drawing your attention to your own feelings when your industry and ingenuity have been thus overlooked?

Child. That when we are struck with the beauty and utility of any of God's works, we should praise him for his wisdom, and thank him for his goodness.

Teacher. It is with such feelings that I wish you to study Natural History, and it would then prove a very delightful and profitable employment.* You must now return to the consideration of the animals before you. Examine them

* It is most important in giving instruction in Natural History, early to accustom children to recognise the God of nature in his works. If God be robbed of his glory, how

carefully—exercise your different senses upon them—mark the various parts of their bodies—consider to what use each part is likely to be destined—and reflect upon what you know of their habits. By using well your senses and your judgment, you will be able to find out much for yourselves. When you are at the sea-side, or out at sea, you may collect facts illustrative of the history of these animals.

Child. That would be exceedingly interesting.

Teacher. Yes it would; but you need not wait for such opportunities. Rivers, and even the garden, will afford you specimens for observation: but what have you now to do?

Child. To examine the animals before us, to use our senses upon them as we did in our lessons on objects, to name their parts, and the uses of their parts as far as we know them.

Teacher. Yes. I wish you first to observe these creatures attentively; and that you may discover readily what is peculiar to them, you must in your own minds compare their qualities,

can we anticipate a blessing on our labours? Has not experience proved, that the study of the wonders of creative wisdom does not lead the natural heart to the Creator? Is it not notorious, that amongst the followers of science is continually seen the practical, if not the avowed Atheist. Let this be a beacon to the Christian instructor, and let it be his careful endeavour to guard against the fatal error of speaking of God's works independently of him. As we are called upon to walk by faith, and not by sight, it is essential to lead children to see God in all things, and to trace Him who is himself invisible in those outward manifestations of his power and goodness, which are within the reach of their observation.

parts and habits, with what you know of other animals. First, tell me some qualities that appear to you to be common to all the mollusca.

Child. Their bodies are soft, fleshy, moist, and cold.

Teacher. Yes, you remember their name is given to them from their softness. Observe also the action of a snail when you come near to it.

Child. It draws its body into its shell for protection.

Teacher. Yes. The bodies of the Mollusca are contractile, that is, have a strong power of contraction which they exercise by means of muscles. What more do you remark in these creatures?

Child. They have a thick skin which appears loose in some of them.

Teacher. This skin is called the *sac* or *mantle;* and is peculiar to the molluscous tribe. It is constantly moistened by a slimy exudation, and is also full of pores and glands, of which I shall have occasion to speak in a future lesson. What are pores?

Child. Pores are very small holes.

Teacher. What do you know about glands?

Child. I do not exactly know what glands are; but we have glands in our throats, are those of the mollusks the same as ours?

Teacher. They are of the same nature, but much smaller than those in our throats. The office of glands is to secrete or separate fluids of various kinds from the general fluid of the sub-

stance. Animals as well as vegetables, are supplied with a greater number of glands; the tears of animals are an example of secretion formed by means of such organs, so is the honey of plants. As the glands form little reservoirs, they often appear like small swellings, perceptible to the sight and touch. Now can you tell me what glands are?

Child. They are organs by which are secreted some particular fluid from the general fluid of the body.

Teacher. To return to the mantle; it sometimes envelops the mollusk like a purse, leaving an opening only where its mouth is situated; sometimes it extends on the two sides, forming expansions which perform the part of fins. Sometimes it spreads over the shell itself, which in this case has always a fine polish. Compare, as I desired you, the mollusks, with other animals, and tell me what further peculiarity you discover in them.

Child. They have no bones, their bodies are only a mass of soft flesh.

Teacher. They have certainly no bones; but in the mollusks which we purpose studying, the shell, by acting as a support to the body, seems in some measure to answer the purpose of bones. What more do any of you discover in these animals?

Child. They do not appear to have any blood.

Teacher. They have not red blood as we have; but are they composed entirely of solid matter?

Child. No, for when a snail is trodden upon, a white fluid issues from it; is this its blood ?

Teacher. Yes, it may be considered as a kind of blood. How does it differ from that which circulates through our bodies ?

Child. It is white and cold.

Teacher. True; and in consequence some naturalists have not considered it as blood, and have described the mollusca to be exsanguineous; a term signifying without blood, and derived from Latin *ex*, out of, and *sanguine*, blood. As this fluid flows through their bodies in vessels issuing from their hearts, it is now generally called their blood. What are you watching in the snail ?

Child. The very quick manner in which it draws in its horns, and shrinks into its shell, if it is touched.

Teacher. What would you determine with respect to the animal from this circumstance ?

Child. That it has the sense of feeling.

Teacher. Yes; and which part appears most sensitive ?

Child. The horns.

Teacher. And do you observe how the little animal feels about, and tries with these projections which you call horns ? They have from thence been termed *Tentacula*, from the Latin, *tentare, to* try or feel. How many tentacula have snails ?

Child. Four.

Teacher. The tentacula vary in number;

many mollusks have only two. The sense of feeling resides in the nerves.

Child. Oh! then the mollusks must have nerves.

Teacher. Yes, they have nerves. Do you perceive any other organs of the senses besides the *tentacula*?

Child. There are black specks on the horns of the snail which appear like eyes.

Teacher. These specks are the organs of sight, of which mollusks have never more than one pair. The sense of seeing, however, is not universally possessed by this class of animals. The organs of hearing and smelling have never been discovered in any of them, but they are supposed to possess the latter from the readiness with which they select suitable food. This circumstance also proves that they possess the sense of taste. You must now recapitulate all that has been said concerning the mollusca. Whence is the name derived?

Child. From *mollis*, the Latin for soft.

Teacher. What kind of body have they?

Child. Cold, slimy, soft, and fleshy.

Teacher. Yes; and another quality you observed when I touched the snail several times.

Child. That its body is contractile.

Teacher. And what enabled it so quickly to contract its body, and retreat into its shelter?

Child. Its being furnished with muscles.

Teacher. When you compare these animals

with others, in what respect do they appear deficient?

Child. They have no bones, the shell acting as a support to their bodies, which are attached to it by muscles.

Teacher. What envelops the mollusca?

Child. A sac or mantle.

Teacher. Describe the mantle.

Child. The mantle is full of pores and glands and is moistened by a slimy exudation—sometimes it quite encloses the animal, having only one opening like a purse, sometimes it has expansions at the sides, like fins, and sometimes it spreads over the shell.

Teacher. What are glands?

Child. Small lumps containing fluids, which are separated from the blood.

Teacher. Yes, in animals the glands secrete fluids from the blood; but in vegetables from the sap. Have these animals any blood?

Child. Yes; but it is white and cold.

Teacher. In what respects is it similar to blood?

Child. It circulates through the body in vessels issuing from the heart.

Teacher. What senses are enjoyed by the mollusca?

Child. The senses of feeling, seeing, tasting, and, it is supposed smelling.

Teacher. In what part of their frames is the sense of feeling most acute?

Child. In the tentacula.

Teacher. Tell me the derivation of that term?

Child. It is derived from the Latin, Tenta*re*, *to* try.

Teacher. But what must they possess in order to be able to feel ?

Child. Nerves.

Teacher. I will now read to you a summary of your lesson, and I shall expect you afterwards to write it from recollection.

Teacher. The mollsuca have soft, slimy, cold, fleshy, and contractile bodies. They have no bones, but their shell acts as a support to their frame. They have muscles by which they are attached to their shells, and by which they move their bodies. They are enclosed in a skin called the mantle, or sac, which is full of pores and glands. Sometimes the animal is so completely enveloped in this, as only to present an opening where the mouth is situated, sometimes it spreads over the shell, and sometimes it has external expansions answering the purpose of fins. The mollusca have not warm red blood, but a white cold fluid issues from their hearts and circulates through their frames. They have nerves, and consequently, feeling; and this sense seems most accute in their tentacula. Some have eyes, but others do not enjoy the sense of sight. They appear to have the power of smelling and tasting, but no traces of ears have been discovered.*

* This little summary of the substance of the lesson may be read over twice to the children, and they should then be

LESSON II.

(To commence with a repetition of the summary of the former lesson.)

Teacher. Examine these animals again, compare them with insects, and tell me if you observe any deficiency in their construction.

Child. They have not any limbs.

Teacher. Very true. They have not limbs or joints, as insects, nor are they divided, or moved by means of rings, as worms.

Child. Yet they move about.

Teacher. Yes; the greater number of mollusks have the power of locomotion, that is, of moving from place to place; the term is derived from the Latin loc*us*, a place. We will

required to write it as well as they can from recollection. It would be desirable also that they should repeat it at the commencement of the succeeding lesson. This process may appear tedious, but the result will be most satisfactory both to the teacher and pupils. The latter should acquire so clear a knowledge of the facts brought before them, and have them so well imprinted on their minds, that they may, through all their progress, be enabled without confusion or hesitation, to recur to each preceding step. Their information should be like a chain, which is held unbroken in the grasp; and when this is accomplished, a power of mind is elicited which, independently of the knowledge obtained, will prove most valuable when applied to more important subjects.

first examine the organs by means of which this power is exercised. In what manner do snails and slugs make their way along the ground?

Child. Their skin expands at the sides of the body, and adheres to the earth, and then they draw themselves on.

Teacher. This fleshy expansion under their bodies is full of muscles, which they dilate and contract at pleasure. It adheres like a sucker, and the animal advances by fixing the fore part to the ground and drawing the remainder after it. This instrument is called a foot. In some species, as the snail, it is attached to the under part of the body by its whole length, but in others it is free at one end, and can be extended or drawn in at pleasure. When it is free it is called a leg, and is generally tongue-shaped; it is frequently used as an organ of motion, but sometimes the animal employs it as a paw for digging holes in the sand or mud. But do you think that this organ will enable the mollusks to advance in all the situations in which they are placed?

Child. No, not when they are in the water; then they must swim.

Teacher. Yes, and this action is performed either by the serpentine movements of the foot and body, or by the movement of expanded portions of the skin or tentacula, which forces them onwards in the same manner as oars propel a boat.

Child. Have all the mollusks that live in

the water either tentacula or expansions of the skin?

Teacher. No; some have no such elongated parts. I think you might have discovered this yourselves by observing one of the animals before you.

Child. Oh yes, the oyster. Such mollusks cannot move then.

Teacher. That is not true of all, some are immoveably attached to the spot where they first received life; but others have the power of leaping or shifting their positions with a sudden jerk, produced by rapidly shutting the two pieces of their shells; others again transport themselves from one spot to another by the force with which they draw in and eject the fluid in which they live. Many species are furnished with a kind of bladder by inflating or contracting which they can rise or sink in the water as circumstances require. Try and enumerate the various means of locomotion possessed by the mollusca.

Child. Many creep by means of a fleshy elongation, which is in some a foot, in others a leg. In the water they swim, making their way either by the serpentine movement of their bodies, or by the use of tentacula. Some can rise and sink in the sea, and some make a leap by rapidly closing their shells, or by drawing in water and suddenly forcing it out again.

Teacher. When we study the different kinds of mollusca, I shall speak to you more fully of

their peculiar habits. Did you ever observe when you have been on the sea-coast, numerous shells clustered together on the rocks and stones?

Child. Yes, barnacles; are they the animals which never move from the spot to which they are attached?

Teacher. Yes, the barnacles and many other mollusks live and die on the spot where their existence first commenced.

Child. How are they fixed to the spot?

Teacher. Some of them, as the barnacles, are cemented to the rocks by the same substance of which their shells are formed; others have a less permanent mode of adhesion, and fasten themselves by means of a viscid liquid which they discharge from glands in their bodies; some produce silky filaments, one extremity of which remains in connexion with themselves, while the other is fixed to marine substances, and thus anchoring themselves, they float secure in the ocean. The bundle of filaments which the animal draws from his body for this purpose is called a *byssus.** Do you know any other shells that are with difficulty removed from the rocks?

Child. Yes, the limpet.

Teacher. The manner in which this mollusk

* The children should see and examine for themselves these contrivances. A pinna with its byssus, and barnacles on a stone are easily procured. The web of the spider would give them a good idea of the work of the pinna, being produced in a very similar manner.

fixes itself upon the rocks, is very simple, though very curious. It forms within its shell, a vacuum, that is, a space free from air, derived from Latin, vacu*us*, *empty*. By filling up the hollow of the shell with the fleshy substance of its body, it expels the air, and having fastened its body to the rock by a viscid substance, contracts itself in the centre, thus leaving a space within the shell entirely free from air. As there then is no internal expansion of this fluid, the pressure of the external atmosphere meets with no resistance, and in consequence acts with so much force upon the shell, that it cannot be removed from its situation without great effort. Repeat to me now the different means of attachment used by the mollusca.

Child. Some fix themselves by silky filaments called a byssus, some by a viscid cement, others by forming a vacuum, and others attach themselves to the rocks by the same substance of which their shells are made.

Teacher. The shells which by any of these means are rendered stationary, are called *fixed shells*, the others *free shells*. Does anything strike you with regard to these two kinds of mollusca?

Child. The inhabitants of the fixed shells must be badly off. They cannot procure nourishment.

Teacher. They cannot indeed go in search of it, but the continued motion of the waves, or the flowing of the tide brings a fresh supply of

water swarming with the little animals upon which they subsist, and some increase the rapidity of this supply, by forming currents in the sea.

Child. What very clever contrivers these animals seem to be.

Teacher. Yes, and your remark leads me to an important consideration, to which I wish to direct your attention. How do these little animals know that it is well for them to attach themselves to other substances. How have they learnt to form the vacuum, or weave the silken filaments ?

Child. Is it not instinct that directs them ?

Teacher. Yes, but can you tell me what instinct is ?

Child. It is something that guides animals.

Teacher. Is man taught in the same way ?

Child. No, we have reason, and can think about what we do.

Teacher. Well, let us consider a little the difference between that which directs man, and that which guides other animals. Suppose a child were to see a fire for the first time: not knowing its nature, he might perhaps put his finger into it. Would he do so, do you think, a second time ?

Child. No, he would recollect the consequences of having done so before.

Teacher He would have learnt then from his own experience : but is all knowledge obtained by our own experience ; do you not know any thing but what you have discovered yourself ?

Child. We learn from the accounts of others.

Teacher. True, we are instructed by the experience of others. But watch any animal, a bee for instance : when it makes its cell, does it try several times before he succeeds ?

Child. No, he does it perfectly at the first attempt.

Teacher. Has it been taught by its own species ?

Child. No.

Teacher. What then is the difference between the principle that guides the bee, and that which guides man ?

Child. Man is taught both by his own experience, and that of others ; but the bee acts rightly without either.

Teacher. Yes; it is directed immediately by a principle implanted in it by the Creator. This principle is called *instinct*, and is well defined to be prior to experience, and independant of instruction. I will now read to you the summary of to-day's lesson—attend, that you may be able to write an account of it from recollection.

SUMMARY.

Many of the mollusca, though destitute of jointed limbs, have organs of motion ; some have a fleshy expansion extending the length of the body, called a foot ; this is full of muscles, by which it is moved, it acts like a sucker, and the animal advances by fixing the fore part to

the ground, and drawing the remainder after it. This organ is sometimes free, and can be extended or contracted at pleasure; it is then called a leg, and is used either as an organ of motion, or as a paw for digging holes in the sand or mud. In the water, some mollusca advance by means of the serpentine motion of their bodies, others by the movement of either expanded portion of the skin or tentacula. Some, quite destitute of any separate organs of motion, effect a change in their position by ingenious contrivances; thus, the common scallops, by rapidly shutting the two pieces of their shell, can transport themselves a short distance; and others send themselves forward by drawing in water and ejecting it again with great force. Many species are furnished with a kind of air bladder, by inflating or contracting which, they rise and sink in the water as circumstances may require. Some, however, have no power at all of moving, but remain fixed through life to the spot where they commenced their existence. Their modes of attachment vary; some firmly fix themselves by the same materials of which they make their shells: others glue themselves by a viscid cement drawn from glands in their bodies; and others throw out a byssus, and anchor themselves securely to some rock. The limpet, by forming a vacuum in his shell maintains a firm hold of marine substances. The shells thus rendered stationary, are called *fixed shells*, whilst those inhabited by animals that move about, are termed *free shells*.

LESSON III.

(Repetition of the preceding summary as usual.)

Teacher. What organs in the mollusca have we considered?

Child. The organs of sense and of motion.

Teacher. And what other organs are essential to animal existence?

Child. All animals must have organs by which they feed themselves.

Teacher. Have you ever observed snails eating?

Child. Yes; I have seen them devour a leaf, and I should think they must have teeth.

Teacher. They have two jaws which are furnished with small teeth, fitted for cutting vegetable substances.

Child. Have all the mollusca mouths like that of the snail?

Teacher. No, the mouths of the different species, as well as their other organs, are adapted to the peculiar wants and habits of the animals. Some have only a simple opening to receive the little animalcula brought to them by the waves, and which do not require mastication.* Most of those which live upon the produce of the vegetable kingdom have a muzzle with jaws which are either horny or armed with teeth.† The

* The Oyster.

† The snail.

carnivorous * mollusca have usually a kind of proboscis ; this instrument is a fleshy pliable tube terminated by a round aperture, with a cartilaginous edge armed with little teeth.† The proboscis is supplied with muscles, by means of which the animal can protrude or draw it in at pleasure; many use it to pierce other shells, that they may suck out the flesh of the inhabitant. I have mentioned to you three different kinds of mouths which mollusks are found to possess ; describe them to me.

Child. Some have only a simple opening, others have jaws, either of a horny substance, or armed with teeth; and others possess a pliable fleshy proboscis, moved by muscles, and terminated by a cartilaginous ring which has teeth.

Teacher. Which are the feeders upon vegetables, and which upon animals ?

Child. The mollusks which have a muzzle feed upon vegetables, those with a proboscis are carnivorous.

Teacher. In feeding there is another point to be considered, how the food is to be brought to the mouth. How do *we* manage this operation ?

Child. By means of our hands?

Teacher. And what makes it particularly needful that man should possess hands ?

Child. His erect position.

Teacher. You have often had an opportunity of watching some of the mollusks which are

* From the Latin *carne*, *flesh*, and *voro*, *I eat.*

† Voluta musica.

vegetable feeders, you can tell me how they manage.

Child. The snail feeds upon vegetables, it crawls upon its fleshy foot till it reaches a plant, and then gnaws it with its jaws.

Teacher. The animal feeders stretch out their proboscis and catch hold of their prey, and some grasp it with their tentacula, and thus bring it within reach of their mouths. Those mollusks which have only an opening, have a supply of food brought to them by the continued movement of the waves and the flowing of the tides, and you must remember my telling you of some who ingeniously increase this supply by creating an eddy in the water. I have brought you an oyster and a snail, and wish you to compare them together, and tell me what appears to you to be the most striking difference between the two.

Child. The snail has a head, but the oyster is only as oft lump of flesh, and has no appearance of a head.

Teacher. Many of the mollusks like the oyster, have no obviously distinct head. This circumstance has led naturalists to divide these animals into two great classes. How should you think they are distinguished ?

Child. One class contains those mollusks which have heads; the other, those which are destitute of heads.

Teacher. The former are called mollusca *cephala* from the Greek κεφαλη (kephale) *a head;* the latter, mollusca *acephala* from the Greek

a without, and κεφαλη *a head*. The mollusca acephala have not a distinct head, nor any appearance of the organs of sight or hearing, their mouth is only a simple opening, and their organization altogether is much more simple than that of the mollusca cephala. They are aquatic animals, and their shell is composed of two pieces, to which they are attached by muscles. Which of these mollusks would you place in this class?

Child. The oyster, the scollop, and the muscle.

Teacher. Here is the summary of to-day's lesson;—read it carefully, and then take pains to write me a correct account of it.

SUMMARY.

The organs of nutrition possessed by the mollusca, vary according to their habits. Those which feed on vegetables, have a muzzle composed of horny jaws sometimes armed with teeth. Many of the carnivorous mollusca, have a fleshy, pliable proboscis, moved by muscles, and terminated by a cartilaginous border, furnished with teeth; others have only a simple opening, and possess no organ of mastication. The mollusca are divided into two great classes; one contains those animals possessing a head, which are called *mollusca cephala*, the other contains those which are destitute of a head, and are called *mollusca acephala*. The latter are distinguished by a much more simple organization, live invariably in water, and inhabit shells composed of two pieces.

LESSON IV.

(Before proceeding to the study of Shells, there should be a recapitulation of all the children have learnt concerning the animals, and a summary read to them and written down by them from recollection.)

MOLLUSCA.

The mollusks have a soft, cold, slimy, and contractile body moved by muscles. They have no articulated moveable parts as limbs; in some, the organs of motion are tentacula of different forms; in others, a fleshy foot extending along the underpart of their bodies; this fleshy substance is sometimes free and pliable, and can be projected and drawn in at pleasure. The bodies of the mollusks are enveloped in a sac or mantle of skin full of pores and glands, which sometimes spreads over their shell. They are destitute of bones. They have not red warm blood, but a white cold fluid circulates through their frames in vessels issuing from a heart. They have nerves connected with their different organs. They are divided into two classes. The first, mollusca cephala, have a distinct head, bearing lips or jaws, and are furnished with eyes and tentacula. The second, mollusca acephala, have a more simple organization; they have no distinct head, and are destitute of jaws and other hard parts of a mouth; they inhabit shells formed of two pieces.

LESSON V.

SHELLS.

Teacher. Well, did you find the study of the mollusca as uninteresting and unprofitable as you expected it to be ?

Child. Oh no, we have, on the contrary, learnt much that has interested and surprised us.

Teacher. And what useful lesson may you apply to yourselves from the mistake you first made ?

Child. Not to look upon any of the works of God with indifference or contempt, but to feel convinced that if they fail to excite our admiration, it is on account of our ignorance.

Teacher. The more you study Natural History, the more you will be inclined to acknowledge this truth. Now I wish you to examine the coverings of the mollusks,—are there any parts of other animals that can be compared to shells ?

Child. The hard coverings of beetles are something like them.

Teacher. What strikes you as being the principal difference between shells and the case in which some insects are enclosed ?

Child. Shells are like houses ; but the coverings of insects fit the different members of their

bodies like a skin, and seem to be a part of the animal itself.

Teacher. The coverings of insects are united to their different members; but shells are attached to the mollusks only in one or two places by muscles. You must have had the opportunity of observing how they adhere in one spot to their shell.

Child. Yes, you are obliged to cut the oyster away from the shell.

Teacher. Besides the difference which you have observed in the covering of insects and mollusks, their composition is not the same. You remember learning in your lessons on lime,* the animal substances of which it forms a principal part.

Child. Yes, our bones consist principally of carbonate of lime, and I think you said that shells were also a calcareous substance.

Teacher. Shells are composed of carbonate of lime, with the addition of a small portion of an animal substance called gelatine: the covering of insects is a phosphate of lime. The substance of shells is *testaceous*, having the hardness of baked earthenware, in latin, test *a*; and hence the mollusca enclosed in them are called *testaceous mollusca*: the covering of insects is *crustaceous*, having the hardness of crust, in latin, crust *a*.

Child. But whence is the carbonate of lime,

* See Lessons on Objects, page 173, Sixth Edition.

of which shells are composed obtained? Is it found in the sea?

Teacher. It exudes from the skin of the animal, which as I told you, is furnished with numerous glands. In these is secreted the calcareous matter.

Child. How very wonderful that they should thus be provided with materials to make their abode; but how is the shell formed from this substance?

Teacher. The little animal you formerly despised is its own architect, and constructs a dwelling exactly suited to its wants. One of our divines who has written a volume to prove that the works of creation are alone a sufficient evidence of the existence of a wise and beneficent God, says, speaking of a shell, "I do not know whether weight being given, art can produce so strong a case as some shells."* What do you now think of the workmanship of these little creatures?

Child. It is very wonderful, and how remarkable that there should be such a variety of shapes in shells!

Teacher. The shape of the shell is determined by that of the animal itself.

Child. But the mollusk does not always continue the same size.

Teacher. Very true. It is quite minute when it comes out of the egg, and the shell is

* Paley's Natural Theology.

then proportionably small ; but as the animal increases in size, it adds to the dimensions of its shells by additions made at the opening, and to its thickness by a succession of layers deposited within.

Child. Do the mollusks always construct their shells of the proper shape ?

Teacher. Yes, the carpenter with his rule and compass is not so exact and unerring as these heaven-taught builders. But is *form* the only point that attracts your attention in these shells ?

Child. Oh no ; they have most beautiful colours and markings ; these cannot belong to the carbonate of lime.

Teacher. No, and again I shall excite your admiration of the little animal, when I tell you that he not only constructs, but also adorns his habitation.

Child. But whence can he procure such beautiful colours ?

Teacher. He is furnished in himself with all that is necessary both for the constructing and beautifying his shell ; his skin you remember is full of pores ; these contain colouring fluids, which, penetrating the calcareous substance before it is hardened, form its diversified tints.

Child. It seems very wonderful that so many shells should have the same pattern.

Teacher. It is indeed most wonderful. I can tell you however how it is supposed to be effected. The pores containing the colouring matter are

arranged in the skin of the mollusks with the same undeviating regularity as the spots upon the leopard, or the stripes upon the tiger, and when the liquid exudes, it stains the shell, and the uniformity of the pattern is the consequence of the order in which the pores are placed in the mantle. Now look at all these shells, and consider them only in reference to their colours and markings.

Child. The colours in some are very beautiful, and there is great variety of patterns.

Teacher. This is very true ; but are they all different ?

Child. No, there are some that have quite the same pattern.

Teacher. Then you may observe two points especially with regard to the markings ; what are they ?

Child. That there is a very great variety, and yet some are alike.

Teacher. Do you suppose that their being alike is accidental ?

Child. Oh no, it could not have arisen from chance.

Teacher. Very true, nor can we fail to observe, that however great the variety may be in individual specimens, all the works of creation present a beautiful principle of order and uniformity. Prove if you quite understand what I mean, by applying it to these shells.

Child. There is a very great variety of pat-

terns and shapes, and yet they are all alike in many respects.

Teacher. They have undoubtedly all a general resemblance, which enables you at once to determine that they are shells ; but more than this, do you not observe that some are more alike than others ?

Child. There are some that are very much alike in shape.

Teacher. Yes, and yet differ in other respects ; but is this all that you observe ?

Child. No, there are some that appear exactly alike.

Teacher. Thus when you look at a collection of shells for the first time, you are struck by their general similarity, and you at once call them all shells. After a little inspection, it will be evident that amongst them, some have a few points of resemblance, and that others are quite alike in all respects. Thus you begin to perceive that the variety which at first almost bewildered you, is limited by a principle, and whilst your eye is gratified by the diversity, your judgment is satisfied by the order you find preserved. Tell me a similar circumstance in another class of natural objects.

Child. Flowers afford one. All roses are alike in general appearance, but the Moss Rose is easily distinguished from the China Rose.

Teacher. The variety exhibited in the works of nature cannot fail to delight us, and the resemblances observable in them enable us to

classify and arrange them. There is still one point with respect to shells which we have not considered; I mean the situations which they occupy. Where are shells found?

Child. Most of them in the sea, but some on land, and others in ponds and rivers.

Teacher. Those which live on land, are called *terrestrial*, from the Latin, terr *a*, earth. These mollusks feed on vegetables, and have always four tentacula, and their eyes are placed at the tips of these organs. The shells which are found in fresh water, are called *fluviatile*, from the Latin fluvi *us*, a river; they are generally of a corneous colour, and are semitransparent; their mollusks have only two tentacula, which are flat, having eyes at the base. The shells inhabiting the sea are termed marine, from the Latin, mar *e*, the sea; they are much the most numerous, the most beautiful, and the most highly prized. I will now recapitulate to you the substance of the lesson of to-day, and you must write it on your slates.*

SUMMARY.

Shells resemble the hard coverings of insects; the principal difference between them is, that the former are only attached to the animal in one or two places, while the hard case of insects

* It would be desirable before the recapitulation, that the teacher should question the pupils upon the points that have been discussed, as in a preceding lesson.

fits the members of their bodies, and has more of the nature of a skin. The substance also differs; that of shells is a carbonate of lime, with a small portion of an animal substance called gelatine, and is termed *testaceous*; the case of insects is a phosphate of lime, and is called *crustaceous*. The carbonate of lime, of which the shells are formed, is secreted in the glands of the mantle, and oozing out, takes the form of the animal, and gradually hardens. When the mollusk is small, the shell is proportionably so; but as the animal increases, it adds to the dimensions of its abode by additions at the opening, and to its thickness by layers from within. The colour and markings with which the shells are diversified, are produced in the pores of the mantle, and are there arranged in the same pattern as that which appears on the shell. Shells are either terrestrial, fluviatile, or marine.

LESSON VI.

Teacher. Let us now consider in what situations shells are placed. They are, as you know, exposed to the dashing of the waves, borne by the violence of storms against rocks; and carried down rapid rivers. You can readily imagine

the consequences of their being situated amidst such perils.

Child. Yes. The shells must frequently be broken, and the poor animals perish.

Teacher. Your first conclusion is true. The shells are often broken or injured; but God always makes a suitable provision for the circumstances under which he places his creatures. Recollect that the same Almighty Being who rules the tempests, directs also the movements of the minutest animals, he knows every effect of the former upon the latter, for he sees all the workings of his mighty plan. I am sure that you must know from scripture that such is the case.

Child. Yes; without Him not a sparrow falleth to the ground.

Teacher. This providential care is very evident in the history of mollusks. We find that the construction of the shell varies according to the situation in which it is placed. Some shells found in the rapid rivers of America,* are fitted by their great hardness and thickness to contend with the most boisterous elements;† others on the contrary, by their very lightness, seem constructed to float on the surface of the sea, and offering no resistance, are carried along gently by its waves. Some of the mollusks,‡ by adding to the weight of their little bark, are enabled to descend and seek a

* The Unio. † Helix Ianthina. ‡ Nàutilus.

shelter in the deep of the ocean; some * you have learnt, anchor themselves to rocks and thus bid defiance to dangers. But in spite of all these, and many more equally beautiful contrivances, a breach is often effected in the habitation of the mollusca.

Child. And then the poor animals must perish?

Teacher. This is by no means inevitably the case, for they are gifted with the power of repairing their shells.

Child. How can they manage this?

Teacher. By a discharge of the same calcareous matter, of which they at first constructed their shells. You might by your own experience prove this to be true; if you procure in the spring some common snails, break off a part of their shells, then giving them a supply of food, place them under a glass that you may watch their operations. You would observe first a frothy matter exuding from that part of the animal which you had uncovered, and forming a film; in a short time a second discharge would raise the first to the level of the external surface of the shell, and by degrees fresh accessions would give the new part the thickness and substance of the old shell.

Child. It would be very amusing to watch this experiment.

Teacher. But do you not admire the instinct

* Pinna.

that so wonderfully directs these little animals in their self-preservation?

Child. It is very surprising certainly, that such a worm should have the power of remedying so great disasters. But could not God have enabled them to form their shell at first too strong to be liable to imjuries, or else have placed them out of the reach of danger?

Teacher. Doubtless God could have done either. But all creation, as it is now constituted, reads us the lesson which we ought never to forget, that the work which was pronounced "good," when it first came from the Almighty's hand, has been marred, Every where we trace the consequences of the fall—all nature in its tendency to decay, shews the sentence of death passed upon it, yet it bears even in its fallen state, the impress of divine love and mercy. Now examine again the shells before you, and try and discover where any of them have been repaired.

Child. Several appear patched.

Teacher. These patches mark where some hole has been covered over.

Child. But here are some shells which have regular seams,

Teacher. These seams indicate where the animal, in consequence of its own growth made an addition to its residence. Observe this shell. (Bucinum flammium) Can you not trace the gradual extension of the shell from a very small size?

Child. Yes, it is marked by a rib like that at the opening.

Teacher. You will find a great many shells which shew that they have been enlarged in the same manner. The fresh layers are parallel to the margin of this opening called the mouth, and the meeting of the edges of the new and old matter is often marked by a ridge more or less elevated,

The shell of the adult animal is often armed with inequalities on the surfaces, as spines or tubercles, which do not appear in the young shell. I will now give you a summary of the lesson of to-day,

SUMMARY.

The mollusca are often placed in situations of great danger. They are exposed to the dashing of the waves, often borne by the violence of storms and cast against rocks or stones. Some placed in rapid rivers are occasionally hurried along by the impetuosity of the stream, God, however, always makes a suitable provision for the circumstances under which he places his creatures, and when he apportions to them spots of danger, arms them with the means of protection and defence. Thus we find that the shell and the habits of the mollusca are adapted to the situations which they occupy. Some that belong to the rapid rivers of America have an exceedingly hard and substantial shell, fitted to contend with the most boisterous elements;

others, on the contrary, by their very lightness are enabled to float on the surface of the water, and offering no resistance, are gently carried along by its waves ; some anchor themselves securely by a byssus to rocks, and thus bid defiance to danger ; others, by adding to the weight of their bark can descend and seek a shelter in the bed of the ocean. There are many other beautiful contrivances for their preservation. But in spite of these, a breach is sometimes made in their shell ; but this they have the power of repairing, by exuding a calcareous matter, similar to that with which they at first constructed the shell.

LESSON VII.

Teacher. To-day you shall tell me all that you remember respecting shells, and I will put it together in a more regular manner.

SHELLS.

Shells are the coverings or habitations of a species of mollusca. They are formed by the animal itself of carbonate of lime and gelatine : these substances are secreted in glands in its body. The colouring matter exudes from the pores of the mantle, penetrates the shell before it is hardened, and the colours being arranged in

order in the mantle, produce the peculiar markings which belong to the different species. When any accident happens to the shell, the animal is enabled to repair it. The size of the shell is in proportion to that of its inhabitant; small at first, but is increased from time to time, till the animal has attained its full size.

Teacher. Before we enter more fully upon the study of shells, and their classification, I wish to direct your attention to two circumstances very conspicuous in the works of the Creator. The first is, the economy displayed by God; * you seem surprised.

Child. Yes, it is so very extraordinary to talk of God being economical, when every thing is at his disposal, and he can create at his pleasure.

Teacher. Do you not recollect our Saviour giving an example of economy at the very time that he was manifesting his omnipotence?

Child. Yes, after he had fed the multitude with the two loaves and five small fishes, he commanded that the fragments should be gathered up, that nothing be lost.

Teacher. The same principle is displayed in the works of creation. Nothing is superfluous or without its use. The second principle to which I wish you to give your attention is, The compensatory providence of God.

* Paley's Natural Theology.

Child. What does that mean ?

Teacher. To compensate is to make amends for any defect, or to give something of equal value, for any thing taken away. In nature we often find objects in which there appear numerous deficiencies, but on further examination we discover that these are compensated or made up by some admirable contrivance. To make this clear to you, we will reflect upon a well-known instance. Consider the spider. What is its food ?

Child. Flies and other insects.

Teacher. And what mode of pursuit should you think best adapted to catching such creatures ?

Child. Flying, but the spider has no wings.

Teacher. Here then appears a sad deficiency ; winged insects are the natural food of the spider, and he has not the means of pursuing them. Yet do you not perceive how God has compensated this deficiency ?

Child. You mean by teaching him to construct a web to entrap the flies.

Teacher. This instance will give you a good idea of what is meant by the compensatory providence of God. It is much displayed in the singular fitness of shells for their respective localities. Thus those which move easily from place to place, and consequently are able to elude their pursuers, are often adorned with vivid colours, whilst those which are incapable of locomotion, escape the notice of their enemies by resembling in colour the stones and

weeds which surround them. Now tell me the two principles which are to be traced throughout the works of the Creator.

Child. The economy of God and his compensatory providence.

Teacher. Bear these principles in mind, and you will see many illustrations of them in the habits of the mollusca. The following lines of Pope will help to fix them in your memories:

> Nature to these, *without profusion*, kind,
> To proper organs, proper powers assigned;
> 'Each *seeming* want' *compensated* of course,
> Here with degrees of swiftness, there of force.

LESSON VIII.

Teacher. What do you think will be our next step in the study of shells?

Child. To learn the names of shells, and how to class them.

Teacher. What do you suppose first led people to adopt classification?

Child. The wish to arrange their shells.

Teacher. This would be one inducement, but there are many more important advantages connected with classification. Suppose that you had found a variety of shells on the seashore, and wished to inform a friend of the specimens

you had picked up, without entering into a long description of each, what would you do ?

Child. I would tell him their names.

Teacher. But if he had never seen the shells before, what idea would the name convey to him ? If I told you that I had a murex in my hand, what notion would you form of this shell ?

Child. None at all, unless you shewed it to me.

Teacher. But if you had seen the shell, observed its peculiar form and appearance, and been told that it was called a murex, what would then be the effect of my telling you that I had another murex in my hand ?

Child. I should know exactly what kind of shell you meant.

Teacher. This will give you some idea of the advantages of scientific classification. In the various branches of natural history, those objects which resemble each other in essential characters are formed into a class or genus, a description of their points of resemblance is drawn up, and a name affixed to the class. When we have become acquainted with these characteristics, the name will recall to our minds the idea of the set of things signified by it.

Child. A name then becomes very useful.

Teacher. How does it become so useful !

Child. By recalling to the mind the things which it signifies.

Teacher. What is the class of objects which you are about to study ?

Child. Shells.

Teacher. In learning the names of shells you will learn also what the names imply. The science which treats of shells, is called Conchology, from the Greek word κονχη (conché) a shell, and λογος (logos) a discourse. From whence does the shell derive its shape and colour?

Child. From the animal that inhabits it.

Teacher. What then do you think we ought to study besides the shell?

Child. The mollusca.

Teacher. Yes. But as we should not be able to procure many of these animals, we cannot pursue that branch of the science; and we will therefore follow the classification of Linnæus, which is founded on the shells. He first divides shells into three great classes. Here are a large number which I will arrange in three divisions, and you must examine each, and observe in what respect the shells I have classed together resemble each other.

Child. The shells in one set are formed of one piece, in the other of two pieces, and these seem to have several pieces.

Teacher. These distinct pieces are called valves. Where have you ever heard of a valve?

Child. A pump has a valve,—and steam engines have valves.

Teacher. Can you tell me what is the use of the valve of a pump?

Child. To prevent the water from returning into the pipe through which it has passed.

Teacher. The animals of these shells with two valves use these pieces for a very similar purpose,—to exclude the water. Now that you have found out the distinguishing character of these classes, I will give you their names. Those shells which are composed of only one valve are called *univalves,* from the Latin, un *us* one, and valve. Shells composed of two valves are called *bivalves* from *bis* the Latin for twice, and valve. Shells composed of more than two valves are called *multivalves,* from mult *us,* the Latin for many, and valve.

QUESTIONS ON THE MOLLUSCA AND THE SHELL.

Questions will be given at each division of the subject, which the children should be able to answer well without assistance, before they proceed to a new part.

1. Describe the animals called mollusks.
2. Which of the different senses do they possess?
3. How do they move on land?
4. By what means do they move in the sea?
5. Describe the different methods by which they render themselves stationary.
6. Describe the organs by which they feed themselves.
7. Name the two classes into which the mollusks are divided.

8. Describe how the animals of these two classes differ from each other.

9. Of what substances are the shells formed?

10. How are they coloured? and what is supposed to occasion the regularity in the markings?

11. How is the form of the shell regulated?

12. What is there remarkable in the formation of shells?

13. Give some examples of shells peculiarly fitted for the different situations they occupy?

14. Mention some instances of the compensatory providence of God manifested in the history of the mollusks?

15. Into how many classes are shells divided?

16. How are the shells of each class distinguished?

17. Give the derivation of the names of the classes.

LESSON IX.

PARTS OF AN UNIVALVE SHELL.

Teacher. To what class do all these shells belong? *

Child. To the class of univalve shells.

* A variety of univalve shells should be placed before the party.

Teacher. I intend that you shall study the univalve shells first, because they are the most simple, and their distinguishing characters well marked; but before you can describe these shells, you must be well acquainted with their parts. Here are some univalve shells,—examine them carefully; I will give you the names for the parts, as you discover them. First, tell me which appear to be the principal parts.

Child. These shells have two principal parts, this which swells out, and this which is tapering.

Teacher. The swelling part is called the *body*,* and this which is tapering, the *spire*. Observe how the spire is produced.

Child. It seems formed by the rolling round of a part of the shell.†

Teacher. These parts that roll round are called *whorls*, from an old Saxon word signifying a round. What do you remark in these whorls?

Child. That they gradually increase in size.

Teacher. The largest forming the body of the shell is called the *body whorl*, the smallest is called the *first whorl*. As the whorls successively roll one round another, what difference is there in the circles they describe?

Child. They gradually increase in diameter.

Teacher. It is from this circumstance that the set of whorls is called the *spire*, a word derived from the Greek root σπειρ, (*speir*,) which

* See plate I.

† See Helix Stagnalis. Plate V. Fig. 3.

signifies convolutions gradually increasing in diameter, just as would be the case in a rope coiled up. In the coiled rope you have the circles rolled one within the other, and lying flat, or being in the same plane. But if the centre whorl is gradually raised above the rest, what form do you obtain?

Child. A conical form.

Teacher. Do you now perceive how the term spire, originally derived from a word that signifies a set of whorls gradually increasing in diameter, can be applied to a conical form?

Child. Yes; because when the whorls rise one above another, they produce the conical form.

Teacher. You will find the whorls in shells arranged in both the ways described. When the whorls are all upon the same plane, or nearly so,* the spire is said to be *retuse*, a word derived from the Latin, *re*, back, and tus *us*, beaten. Tell me why this term is chosen, and pick out some shells with retuse spires.

Child. I should think the spire is called retuse, because the whorls appear beaten back into the body.

Teacher. Exactly so; now look at some specimens that form quite a contrast to these retuse spires.

Child. Here are some in which the whorls gradually taper to a very fine point; what kind of spire is this?

Teacher. This very pointed spire is said to

* See Conus Marmoreus. Plate II. Fig. 1.

be *subulate*,* from the Latin subul *a*, a pointed tool. The term spire is now applied to any form resembling that produced by whorls, which rising one out of the other, and decreasing in diameter, though it be not occasioned by whorls. You can, perhaps, recollect an instance in architecture, in which the name is so applied.

Child. The spire of a church.

Teacher. When the spire of a shell is formed by whorls, which is generally the case, it is said to be spirally convoluted, the latter term is derived from the Latin words, *con* together, and volut *us* rolled. Now examine the spire still more attentively, and you will find some other parts.

Child. There is a line formed where the whorls meet; has this line any particular name?

Teacher. Yes, it is called the *suture*, from the Latin sutur*a*, a seam or joining; do you perceive any difference in the sutures?

Child. Yes, in some shells it is quite a ridge, and in others it is more like a channel.

Teacher. When it is raised like a ridge or keel, it is called *carinate*, from the Latin carin *a*, a keel; when it is a sunken line, it is said to be channelled. Now look at your shells again.

Child. Are any parts of the shell considered to be the top and bottom.

Teacher. Yes, the point of the spire is the top. You recollect what the top and bottom of a cone

* See Buccinum Subulatum. Plate III. Fig. 4.

are called, and you may apply these terms to shells.

Child. The point of the spire is then the *apex*, and the part immediately opposite, the *base*.

Teacher. You are right.

Child. I think that when you described to us how the shells were enlarged, you called the opening the mouth.

Teacher. Yes, it is termed either the mouth or aperture.

Child. Shells have also sides.

Teacher. Yes, and it is necessary that you learn to distinguish the two sides. You are supposed, when you describe a shell, to place it upon its base with its mouth turned towards you; the right side will then be that nearest to your right hand, and the left that nearest your left hand.

Child. What is the part turned toward me called?

Teacher. The front, and what do you suppose the reverse is?

Child. The back.

Teacher. Look at this section of a shell.*

Child. Is it cut down the middle that we may observe the inside?

Teacher. Yes; and what do you perceive?

Child. There is a pillar round which the whorls appear to wind.

Teacher. This pillar is called the *Columella*, from the latin colum *ella*, a little column.

* See Section of a shell. Plate I.

Child. Have we now mentioned all the parts?

Teacher. No, you must examine your shells more attentively.

Child. The edges of the mouth.

Teacher. By what name are the edges or borders of our mouths called?

Child. Lips. Is the same term applied to the edges of the mouth of shells?

Teacher. Yes, and you must distinguish these two lips. What is their position?

Child. One is on the outside of the mouth.

Teacher. That is called the *outer lip*, and where is the other.

Child. Upon the body whorl.

Teacher. To which part of the shell is it near?

Child. It is near to the columella.

Teacher. It is thence called the *Columellar lip*. In what respect do these lips resemble ours?

Child. They are the borders of the mouth.

Teacher. Right. But how do they differ from our lips?

Child. They are not moveable.

Teacher. Do you suppose this is any disadvantage to the animal?

Child. I should think it is, for he cannot close his mouth, and exclude the water or keep out enemies.

Teacher. True, but those species which would suffer from such an exposure, are provided with a kind of lip which fits into the mouth

and closes the entrance to the shell, when the animal retires within it. This lid is called the *operculum*, a latin word, signifying a covering. The shells which are furnished with this appendage, are said to be *operculated*. Did you ever observe anything at all like it in the snails?

Child. The entrance to the shell is guarded by a thin covering during the winter.

Teacher. The animals belonging to land shells, as for instance snails, protect themselves from the inclemency of winter, by forming a temporary covering, which adheres to the sides of the shell, and is deciduous,—that is, falling after a certain period, from Latin decido, I fall. The operculum of the marine shell is of a very different nature. It is either a calcareous or horny substance, is permanent, and not attached to the shell, but to the foot of the animal, who draws it over the mouth when he recedes into his abode. Now tell me the position of the mouth.

Child. It is on the right side of the shell.

Teacher. Observe whether that is invariably its place.

Child. No, here is one shell it which it is on the left side.

Teacher. This is the case in some few species, and the shell is then said to be *sinistral*, a word derived from the Latin *sinistra*, the left hand. The others are called *dextral* shells, from *dextra* the Latin for the right hand. The sinistral shells are also said to be *reversed*, because the whorls

proceed in a direction contrary to their usual course. Now look at this very singular shell. (Murex haustellum.)

Child. It has a long tube.

Teacher. From what does it proceed ?

Child. From the mouth.

Teacher. Do you recollect any animals that have a similar projection proceeding from their mouths ?

Child. Oh yes; birds, their beaks are like this part of the shell.

Teacher. This projection in shells is also called a beak, or *rostrum*, the Latin for beak.

Child. The beak is hollow.

Teacher. It is ; the interior is called the *canal* and the shells which have these beaks are said to be *canaliculated;* and when the aperture has not a beak or canal, it is called *entire.*

Child. Is the beak of any use ?

Teacher. Yes, the animals which have this beak have an elongated fleshy tube, which is in some way connected with their breathing.

Child. Many of the shells have projections, some resembling thorns, some ridges, and some rounded protuberances.

Teacher. The projections resembling thorns are called spines, and the shells which have them are said to be spinous. The rounded projections are termed *tubercles,* and the shells on which they appear are called *tuberculous.* The ribs which are longitudinal rounded sutures formed at the various growths of the shell are

called *varices*, from the Latin varix, a swollen vein. But such parts as occur only in a few species we will notice when we examine the species. You must now repeat to me the parts of a univalve shell, and I will write them on the slate.

PARTS OF A UNIVALVE SHELL.

The spire.
whorls.
body whorl.
first whorl.
suture.
apex.
base.
aperture.
lips.
columellar lip.
outer lip.
columella.
body.
back.
front.
right side.
left side.
operculum.

Teacher. Describe to me each part and its position.

Child. The *spire* is composed of the upper

whorls, and is situated at the upper part of the shell.

The *whorls* are the parts that roll round and form the spire.

The *first whorl* is the smallest whorl, and is at the top of the spire.

The *body whorl* is the largest whorl, and is at the base of the shell.

The *suture* is the seam formed by the meeting of the whorls.

The *apex* is the top of the spire.

The *base* is the opposite extremity to the apex, and is situated either at the lowest part of the aperture, or at the end of the beak, when the shell is canaliculated.

The *aperture* or mouth is the entrance to the cavity of the shell.

The *lips* are the edges of the mouth.

The *columellar lip* is the lip nearest the columella.

The *outer lip* is the outer edge of the mouth.

The *columella* is the pillar round which the whorls form their spiral volutions.

The *front* is that part of the shell in which the mouth is situated.

The *back* is opposite to the front.

The *right side* is that part of the shell which would be next to the right hand of a person looking at it, the front of the shell being placed opposite to him.

The *left side* is that part of the shell which would be next the left hand of the person

looking at it, the front being opposite to him.

Teacher. Give me the derivation and application of the word *spire.*

Mention the different kinds of spires, with the derivation of the terms which you use.

Whence is the term *suture* derived?

How do the sutures vary?

What different projections occur on the surfaces of shells?

From what is the term *varices* derived?

How are the cavities of the shells often closed?

Tell me the derivation of the word *operculum.*

What different kinds of opercula are there?

What are the shells called which have a beak?

What is the mouth said to be when it has no beak? *

* These model lessons have been drawn out with great minuteness in order to exhibit two principles, very important to be applied in this kind of instruction. 1st. That the object itself should be presented to the children; that their powers of observation may be stimulated and directed by appropriate questions; and thus a considerable portion of their knowledge be acquired by themselves, instead of all being simply communicated by the Teacher. 2nd. That whatever supplementary information is given should be reproduced by the class before the conclusion of the lesson.

LESSON X.

Genus.—CONUS.—*Plural, Coni.*

CONE.

THE party should have before them a variety of univalve shells, amongst which there should be a large proportion of such Cones as have the characteristics of the genus well defined.*

Teacher. I have brought a variety of shells for you to examine; what is the point of resemblance which unites them all in one class?

Child. They are all composed of one valve; they are all univalves.

Teacher. From these univalve shells select those which appear to you to be similar in their general appearance, and in the form of their mouths.

Child. We have done so.

Teacher. Explain to me what you have done.

Child. We have selected those shells which have the same general appearance, and a similar kind of mouth.

Teacher. What was the common point of resemblance in all the shells which I have set before you?

* It is very important in teaching children to draw out the generic character of shells, to set before them specimens in which the distinguishing features are strongly and clearly marked; their ideas will then be distinct, vivid, and permanent. After this they may proceed to the examination of shells, which, combining the qualities of different genera, form the connecting links between them.

Child. Their being composed of only one valve.

Teacher. And what are the points of dissimilarity that lead you to separate this smaller set from the whole group?

Child. The difference in their general appearance, and in their mouth.

Teacher. You have now formed a smaller class. Such a subdivision is called a Genus, from the latin word gen *us*, a kind; the plural of genus is genera. The characteristic distinction of each genus among the univalves is founded on the general appearance of the shells, and the form of their mouth. The specimens which you have chosen belong to the genus called *Conus*, the plural of which is *Coni*. You must now examine the shells carefully and try and discover in what respect they resemble each other; you will then be able to describe their generic character, or mark those qualities possessed in common by them all, and which distinguish them from all other shells. How will you set about this?

Child. We must compare them together, and put down those qualities which they all possess.

Teacher. First consider their general appearance.

Child. Their shape is very similar; it resembles a cone.

Teacher. Yes, and it is *conical*, and from hence they have received their scientific name, Conus, and their common English name, Cone.

Child. The name expresses very well the appearance of the genus.

Teacher. It does; but which is the broadest part of a Cone?

Child. The base.

Teacher. And is the base the broadest part of these shells?

Child. No; quite the reverse.

Teacher. They are therefore said to be *inversely conical.*

Child. The cones are spiral.

Teacher. Observe how the spire is formed.

Child. By the whorls.

Teacher. And how are the whorls arranged?

Child. They are *spirally convoluted.*

Teacher. Compare the spires of the Cones with those of the other shells before you, and tell me what you remark.

Child. The whorls scarcely rise one above the other.

Teacher. You remember what a spire is called when the whorls have the appearance of being pushed into the body whorl.

Child. Such a spire is called retuse. Here is a Cone in which the upper whorls appear so pushed into the body whorl that the spire forms almost a flat surface.

Teacher. What then is the character of the spire of the Cones.

Child. The spire of the Cones is *retuse.*

Teacher. Compare together all the different shells before you, and you will find that the

relative proportion of their parts varies very much. In some you will perceive that the mouth is particularly large, in others the spire. What is the relative proportion of the parts of the cone?

Child. The body whorl is very large, compared with the other whorls.

Teacher. This peculiarity is expressed by the term *turbinate* which is derived from the Latin word turbin *is*, of a whirlwind.

Child. Why is this form of a shell named after a whirlwind.

Teacher. Because the first sweep of a whirlwind describes a circle much larger than those which succeed when its power is in some degree exhausted. Do you not now perceive how the term is applicable to the form you were describing?

Child. Yes. The body whorl is very large in proportion to the others, just as the first sweep of a whirlwind is large compared with those that succeed it.

Teacher. You have now observed the general appearance of the Conus; what particular part were you to take into consideration in order to draw out the generic character?

Child. The mouth.

Teacher. And what do you observe in the mouth of the Cones?

Child. It is long and narrow.

Teacher. When the mouth is very narrow in proportion to its length, and also of a nearly

equal breadth throughout, it is called *linear*, from its having the character of a line. In considering the parts of an object, what besides their form strikes your attention?

Child. Their position and direction.

Teacher. You remember the usual position of the aperture.

Child. It is almost always dextral or on the right side of the shell.

Teacher. And as this is its usual position, it is not noticed in the generic character, indeed the peculiarity of a sinistral aperture never runs through a whole genus of shells. But what do you observe with regard to the direction which the mouth of the Cone takes?

Child. It is in the direction of a line passing from the apex to the base, that is the length of the shell.

Teacher. And what do you call the direction of a line passing from the top of a body to its base?

Child. Longitudinal; the aperture of the Cone is *longitudinal.*

Teacher. You recollect learning in a former lesson the proper term for shells with a beak, and also for those without one.

Child. Yes, those with beaks are called *canaliculated,* and those without *entire.* The mouth of the Cone is *entire.*

Teacher. Yes. A little experiment will lead you to detect another characteristic of this genus. Observe, I fill this shell (a Turbo) with

water to the edge of the lips—has any of the liquid run over?

Child. No; the shell holds the water like a cup.

Teacher. When this is the case, the mouth is said to be *contracted.* But observe what is the consequence when I attempt to fill a cone with water up to the lips.

Child. The water runs out before it reaches the lips.

Teacher. Examine where the liquid flows out, and what is the cause of this difference in the two shells.

Child. The water flows out at the base of the cone. In the other shell the lips are united; in the cone they are separated by a small channel.

Teacher. This channel is called a *sinus*, from the Latin sin *us*, a curved line. If the two lips be separated by a sinus, liquid poured in overflows before it reaches the lips; the aperture in this case is called *effuse*, from the Latin fus *us*, which signifies poured out. You have no doubt heard the term effusion applied to the overflowing of any liquid; you ought now to know exactly what such an expression means. Compare the columellar lip with the corresponding part of the Cone in these shells (a Voluta and a Cypræa.)

Child. It is smooth.

Teacher. Examine all your Cones, and see whether they are all quite smooth.

Child. No: there are stripes at the base of some of them.

Teacher. These are called *striæ,* the Latin for stripes. Are they only perceptible to your sight?

Child. I can feel them also.

Teacher. What kind of striæ must they be if you can perceive them by your touch?

Child. They must be raised.

Teacher. Yes; they are slightly raised like wrinkles, on which account they are called *rugose striæ,* from the Latin rug *a,* a wrinkle. What direction do they take?

Child. An oblique direction.

Teacher. The columellar lip is nevertheless called smooth, because it has but trifling elevations. How would you describe the columellar lip of a Cone?

Child. The columellar lip of a cone is *smooth.* except that it is marked by a few *oblique rugose striæ.*

Teacher. Remember that the stripes are only occasional, not invariable. Do you think that any quality in these shells has escaped your observation?

Child. They are all prettily marked and have a beautiful polish.

Teacher. True; but the colours of shells and the peculiarities on their surfaces are not spoken of in the generic character; these form the distinctions of the different species. We will now sum up what has been said respecting

the Cones, and thus draw out their generic character. You must first mention to which of the three great classes they belong; next their general appearance; and lastly, the form and peculiarities in the aperture.

* Genus—CONUS—*Plural, Coni.*

CONE.

Generic Character. Shell univalve; whorls spirally convoluted, spire retuse; form inversely conical, turbinate; aperture linear, longitudinal, entire, effuse at the base; columellar lip smooth, sometimes marked at the base with a few oblique rugose striæ.

LESSON XI.

REMARKS ON THE SHELL AND ITS INHABITANT.

Teacher. The genus Conus is very easily known by its conical form and smooth columellar lip; these may be considered its two distinguishing characters. Much has not been discovered of the history or habits of the mollusks

* The generic character should be written on the slate before the children; they should learn it, and afterwards occasionally repeat it.

belonging to these shells. I will relate to you all the facts that I have been able to collect, and you must give your undivided attention to what I say, in order that you may afterwards write down the account from recollection.

The animal inhabiting the shells belonging to the genus Conus, breathes by means of gills ; it has two tentacula bearing eyes, the mouth is a long proboscis, and the foot is furnished with an operculum, by which it closes the entrance to its shell. The section of a Cone displays a fact very interesting, from its illustrating the singular habit of the mollusks ; it is, that the internal whorls are of a much thinner substance than the external coating. It is supposed that when the animal by an addition to its shell, causes what was its outer whorl to be surrounded and concealed by a new one, that it absorbs a portion of the old whorl, and thus it diminishes the weight of its shell, gives more room within for its body, and preserves the solidity and strength of its bulwarks. In this we see a beautiful instance of the superintending providence of God, who by the instinct he implants, directs the habits of the animal kingdom. The shells of this genus are remarkable for the regularity of their form, the brillancy of their colours, and the beautiful variety and distinctness of their markings. They are usually covered with a thick epidermis,* which preserves the fine polish

* Epidermis, an outer skin, from the Greek επι, (epi) upon, and, δερμα (derma) a skin.

of the surface. They are all natives of the ocean, and are taken in the seas of hot climates where they live at a depth of about ten or twelve fathoms.* They are never found on our coasts. Their name is derived from the Greek, κωνος (conos) a cone. Now attend and answer the questions I shall put to you upon all that I have detailed. What kind of animal inhabits the cone?

Child. It is one that breathes by means of gills; has a pair of tentacula bearing eyes; and its mouth is a long proboscis.

Teacher. There is one part of the animal which you have not noticed.

Child. It has an operculum attached to its foot, with which it closes the aperture of its shell.

Teacher. What is remarkable in the habits of this mollusk?

Child. It is supposed to absorb the matter of which the interior convolutions of its shell are composed.

Teacher. What then is the appearance of the shell when cut in halves?

Child. The interior parts of the whorls are thin, whilst the outer part of the shell is thick and strong.

Teacher. What advantage is the animal supposed to derive from the external convolution being so much thicker than those within the shell?

Child. The thinness of the interior diminishes

* A Fathom is six feet.

the weight, and gives room for its body, whilst the thickness of the exterior preserves its strength.

Teacher. What is there remarkable in the appearance of these shells ?

Child. They are remarkable for the regularity of their form, the brightness of their colours, and the variety and beauty of their markings.

Teacher. What is their appearance when first taken out of the ocean ?

Child. They are generally covered with an epidermis, which preserves their beautiful polish.

Teacher. To what seas do they belong ?

Child. To the seas of warm climates.

Teacher. And what is their situation in the ocean ?

Child. About ten or twelve fathoms under water. How much is a fathom ?

Teacher. A fathom is six feet; how many feet then are they under water ?

Child. Between sixty and seventy feet.

Teacher. From what is the name Conus derived ?

Child. The name conus is derived from the Greek κωνος (conus) a cone.

The Teacher should again read to the children the facts connected with the natural history of the genus, and require them to give an account in writing of all they have heard. For fear of discouraging them in the outset, some assistance may at first be given ; but it should be gradually withheld, and the attention brought into vigorous activity, that the mind may become able to grasp the subject brought before it. The first object to be attended to in their composition, is fluency, and this will be best promoted by allowing them to use their

LESSON XII.

Teacher. If any one were *now* to speak to you of a Conus, what idea would the name call up to your mind ?

Child. The name Conus would recall the idea of a univalve shell, whose form is inversely conical and turbinate ; the spire retuse ; whorls spirally convoluted, aperture linear, longitudinal, entire, effuse at the base ; its columellar lip smooth, having sometimes a few oblique rugose striæ towards its base.

Teacher. Yes, all the shells before us possess these qualities, or they would not be Cones:— but are they alike in all respects ?

Child. No ; they differ very much in their colours and patterns, and also in their size.

Teacher. On account of this variety in the shells possessing the same generic marks, the different genera have been subdivided into species, the characters of which are determined by the circumstances of colour, markings, size,

own expressions, and follow their own arrangement of the subject. When they have learnt to express themselves readily, they should be taught to seek for appropriate language, and to correct the inaccurate and inelegant expressions in their compositions. They should also be instructed to consider their subject well, before they begin to write on it, that they may arrange the matter in the best order.

and the inequalities of the surface. Here is a shell called *Conus marmoreus :* I wish you to examine it, and draw out its specific character ; it is considered as the type or representative of the Conus, from its having the characteristics of the genus strongly marked. Now, tell me what you have to do.

Child. We must try and describe this shell.

Teacher. Yes ; but you must recollect that you have to point out the specific distinctions only ; you must now omit the generic marks, as you have already determined them, and they are implied in the name Conus. First, what is the size of this Cone? *

Child. It is rather more than two inches long.

Teacher. Yes, in length it generally varies from two to three inches. What is the colour of the shell, and that of its markings ?

Child. The ground is a dark chesnut brown, approaching to black, and the markings are white.

Teacher. What form do the spots most nearly resemble ?

Child. They are nearly triangular.

Teacher. You may call them white subtriangular spots ; *sub* means under, and when prefixed to an adjective implies that the quality

* The children should have the length of an inch given to them, and by degrees they will learn to determine the dimensions of the specimens without measuring them. They should also be practised in deciding colours and their various shades, by referring at first to some standard. Werner's Nomenclature of colours is a useful work for this purpose.

attributed to the object, exists in an inferior degree. Examine the substance of the shell.

Child. It is heavy and thick.

Teacher. It is a ponderous shell ; now look at the spire, and tell me what you remark in it.

Child. It has little swellings placed regularly at the edges of the whorls.

Teacher. These swellings are called tubercles, and a spire marked with such inequalities is said to be *coronated.*

Child. I suppose that means crowned.

Teacher. Yes, the spire is so called from its crown-like appearance ; do you observe any other peculiarity in it ?

Child. The whorls are concave, and in most shells they are convex.

Teacher. The whorls in this shell form a little spiral channel, and are thence said to be channelled. We will now write down the specific character ; but I must inform you, that the name *marmoreus* is derived from the Latin *marmor,* marble ; and is applied to these shells on account of their mottled appearance.

CONUS *Marmoreus.**

MARBLED CONE.

Specific Character. Shell ponderous, smooth, dark chesnut brown, with white subtriangular spots ; spire coronated, whorls channelled ; size, from two to three inches in length.

* Plate II. fig. 1.

Genus.—CYPRÆA.*—*Plural, Cypræa.*

COWRY.

Generic Character.† Shell univalve, involuted,‡ smooth; form, suboval, resembling a coffee berry, obtuse at both ends; aperture linear, longitudinal, extending the length of the shell, effuse at each end; lips curved inwards and toothed; the spire in some species just perceptible, in others its position marked by an umbilicus.§

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The Cyprææ, of which there are numerous species, display a high natural polish, uniformity

* Plate II. fig. 2, 4, 5.

† The proposed manner of imparting instruction upon Natural History, so as at the same time to develop the faculties of children, having been fully shown in the preceding pages: the substance only of the lessons will now be given *for the use of the Teacher*, who, it is supposed, will analyse it and arrange it in questions according to the plan of the foregoing lessons. A frequent repetition of the generic character is recommended, and also that the children be required occasionally to give a list of the parts of a shell, and definitions of the terms they use.

‡ Involuted. Rolled inwards, this term is applied to a shell when the first whorls are rolled within the body whorl, from the Latin involut *us*, rolled up in.

§ Umbilicus. A small hollow: this term was applied by the ancients to the centre of the shield.

of shape, delicate and distinct markings, with great beauty and variety of colours. They are readily distinguished from all other shells by their lips being rolled inwards, and both of them toothed. The history of the genus is very interesting from the remarkable difference which occurs in the appearance of the same shell at the various stages of its growth. In its earliest state, the shell is very thin, almost colourless, and dull; the mouth rather wide, the outer lip not rolled inwards, but having a sharp edge, and neither lip denticulated. The shell which the animal first forms is indeed so dissimilar to the perfect Cypræa that it was formerly placed in another genus. In the second, or intermediate period of growth, the shell begins to approach the general form that characterizes the genus. The lips are curved inwards, and the teeth become apparent; but the shell is still thin, its colour faint, and its markings seldom more than ill-defined tranverse bands. In its third and perfect state, the Cypræa has received an additional coating of testaceous matter, the pattern appears with its vivid tints, and delicate markings, and the spire if not entirely hidden, yet scarcely projects out of the body whorl.

The animal itself undergoes a considerable change during its growth, its mantle at first is small, but it increases with its age, and expands at the sides into two ample wings; from these it is that the final layer which completes the shell is deposited. In the adult specimens, these ex-

pansions of the mantle completely cover the shell, when the animal goes forth to seek its food; at the place where they unite, a longitudinal line is formed, from its position on the back of the shell, it is called the dorsal * line; when the wings are so large that they fold one over the other, their place of junction is not marked. The external polish of these shells is owing to their being so frequently covered by the mantle. The animals inhabiting the Cypræa, have a fleshy foot with which they crawl, similar to that of the snail; the head is placed on a neck, and has two finely pointed tentacula, with two eyes situated at their base; the mouth is a round opening armed with teeth, these latter are not only organs of nutrition, but defensive weapons. The mantle in front forms a kind of tube, which is lodged in the notch of the shell; through this the mollusk receives the water it breathes. In a state of rest the Cyprææ remain buried under the sea at some distance from the shore, but it is said that at full of the moon they quit this retreat and traverse the rocks. They belong principally to the seas of hot climates; a few species are met with in temperate regions, but these possess not the beauty of colouring displayed by their congeners.† It may generally be observed with regard to shells, that

* Dorsal, belonging to the back, from the Latin dors*um* the back.

† Congener—one of the same genus, from Latin con, together, and gen*us*.

the intensity of their colouring decreases as their locality approaches the poles. One species called the Cypræa Moneta* is the current money of Bengal, Siam, and Africa; it is picked up by the negro women of the Indian islands about the full of the moon. This genus, on account of its great beauty, was formerly dedicated to Venus, the fabulous divinity of the island of Cyprus, from which circumstance its name is derived.

CYPRÆA *Arabica.**

NUTMEG COWRY.

Specific Character. Shell subovate; colour brownish, or blueish white, inscribed with dark brown markings resembling Arabic characters; the sides are thickened and spotted with purple; the teeth are chesnut brown; the dorsal streak is simple.

The shell is from two to three inches long, the breadth is nearly three quarters of its length.

The young shells of this species are blueish grey, variously clouded or banded with brown; when the teeth are formed, the back appears of a brownish or dull blue colour; in this stage of its growth, it has been known by the name of Cypræa Amethystea, or the Smoke Cowry. Linnæus was not aware of the change in the

* Plate II. fig. 4. † Plate II. fig. 2.

appearance of these Cowries at their different periods of growth, and from this defect in his knowledge, he has described the present species under three different names.

CYPRÆA *Europea.**

NUN COWRY.

Specific Character. Shell ovate, about half an inch long, and a quarter broad, transversely ribbed, the ribs terminating within the lips; of a pale purple or flesh colour, with three dark spots on the ridge of the back.

This is a British species, and found abundantly on our shores; it greatly resembles the West Indian species, but is distinguished from it, in having no dorsal groove, and the dorsal spots, if there are any, being limited to three. Both the shell and the inhabitant vary so much in their different stages of growth, that much confusion has arisen in their classification. The shell in its juvenile state is extremely thin, brittle, pellucid, and quite smooth; and the animal of a pale colour, displaying no reflected membrane. In its adult state the shell is thick, opaque, ribbed, and when the animal is in motion under the water, it extends over it the lateral appendages of its mantle, which are speckled with a variety of colours, presenting a very beautiful appearance.

* Plate II. fig. 5.

Genus.—BULLA.*—*Plural, Bullæ.*

DIPPER OR WATER BUBBLE.

Generic Character.† Shell univalve, convoluted, often without any spire, smooth ; ‡ shape suboval, inflated ; aperture longitudinal, generally the length of the shell, entire at the base ; columella oblique, smooth.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

This genus is perhaps less accurately defined than any other of the Linnæan genera : it contains an assemblage of shells presenting a very varied appearance ; indeed it seems as if it had been formed to be a receptacle for including all the species that could not find a place elsewhere. The most distinguishing characteristic of the Bulla is its gibbous or inflated figure, to which it owes its name, signifying water bubble. One

* Plate II. fig. 6, 8, 9.

† It is hoped that Teachers who use these lessons will recollect that it is most important when the children are drawing out the generic character, to bring before them a great variety of shells, that they may group them according to resemblances which *they perceive*, and under direction learn by observation, their distinctive characters.

‡ The Bullæ are said to be smooth because their surface has never any projections.

species (Bulla Ovum) bears a very striking resemblance to the Cypræa, it differs chiefly from that genus by the absence of teeth on the columellar lip. Some of the Bullæ are remarkable for having both ends of the mouth produced into long beaks; these shells are called birostrate.* (Bulla Volva.) †

The inhabitants of many of the Bullæ are larger than their shells, in consequence they cannot wholly recede into them; indeed in many the usual order is reversed, and the shell is so surrounded and enveloped in the body of the animal, that no part of it is visible, and an inexperienced person would little expect to find a regular testaceous specimen buried in an unsightly slug.

A very remarkable circumstance in the animal of the Bulla, is the form and structure of the stomach, which is furnished with a gizzard; this organ is composed of three strong shelly pieces, which have a roughness and prominency in their centre, that fits them to grind whatever comes under their action; these plates are surrounded and connected by a cartilaginous ligament by which they are moved. It is supposed that such a structure is necessary to the existence of these mollusks; for they are exceedingly voracious, as is evident from the fact that the animal of Bulla aperta has been found quite distorted from

* The children being acquainted with the words rostrum and bis, will see at once the derivation of this word.

† Plate II. fig. 8.

its having swallowed entire a shell nearly equal in size to itself; not unfrequently shells are found in their gizzard, reduced to a powder, affording ample proof that it unites the two offices of mastication and digestion.

The Bullæ are not furnished with an operculum; indeed to many of the species it would be a useless appendage, as the animal extends beyond the shell, and cannot, on account of its gizzard contract itself so as to retire within. The marine species also reside in deep water, and they are as safe there from crabs and other enemies as the mollusks who live near the shore, and barricade the mouth of their shells with their opercula.

BULLA *Lignaria.**

WOOD DIPPER.

Specific Character. Shell oval, thin, brittle, semi-transparent, yellowish or chesnut brown, with numerous transverse striæ of a light colour approaching to white, giving it some resemblance to veined wood; sometimes it has one or two oblique bands; inside white, glossy; aperture large, extending the whole length of the shell, somewhat contracted towards the upper part; columellar lip smooth; it has no external

* Plate II. fig. 6.

convolutions, but at the top is depressed, and has a small umbilicus ; it is usually about two inches long, and one and a quarter broad at the base.

This is one of the Bullæ which possess a gizzard.* In this animal it consists of two triangular, thin, testaceous plates nearly an inch in diameter, and another of an elongated semicylindrical form. These plates are connected together by a tough yellowish ligament ; and form a most powerful digestive organ ; when the animal has been dissected, there have been found in or near this gizzard, numerous specimens of the smaller testacea, with their shells reduced completely to a powder.

This is the largest species of the British Bullæ.

BULLA *Fontinalis*.†

STREAM DIPPER.

Specific Character. Shell sinistral, having four or five reversed volutions, glossy, pellucid,‡ and of a light horn colour ; the body whorl is large ; the others are very small, and not much produced ; aperture oval oblong, three fourths of the length of the shell. Old specimens are

* Plate II. fig. 7. † Plate II. fig. 9.

‡ Pellucid, so clear that the light is seen through it. From Latin, *per* through, and *lux* light.

somewhat striated, and rather wrinkled longitudinally, with two or three faint tranverse ridges on the body whorl. Length in the largest specimens, half an inch, breadth a quarter.

This is a British species, not unfrequently found in stagnant pools and running waters, upon the under side of the leaves of aquatic plants.

The animal is of a light yellowish colour, has two long setaceous* tentacula, with two black eyes placed underneath at their base. When in motion, it covers great part of the shell with a transparent membrane, scarcely perceptible to the naked eye.

It has very considerable powers of locomotion, and transports itself with the shell downwards, by adhering to the surface of the water, crawling over it with as much apparent ease as if it were on a solid body. It can also let itself down gradually by a thread which it affixes to the surface of the water, as a caterpillar attaches itself to the branch of a tree; it is the only animal that is known to be capable of thus suspending itself under water. It has also the power of throwing its shell about in an extraordinary manner, whilst it keeps its body fixed by its foot; it probably resorts to this singular habit either in self-defence, or to remove the little aquatic animals with which it is tormented.

* Setaceous—bristle shaped, from Latin *seta*, a bristle.

Genus.—VOLUTA.*—*Plural, Volutæ.*

VOLUTE OR WREATH.

Generic Character. Shell univalve, spirally convoluted; shape suboval; aperture narrow, longitudinal, generally effuse at the base; having sometimes a dorsal notch; columella has oblique plaits, varying in size and number.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

This genus contains shells highly valued for the beauty of their colours, and the brightness of their natural polish. They vary considerably in their appearance. Some have the aperture entire; in others it is effuse, terminated by a notch, or produced into a canal; the distinctive mark however by which they may be immediately recognised is the plicated† columellar lip. It is supposed that the animals inhabiting such variously formed shells, must also be very different, since it is found that the abode of a mollusk is invariably suited to its conformation and habits. There are but very few British species of this genus, and even these are doubtful.

* Plate II. figures 10, 11.

† Derived from Latin *plica*, a fold.

The term Voluta signifies rolled up cylindrically.

One large family has been separated by modern conchologists from the Volutes, and formed into a distinct genus called Oliva, composed principally of the Voluta Oliva* of Linnæus. These shells are of a cylindrical form, have a short spire, and the aperture notched at the base. They are easily distinguished from all other Volutes, by having their whorls separated by a channel. Their surface displays a fine polish, and many of them are beautifully coloured. It appears that the Olives are formed, like the Cowries, of two coatings of testaceous matter; when the upper one is artificially removed, that underneath often displays most beautiful tints. They are found in hot climates. The animals which inhabit them, breathe only water, which they inhale by means of a tube situated under the head, and fitting into the dorsal notch.

Another large family of Volutes are called Mitres, from their resemblance to the insignia of clerical dignity. These are now arranged in a distinct genus bearing the name Mitra. Their form is more elongated than that of their congeners, being † turreted or fusiform, and the apex very pointed. They are also characterized by the gradual decrease in the size of the collumellar folds as they approach the base. These shells

* Plate II. fig. 10.

† The whorls gradually decreasing, the length of such shells greatly exceeds their breadth.

are as much admired for the brightness and variety of their colours as for the elegance of their form. They are found in the seas of hot climates. The natives of the Island of Tanna fix them into handles and use them for hatchets. The Voluta Epicopalis or Bishop's Mitre,* is the type of this family. It is white, marked with distinct orange spots. It is frequently found in India. Its inhabitant is said to be of a poisonous nature, and to wound with its pointed proboscis any offender who ventures to touch it.

VOLUTA *Musica.*

MUSIC SHELL.

Specific Character. Shell oval, with pointed tubercles on the whorls; aperture emarginate,† columella with eight plaits; outer lip smooth and thick; shell two or three inches in length, colour white or buff; it is remarkable for its dark markings, arranged like a stave in music in parallel lines, upon which are spots resembling the notes; from this appearance it derives its name.

* Plate II. fig. 11.

† Emarginate, notched, or having the margin excavated by a sinus.

VOLUTA *Pyrum.*

TURNIP VOLUTA.

Specific Character. Shell pear-shaped, ponderous, smooth, canaliculated, striated, and slightly nodulous transversely; spire acute; columellar lip with three plaits; colour dirty white; the young shells are yellowish, and have irregular transverse rows of dark spots. The size of the perfect shell is about five inches long, and about half as broad.

The reversed shells of this species are held sacred in China, where a great price is given for them; they are kept in pagodas by the priests, who on certain occasions administer medicine to the sick out of them, they also use them to anoint the Emperor at his coronation. They are often curiously ornamented with carvings, executed by the Indians, who use them for drinking cups.

Genus.—BUCCINUM.*—*Plural, Buccina.*

WHELK.

Generic Character. Shell univalve, spirally convoluted, frequently canaliculated; form gib-

* Plate III. fig. 1, 2, 3, 4.

bous; aperture ovate, effuse at the base, ending either in a notch, or a short canal abruptly curved and turning to the left, that is, from the outer lip; columellar lip flattened.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The characters which distinguish this genus do not always occur in each species. The most invariable mark of distinction is the direction of the canal; and should this fail, as is the case in a few instances, the thick gibbous form or the flattened columellar lip will still point out the proper situation of the shell to be amongst the Buccina.

One division of this genus is known by the common name of Tuns; their scientific name is Dolium. These shells are thin, brittle, turbinate, of an inflated or globular form, transversely ribbed, the aperture is large, and has a notch at the base. The type is the Buccinum Dolium.*

Many of the Buccina are called Helmets,† and are distinguished by their inflated, turbinate form, and by their short beak abruptly reflected; their columellar lip is thickened and spread over the body whorl, forming a flat expansion; their outer lip is also revolute,‡ and often dentated; §

* Plate III. fig. 1. † Plate III. fig. 3.

‡ Revolute, rolled back.

§ Dentated: toothed, from Latin, *dens*, a tooth.

their spire is retuse and marked at intervals by curved ridges which are the permanent margins of the former apertures, and are interesting, as marking clearly the various stages of the shell's increase. The Helmets are very common, and many are remarkable on account of their size and solidity. One species (the Buccinum Cornutum) is more than a foot in length. These shells are handsome and are often used as ornaments in rooms. They are found mostly in topical seas, distant from the shores, in sandy bottoms where the animal buries itself in search of prey. They form the modern genus Cassis.

The most beautiful shells of this genus are called Harps; * they have an elegant shape, rich tints, and usually a glossy surface; their form is oval, spire short, aperture large, notched at the base, the inner lip is spread over a portion of the body whorl, the outer lip is thickened and rolled outwards. The animal produces this thickened revolute lip at different periods of its growth, thus forming a number of elevated ridges on the shell. Such marks of increase are observable in many other marine shells, and in a few land species; but in none are they more numerous than in the Harps. The effect of these ribs is very rich and pleasing. The Harps are found in the seas of hot climates, particularly near the Isle of France. The genus they now form is called Harpa.

* Plate III. fig. 2.

Another very distinct natural group of this genus consists of shells called Needle Buccina,* a term which indicates their subulate form. They possess the characteristic mark of the genus in the notch of the aperture slanting towards the left, though their pointed elongated shape gives them a very different appearance to that of the Buccina in general. They are now arranged in a genus called Terebra.

The name given to this genus is derived from the Latin buccina, a trumpet, and it is very probable that these shells furnished the first idea of that instrument, for if the apex be pierced or broken off, a variety of sounds may be produced by blowing into it. Triton, the fabled trumpeter of Neptune, is represented with one of these shells in his hand, when he is supposed to be calling up the river deities to attend their monarch. This kind of trumpet is still used by the Italian herdsmen to direct the movements of their cattle. In a part of Wales also the farmers summon their labourers in a similar manner, and the deep and sonorous notes thus produced, breaking in upon the silence of those mountainous districts have a very striking effect. In Palestine the bee masters enticed their bees with a whistle made by means of some shell, (probably a Buccinum) and led them from meadow to meadow to collect their store of sweets. Isaiah seems to refer to this custom when he prophecies the con-

* Plate III. fig. 4.

quests of the Assyrian monarch. "And it shall come to pass in that day that the Lord shall hiss (or whistle) for the bee that is in the land of Assyria. And they shall come, and shall rest all of them in the desolate valleys, and in the holes of the rock, and upon all thorns and upon all bushes." Isa.vii. 18, 19.

Various species of turbinated shells, chiefly of the Buccinum or Whelk tribe, are picked up on the shores of the Isle of Wight. They are found tenanted not by their natural inhabitants, who love the deep recesses of the ocean, but by a species of Crab called the Bernard, or Hermit Crab. This creature curiously exhibits the wonderful operations of animal instinct, whilst he exemplifies in a striking manner the resources of a compensatory Providence. The hinder part of his body is tender and naked, unprotected by that shelly covering which guards his head and anterior extremities; he would therefore be peculiarly liable to injuries were he not endowed with a foresight that directs him most ingeniously to provide against any accident. This he effects by seeking for the roomy cavity of some forsaken Whelk, and wriggling himself into it, he maintains his hold by means of a hooked claw, which he fastens to any projection in the shell, while his head and front claws hang out at the aperture. Thus secure, this little crab continues till increased in size he is compelled to abandon his retreat and seek for a tenement of more ample dimensions; at such times he may be seen

traversing the sands, searching with patience and assiduity for another abode, and examining each empty shell, till he meets with one better suited to his wants.

BUCCINUM *Harpa.**

HARP SHELL.

Specific Character. Shell oval, turbinate with longitudinal, acute, and curved varices; mouth expanding, notched at the base ; outer lip revolute ; collumellar lip smooth, flattened ; variously marbled or banded with fawn colour or reddish brown ; size from two to three inches long, and nearly two-thirds as broad.

There are several varieties of this species, which is much distinguished for its beauty. They are found principally in the Indian ocean, also in the seas of hot climates. They are furnished with a horny operculum.

BUCCINUM *Undulatum.*

WAVED WHELK.

Specific Character. Shell thick and coarse, with seven or eight ventricose whorls, having

* Plate III. figure 2.

undulating * ribs both transversely and longitudinally striated; varies in colour from dirty white to chesnut brown; size from two to five inches long, and more than half as broad.

There are scarcely any of our shores which do not produce this shell. It is commonly taken in dredging by fishermen, who either use the animal for bait, or destroy it, under the supposition that it is very destructive to a large species of scallop, insinuating its tail, as they term the trunk, into the shell, and killing the inhabitant for food. The old shells are frequently covered with a brown epidermis, or rough extraneous matter.

The animal has two conical tentacula bearing eyes at their base, a short foot, to which is attached a horny operculum, and a long trunk that issues through the notch at the base of the shell.

BUCCINUM *Lapillus.*

ROCK WHELK.

Specific Character. Shell ovate, thick, with five or six whorls more or less striated longitudinally, and transversely crossed with finer irregular striæ; apex, small, pointed; aperture oval; outer lip waved or denticulated; it is usually of an uniform dirty white, or yellowish

* Undulating: wavy, from the Latin undul *a*, a small wave.

colour, sometimes banded with brown or yellow. Length rarely exceeds two inches, breadth one.

The animal that inhabits this shell has two slender tentacula bearing eyes about half way up on the outside, the ends of the tentacula as far as the eyes are retractile * like those of snails. Its mantle forms a tube through which it breathes; it has a foot with a horny operculum. Near to its head, and lying in a little furrow, is a white vein which yields a beautiful purple tint, supposed to be that so long celebrated as the Tyrian dye. In order to obtain this colour, the vein is laid open with a needle, and is found to contain a tenacious yellow matter like cream. As soon as this fluid is put on any substance, as silk, linen, &c. and exposed to the air, the yellow assumes a brighter hue, but speedily turns to pale green, then gradually becoming darker, until it has obtained a blue cast, and from that it changes to a purplish red, more or less deep according to the quantity used. The succession of the tints is accelerated by exposure to the rays of the sun. The stain given by this animal fluid seems to be indelible, bidding defiance to every chemical process to obliterate it, and it might therefore be most advantageously used as a kind of marking ink.

The Buccinum Lapillus is one of the most common shells upon our coasts, adhering to rocks quite up to high water mark.

* Retractile, capable of being drawn back, from the Latin re back, and tract *us* drawn.

BUCCINUM *Subulatum.**

TIGER SPIRE.

Specific Character. Shell turreted, subulate, smooth: colour white, tinged with yellow, red, or brown, and marked on the body whorl with three rows of squarish, dark, ferruginous† spots; the shell is from three to six inches long, and the breadth scarcely exceeds one eighth of the length.

Genus.—STROMBUS.‡ *Plural, Strombi.*

WINGED OR CLAW SHELL.

Generic Character. Shell univalve, spirally convoluted, canaliculated; form suboval; aperture more or less dilated, ending in a beak turning to the right, that is, towards the outer lip; the outer lip usually expanding into a kind of wing, with a sinus near the base.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The remarkable peculiarity in the shells of this genus is their propensity to have their outer lip expanded into a wing-like projection; from this

* Plate III, figure 4.

† Ferruginous, of the colour of iron rust, from the Latin ferrug o, rust. ‡ Plate III. figure 5.

circumstance they are sometimes called the Alatæ * or winged shells. In some species this expansion is lobed, in others it is divided into curious digitations † or claws, giving the shells a resemblance to spiders or scorpions, whence they have received their specific names. Some are remarkable for a lengthened spire, and very much resemble in form the Needle Buccinum; these now form the genus Terebra.

The distinguishing marks of Strombi are the sinus in the outer lip near the base, and the position of the beak. Like the Cyprææ, they vary so considerably in their different stages of growth, that the juvenile specimens are scarcely to be recognised as belonging to this genus: at an early period the outer lip is not expanded, and there are no traces of claws; subsequently the wing spreads out, and the claws appear as short open spouts; and when the shell arrives at its full size, these become solid hornlike projections, often very long and curiously curved.

There are not more than two or three species of the Strombus found on our coasts.

The inhabitant is little known, but it is supposed from its second sinus or notch, and its curious digitations, that there must be some peculiar circumstances in its construction and habits.

* Alatæ winged, from the Latin ala, a wing.

† Digitations, projections in the form of fingers, from the Latin digit *us*, a finger.

STROMBUS *Pes Pelicani.**

PELICAN'S FOOT.

Specific Character. Shell turreted, finely striated transversely; spire tapering to a fine point with ten tuberculated convolutions; the body whorl has two rows of smaller tubercles beneath the larger ones; outer lip much expanded, four-clawed, the upper claw extending up the spire, the lower one forming the beak; the two middle ones are ribbed along the back in a continued line from the rows of tubercles, and underneath is a corresponding groove. The shell is of a pale brownish flesh colour. Length nearly two inches.

The Strombus Pes Pelicani is subject to great variations in the different stages of its growth. In young shells† the outer lip has not assumed its peculiar form; it first gradually expands, then the claws appear, and finally it becomes digitated. Shells are found in all the intervening gradations between the young and the adult specimen.

This species is rather common on many of the coasts of Great Britain, it is chiefly met with on sandy shores.

* Plate III. figure 5. † Plate III. figure 6.

STROMBUS *Chiragra.**

SAVAGE CLAW.

Specific Character. Shell ovate, turreted; spire short, tuberculated; outer lip having six strong curved claws, the sinus not immediately at the base; mouth striated; colour white mottled with brown; lips orange colour with black and white stripes; outside generally coated with a thin horny epidermis; size about five inches long and three broad not including the claws, which are from two to three inches long, the upper and lower ones curved in opposite directions.

This Strombus also exhibits a very different appearance at its various periods of growth.

Genus.—MUREX.*—*Plural, Murices.*

ROCK SHELL.

Generic Character. Shell univalve, spirally convoluted, canaliculated, rough with spines,

* Signifying, savage claw, from the Greek words χειρ, (cheir) hand, and αγρα, (agra) fierce or savage.

† Probably named from the Latin, murex, the primary signification of which seems to have been the sharp point of a rock. Plate IV. figure 1, 2, 3.

tubercles, foliations, or varices; aperture oval ending in a beak, either straight or turned backwards. Some of the species are remarkable for the great length of the beak.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The very great variety which occurs in the shells of this genus has caused them to be arranged under several divisions; but the mark by which a Murex, according to the Linnæan definition, may be easily recognised, is the oval shape of the mouth; this being preserved even when the aperture is terminated by a beak, as instead of gradually contracting, it abruptly opens into a canal. Besides this regularity in the outline of the aperture, another distinctive mark is that the beak neither inclines to the right nor to the left.

The Murices are in general of an irregular form, arising from their surfaces being covered either with spines, tubercles, varices, or foliations; and from the rock-like and rugged appearance thus occasioned they derive their designation. Some of the shells of this genus are remarkable for the singular extension of their beak.

Many of the Murices are distinguished by their thick protuberent rounded varices. These shells have been divided into different genera

according to the arrangement of these ornaments: In one division the shells are distinguished by having two varices in each whorl, which are continued in a longitudinal series on each side up to the apex, giving them a flattened appearance on the front and back; the genus which they now constitute is called Ranella * Frog, from the resemblance of the shells to that animal.

The shells of another division † are distinguished by three rows of varices, sometimes expanding into elegant foliations or lengthened spines, these varices are so arranged that they form three longitudinal raised lines taking rather an oblique inclination towards the apex. It is evident that the habits of the mollusca of these two sets of shells must be different, for the situation of the varices of the latter proves that a smaller portion is added to the abode at each epoch of its growth than in the Ranella.

A third division ‡ of this genus includes shells ornamented by varices, not disposed in a continued series as in the other two classes. This difference in the disposition of these protuberances is occasioned by the piece which the animal adds to its shell being more than half a volution. The varices are consequently few, and appear scattered over the shell.

* Plate IV. fig. 2. † Plate IV. fig. 1.
‡ Plate IV. fig. 3.

MUREX * *Ramosus.*

BRANCHED MUREX.

Specific Character. Shell oval with three foliated varices; beak short and truncated; the colour of this shell varies greatly; it is sometimes of an uniform whiteness, sometimes pale yellow, brown, pale red, nearly black, and sometimes the whorls are of one of these colours, and the foliations of another. Its dimensions also differ greatly; it varies from two to five inches, and is about half as broad.

There is a circumstance of unusual interest to be observed in the manner in which this animal increases the size of its shell, and which shews most admirably the regularity and beauty of the laws of nature, and directs the mind to the contemplation of the wisdom and power of the Creator, who alone could teach these little animals how to construct an habitation so perfectly adapted to their circumstances and situation. It will be observed that each periodical increase of these shells consists of a piece which surrounds about a third part of the last volution already formed, which portion is terminated in this species by a foliated, in some by a spinous varix, it is obvious that these foliations or spines must be in the way of the future increase of the

* Plate IV. fig. 1.

shells, unless they could be removed from that part which it is intended to cover; the animal therefore is furnished with the means, perhaps by a solvent liquid, of eating away the lower part of these projections; so that they become detached and fall off by the time that he is ready to form his new inner lip upon the space which they occupy, thus forming a comparatively smooth and even surface on which he is to spread the testaceous matter, of which the addition to his building is composed.*

It is principally in this genus that are found the shells which yielded the celebrated Tyrian dye, they were thence called Purpuræ. An expression of Virgil implies that it was extracted from the animals of this genus in his time; He says, "glowing with Tyrian Murex." The Tyrians were the most successful among the ancients in preparing and using this celebrated colour. The Mediterranean supplied them with the mollusks in abundance, and in order to produce the tint that was in highest estimation, a bath of the liquid extracted from the animal of the Murex was prepared: in this they steeped the wool for a certain time, and when taken out they immersed it in another boiler, which contained an extract from the Buccinum alone. Wool which had been subjected to this double process was so highly valued, that in the reign of Augustus each pound of it sold for about

* Sowerby's Genera of Recent and Fossil Shells.

£36; this enormous price is not to be wondered at, as only a single drop of the colouring fluid is afforded by each animal.

This beautiful and precious colour was held in the highest estimation by the ancients, and in some countries it was consecrated to sacred purposes. Moses, under divine instruction, used purple stuffs for the furniture of the tabernacle, and for the dress of the high priests.

The Babylonians arrayed their idols in robes of splendid purple; and such indeed was the practice of the Pagans in general, many of whom superstitiously believed that this dye had a peculiar virtue, and was capable of appeasing the wrath of their pretended gods.

Purple robes were also characteristic of regal dignity, and by an imperial decree in Rome, they were entirely restricted to the use of the emperor, the penalty of death being inflicted on any who dared to appear in habiliments of this hue. The language of the day shews how exclusively this colour is appropriated to the emperors, for "to assume the purple," signified the being elevated to the Imperial Throne.

Several different accounts are given of the discovery of this dye; but they all seem to have originated in the simple fact, that a dog having broken one of the shells, stained his mouth with the colour, which excited the attention of his owner, and led to an examination of the cause.

The vast heaps of fragments of shells found about Tarentum, are supposed to be those from

which the celebrated dye was extracted, and seem to indicate that place as one where it was prepared; it has not been ascertained to what species these shells belong.

MUREX *Tribulus*.

THORNY WOODCOCK.

Specific Character. Shell subovate, with three spinous varices: spines continued to the extremity of the beak, which is long; between the varices the shell is transversely ribbed and slightly nodulous: the colour is dirty white, or pale brownish white; the shell is about three or four inches in length, of which the subulate beak occupies the larger part; the breadth of the body whorl is about an inch and a quarter, or an inch and a half.

This shell is found in the Asiatic and American seas, also in the Red Sea. It was first discovered by a singular accident. A diver feeling a sharp pain from something having pierced his foot, and apprehending that it might proceed from the bite of some venomous animal, immediately gave the signal to be drawn up, when he perceived that it arose from one of these shells, the thorns of which had entered his flesh.

MUREX *Tritonia.*

TRITON'S TRUMPET.

Specific Character. Shell ventricose, with alternate varices, and slightly elevated transverse ribs, the interstices striated; the whorls crenated * at the suture; columellar lip grooved; beak short and ascending; colour whitish, ornamented on the ribs with parallel curved reddish brown spots, which are shaded off towards each other; columellar lip striped with dark brown; the length is a foot, sometimes sixteen inches, and the breadth about half as much.

It inhabits the Asiatic seas, and those of the Torrid zone in general. It is used by the natives of New Zealand as a musical instrument, and by the Africans as a military trumpet. It is supposed to be the shell intended by Ovid, when he describes the waters of the deluge retiring on the sound of the trumpet of Triton.

Genus—TROCHUS†—*Plural, Trochi.*

TOP SHELL.

Generic Character. Shell univalve, spirally

* Crenated, being notched, from the Latin cren *a*, the notch of an arrow.

† Plate IV. figures 4, 5, 6.

convoluted; form more or less conical; aperture entire, quadrangular, sometimes approaching to round, generally wider than it is long; margins separated; columella oblique.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

Many of the Trochi so nearly resemble the shells in the following genus Turbo, that it is often difficult to discriminate between them. The character by which the former are most readily known, is the angular contour of the mouth. Their true form is that of a pointed cone, capable of standing nearly perpendicular, or but little inclined on its base. Some of these erect shells* have their columella umbilicated, others† are imperforate. A few of the Trochi are elongated ‡ resembling in form the Needle Buccinum; these have an exserted columella, and when placed on their base, fall on one side. These latter are now arranged in the genus Pyramidella.

Many of the shells of this genus have their outside rough with tubercles, and many are covered with a thick epidermis, on the removal of which a bright surface appears, shining with iridescent colours. The animals which inhabit the Trochi have no proboscis, but a mouth armed with two jaws, and thence it is concluded

* Plate IV. figure 5. † Plate IV. figure 4.
‡ Plate IV. fig 6.

that they feed upon vegetables; the shell has neither notch nor canal, and the mollusk no siphon.

TROCHUS *Perspectivus.**

STAIRCASE TROCHUS.

Specific Character. Shell conical; umbilicated; the umbilicus large, funnel-shaped, round which the whorls wind spirally, having a crenated margin; aperture nearly quadrangular; shell flat underneath, longitudinally and transversely striated; colour greyish, beautifully variegated with ochrous brown spots.

This shell is the type of the modern genus Solarium. It inhabits the shores of Asia: frequent about Alexandria.

TROCHUS *Conchyliophorus.*

CARRIER TROCHUS.

Specific Character. Shell conical, coarse, obtusely plaited; whorls imbricated,† base concave; colour brownish white; size an inch and a half long, and an inch and three quarters broad.

It is a singular fact in the natural history of

* Plate IV. figure 5.

† Imbricated, tiled, from the Latin imbrex, a tile.

this shell, that it accumulates, during its formation, different foreign substances, and is often found covered with stones, coral, small shells, and fragments of shells; on account of this curious property, it has acquired the name of the *Carrier*. It has not been ascertained how this animal, during the formation of its shell, collects these various substances; probably some very tenacious matter is combined with its calcareous secretions, so that, whatever comes in contact with it before it is hardened, adheres to its surface.

Genus—TURBO*—*Plural, Turbines.*

TURBAN-SHELL.

Generic Character. Shell univalve, spirally convoluted, solid; shape more or less conical; aperture entire, contracted, orbicular.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The shells of this and the preceding genus are often so similar, that it is difficult to define

* Plate IV. figures 7, 8.

the boundaries by which they are separated; the mouths of the Trochi gradually losing the angular, and assuming the orbicular form; whilst many species of the Turbines exhibit a very imperfectly circular aperture.* Both names also imply any thing that whirls round; and the shells in each genus agree in their conical form, and in shewing no indication of an increase in growth, after the first formation. Besides, this general resemblance in their appearance, the animals are nearly allied in their habits. The marine species are found on rocks and craggy shores, or on the sand, when detached by a storm from their customary abode.

There are several species of Needle or Screw-shell among the Turbines; they are distinguished by their circular mouth, from those of a similar form in other genera; their shape is that of a well-proportioned spire, formed by thirty or forty whorls, gradually tapering from the base to the apex, and terminating in a fine point. There are upwards of seventy species of Turbines among British shells, and several of them are terrestrial. One called *Turbo Fasciatus*, is found so abundantly in a part of Cornwall, that it is impossible to take a step without crushiing numbers. It is the prevailing opinion that they contribute much to fatten sheep; they spread themselves over the plain and hill near Whitsand Bay, Cornwall, and the sheep which browse on

* Turbo, the Latin for a whirlwind; trochus, a top.

the short herbage, must devour a prodigious quantity of these mollusks, which early in the morning ascend the short blades in quest of food. Some very small Turbines, are found abundantly on old walls amidst moss.

TURBO *Littoreus.**

PERIWINKLE.

Specific Character. Shell strong, sub-oval ; body-whorl large, the others, four or five in number, small and nearly flat, separated only by a fine line ; aperture suborbicular, outer lip thin, inner flat and thick. When full grown, this shell is nearly smooth and of an uniform brownish colour, but the younger shells are more distinctly striated and variously marked with purple, white, yellow, or red bands ; size, about three quarters of an inch long, and nearly equally broad.

The Periwinkle is extremely abundant on the shores of Great Britain ; it is often sold in our seaport towns, and when boiled, eaten by the lower classes. It is found on rocks usually above low water mark. The Swedish peasants affirm, that when the animals of this species ascend the rocks, it is a sure sign of an approaching storm, for that, prompted by instinct, they thus place themselves

* Littoreus is derived from the Latin word littus, a shore. The littoral species are those which burrow in the sand, or adhere to the rocks when left dry by the receding tide.

out of the reach of the dashing of the waves ; and on the contrary, that when they make their descent into the sand, is is an indication of a calm. The mollusk of the Periwinkle is striped with black ; it has two setaceous tentacula annulated,* or streaked transversely with black ; the eyes are at the base of the tentacula and are very prominent.

TURBO *Scalaris.*†

WENTLE-TRAP.‡

Specific Character. Shell turreted, with eight rounded detached whorls, connected only by elevated acute oblique ribs ; the aperture round, outer line thickened, and reflected ; the colour snow-white, sometimes pale flesh colour : the size varies from an inch and half to two inches in length. The aperture is closed by a horny spiral operculum.

This elegant shell when perfect is valued at a high price, on account of its rarity. The numerous ribs mark the different periods of its increase, and are in fact the reflected margins of its former apertures, produced at its various stages of growth. It is found in the warm seas of the east. There is a shell which inhabits the European and American Seas, and is found upon

* From annulus, the Latin word for a ring.

† Plate IV. figure 7.

‡ A corruption of the German windel-treppe, a winding staircase.

our coasts, though not abundantly, called Turbo Clathrus, or False Wentle-trap.* It differs from the true Wentle-trap principally, in having its whorls contiguous. The inhabitant is one of the animals that yield a purple dye: if kept some days out of water it becomes sickly, and discharges a most beautiful purple liquid. This dye differs in many respects from that obtained from the Buccinum Lapillus. It can be produced spontaneously from the mollusks; the colour when first it comes from this animal is purple, and not of the same unalterable nature as that obtained from the other. These shells now form a separate genus called Scalaria.

Genus HELIX †—*Plural, Helices.*

SNAIL.

Generic Character. Shell univalve, spirally convoluted, sub-diaphanous,† thin and fragile; aperture entire, contracted, sub-orbicular; body whorl projects into the mouth, separating the lips.

* Plate IV. figure 8. † Plate V. figure 1, 2, 3.

‡ Diaphanous is from the Greek words δια, (dia) through and φαινω, (phaino) I appear.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The shape of the Helix varies considerably: some of the species exhibit quite a turreted form; * in others the whorls are arranged on a horizontal plane,† so that the spire is quite flattened, and the course of the volutions may be seen either from the upper or under part of the shell. Many display a form between these two extremes; others again are turbinate, and of a globose appearance.‡

There is not, perhaps, any thing in animated nature more abundant or universally diffused than snails; the butterfly alone can compete with them in this respect. Snails are found in the most barren and desert wastes. There are parts of the great Sahara destitute of all manner of herbage, except here and there a tuft of coarse grass, or a solitary stunted laurel, which according to the Psalmist's description, "withereth before it be plucked up." Yet these parched specimens of vegetation are sometimes quite studded with snails. It has often been conjectured, that snails were in part the food of the Israelites, when they took their rapid flight from Egypt; for the country, through which they passed in their way to the Red Sea, is described

* Plate V. figure 3. † Plate V. figure 2.
‡ Plate V. figure 1.

by one who traversed it, as having a herbage underneath the trees and shrubs, which is completely covered with snails of a prodigious size, and of the best sort; and in that country these animals are esteemed a delicacy.

Snails furnish a valuable article of food on the shores of the Mediterranean, where they are boiled in their shells, and served up with rice. They possess nearly the same nutritious qualities as oysters, and the use of them has often proved efficacious in consumptive disorders.

The Helices which live on land become torpid on the approach of winter, and generally cover the mouth of their shell with an operculum. Like that of other terrestrial mollusca, this covering is not attached to the animal, but to the shell, and is deciduous, acting only as a preservative against the cold of winter.

The history of this genus is very interesting and instructive, affording a striking instance of the superintending providence of the Almighty, and his care for the peculiar wants of His creatures; though all things are at his command, He is not prodigal of means; He gives what is required, and holds back what is needless. Upon the animals who inhabit the rocky shores, or bottom of the ocean, He has bestowed a thick substantial covering; but to snails, the greater number of which live on the land, or in stagnant pools, or peaceful streams, He has given a thin and remarkably light shell, which, while it affords ample protection to its inmate, offers no

impediment to its loco-motive propensities. Can we see this beautiful adaptation to circumstances—this provision for the wants, and consideration for the comforts of His creatures, and not give the praise and adoration to Him, who riding upon the wings of the winds, regards not only the sons of men, but the meanest reptile that crawls upon the earth !

HELIX *Pomatia.**

EATABLE SNAIL.

Specific Character. Shell nearly globular, turbinate, with five rounded whorls strongly wrinkled longitudinally ; aperture semi-lunar, margin rather thickened, and turned a little outwards ; the columellar lip much reflected over the umbilicus ; colour dingy yellowish brown, commonly with three faint bands on the body whorl ; one of which continues round the next whorl ; size about two or three inches in length, and nearly equal in breadth,

This is the largest species of land shell found in England. It is not a native of this country, but was originally introduced about the middle of the sixteenth century, either as an article of food, or for medicinal purposes. It is supposed to have been first imported from Italy into Surrey, by a Mr. Howard of Albury ; the animals increased there prodigiously, and are now become

* Plate V. figure 1.

the most common species about Box Hill, Ashtead, and that neighbourhood. They were introduced into Buckinghamshire as a medicine for a lady who was in a consumption. They are commonly used as food by the Roman Catholics in many parts of Europe during Lent, and are preserved and fattened for that purpose in large reservoirs, the floors of which are covered with herbs and flowers. These mollusks were among the dainties of the luxurious Romans, who had their Cochlearia or nurseries for snails, where the animals were fed on bran and wine, till they increased to such a size, that if we may credit Varro, a shell has been known sufficiently large to contain ten quarts of liquid. It is mentioned as a remarkable fact relating to this shell, that when the animal is in a diseased state, the spire becomes much elongated.

HELIX *Hortensis.*

GARDEN SNAIL.

Specific Character. Shell subglobular, smooth, diaphanous with fine transversely banded whorls; aperture roundish, semiorbicular, the outer lip slightly reflected; the colour of the shell and the bands are exceedingly various; greatest diameter less than an inch.

This is the most common species of snail. At the approach of winter, it forms an operculum of a coriaceous substance, composed of several

coatings, and finding a retreat at the roots of trees, and under old walls, it braves the rigours of the season. Its circulation is most remarkably sluggish, and its movements are correspondingly slow; but the thick juices which prevent its activity, enable it to bear the severity of winter, so that no cold, however intense, has been known to freeze it. Again these juices, though they retard the progress of the animal, furnish it by means of their viscidity, with the power of travelling with its house on its back up perpendicular ascents, or across horizontal surfaces. Snails do not usually crawl out in search of nourishment, except in rainy seasons, or in damp shady places; in time of drought, they take their station under stones and leaves, or in the cavities of the trunks of trees. The eggs of the snail are round and white; and covered with a soft shell, adhering to each other in clusters; the parent hides them with great care in the earth.

HELIX *Ianthina.*

VIOLET SNAIL.

Specific Character. Shell with four whorls obliquely situated, subglobular, thin, fragile, diaphanous: aperture subtriangular, the angle formed by the upper and lower part of the outer lip rounded; columella straight, and elongated, the inner lip turned back over it; colour violet,

palest towards the summit: size an inch long, the breadth rather exceeds the length.

This shell beautiful in its form and colour, is still more interesting in its history, as displaying another instance of the overruling care of the Creator, and of his compensatory providence. Unlike most fragile shells, its dwelling is the stormy ocean; but as the feeble reed bends to the mighty wind, and rises unhurt when its power is suspended, so this delicate shell offering no resistance to the sea, rides upon its waves in perfect safety; and as if still more to diminish its gravity, the shell has no solid columella. It is always found floating upon the water, and probably never visits the bottom, or willingly approaches any shore. It is thus supported on the surface, by means of a small cluster of bubbles composed of transparent vesicles which it can inflate with air at pleasure, and thus buoy up its delicate bark. Every shell contains about a teaspoonful of liquor of a most beautiful red purple, which is easily discharged, as soon as the animal is touched. It is said also to shine by night with a phosphorescent light. This shell had always been considered a Helix by Linneus and others, until the time of Lamarck who determined it to be necessary to place it in a distinct genus. He ascertained that its inhabitant differed essentially from the snail. The organ which in the snail is considered a foot, was found not to be fit for crawling, but swimming, being covered with the air bladders

before mentioned. It inhabits the coasts of Europe, Asia, and Africa, and is common in the Mediterranean. A few specimens have been picked up on the Welsh coasts, but these were probably driven there by storms.

HELIX *Obscura.*

SMALL BROWN SNAIL.

Specific Character. Shell sub-oval, rather obtuse, opaque, with about six longitudinally wrinkled whorls; aperture roundish, lunar; it is of a brownish horn colour, and the outer lip white, with a reflected margin; length half an inch, breadth one fourth, or one sixth. These shells are usually covered with an epidermis, which varies according to the situations they occupy; and the colour being regulated by that of the substance to which they attach themselves, they thus escape observation.

Genus—NERITA.* *Plural, Neritæ.*

NERITE OR HOOF-SHELL.

Generic Character. Shell univalve, spirally convoluted, retuse, gibbous, flattish underneath;

* Plate V. figures 4, 5.

aperture simi-lunar; columellar lip, truncated, flattish, straight, and oblique to the axis of the shell.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

There is no genus more easily distinguished than that of Nerita. The semilunar aperture and straight flat columellar lip are its decided characteristics. There are a few species which might pass for Turbines, the columellar lip not preserving its straightness; but even in these doubtful shells it is flat, and therefore their proper place in this genus is obvious. Some of the species have an umbilicus; and in some the columellar lip is beset with strong teeth. The Nerites are all either fluviatile or marine, the former are thin and generally have a bright polish on their surface; nothing can exceed the beauty and delicacy of the minature painting with which many of them are adorned. When viewed through a microscope the most highly finished touches are discernible. They are worn as ornaments by the Indians. They are now formed into a new genus called Neritina. The marine species are distinguished by their solid substantial shells, often having elevated rounded ribs. The animal has a short foot, and two setaceous tentacula, having eyes at their base.

NERITA *Peloronta.**

BLEEDING TOOTH.

Specific Character. Shell solid, thick, semi-globular, turbinate, imperforate, slightly ribbed transversely; spire flat; aperture entire, semi-lunar; outer lip crenulate, inner lip rather concave, with two or three large teeth and an irregular saffron or blood-coloured spot in the middle; ground of the shell whitish or pale grey with irregular black and red or purplish longitudinal zig-zag markings: aperture white, and throat pale saffron-colour.

The shells of this species inhabit the ocean and are found in the West Indies, Red Sea, and Mollucca Islands. The animal is furnished with an operculum which opens and shuts at its pleasure, like a door upon its hinges, having a little prominence within the shell at the lower end of the lip, between which and the inner lip a small projection of the operculum slides as it opens.

NERITA *Corona.*

Specific Character. Shell globose, striated; spire short eroded;† body whorl large with a

* Plate V. figure 4.

† Eroded, gnawed out from Latin e, out, and rod *ere*, to gnaw.

transverse row of long spines ; generally coated with a black epidermis; length from half to three quarters of an inch, about two thirds as broad.

This shell has an operculum, which is testaceous, covered with a horny epidermis of a semicircular form, exactly closing the aperture, and furnished internally with a dentiform appendage, which, when the aperture is closed, lies between a prominence at the lower part of the aperture, and the end of the inner lip.

The columella, together with the inner part of the spire, and even a part of the lip is absorbed by the animal, in proportion as it increases in size, whence it appears to have no columella.

NERITA *Littoralis.*

STRAND NERITE.

Specific Character. Shell thick, smooth, summit rather obtuse ; whorls four or five, body whorl large, the others small and lateral ; aperture lunar, rather inclining to oval ; columellar lip not so flat as usual in this genus ; colour various, commonly plain light or orange yellow, red or brown, sometimes prettily mottled, or marked with one or two paler transverse bands ; size about three-fourths of an inch long, breadth rather exceeding the length.

This species is extremely common on all our

shores, varying considerably in colour and shape : its roundish mouth and accidental resemblance of colour have occasioned some specimens to be described as Turbines.

Genus—HALIOTIS.* *Plural Haliotides.*

SEA-EAR OR EAR-SHELL.

Generic Character. Shell univalve, ear-shaped, open ; spire flat, lateral, retuse, nearly concealed ; aperture almost as large as the shell ; the disk, † excepting in one or two species, has a series of perforations parallel to the collumellar margin.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The ear-like shape, the flattened spire and the row of perforations on the disk readily distinguish this genus from every other. The outside of the shell is generally rough, worn or covered with marine substances. The inside is enamelled with mother-of-pearl, exhibiting a beautiful iridescent play of colours. Each period of the shell's increase is marked by a new hole, and till the

* Plate V, figure 2.

† Disk, a rounded surface, from the Latin, discus, a dish or platter.

final addition is made, there is a notch in the last perforation in which the animal places its siphon. When a new hole is opened, one toward the spire is closed, and there are seldom more than seven or eight unstopped at the same time. When the Haliotides traverse the rocks, their shell is like a reversed basin, and the circumference is bordered by the foot of the animal, which is very large ; the spire is at the posterior part as it advances. In their repose they adhere to the rocks with such tenacity that it requires the utmost force to disengage them, though they can with the greatest facility remove themselves. They are always found near the surface of the water, and in serene summer nights they feed on the vegetation which springs up on the shore. All the shells of this genus are marine, as the name implies, being derived from ἁλς (hals) sea, and ὦτα (*ōta*) ears. Most of the species inhabit the seas of warm climates. They have no operculum.

HALIOTIS *Tuberculata.**

COMMON SEA-EAR.

Specific Character. Shell strong, thick, subovate, transversely wrinkled, striated longitudinally, and tuberculated ; near the inner margin is a ridge extending the length of the shell, and

* Plate IV. figure 2.

terminating in one spiral turn at the end, a little produced; this ridge is beset with tubercles which increase in size as they recede from the apex; the last six are open; when cleared of extraneous matter with which it is constantly covered, the outside is of a reddish brown colour frequently mottled; the inside is a beautiful mother of pearl. The outer lip forms a flat ridge quite up to the spire, and is pearly like the inside; the length is from three to four inches, the breadth between two and three.

These shells inhabit the deep; and they are sometimes thrown upon our southern coasts after violent storms. In Guernsey they are found in great plenty adhering to the rocks at the lowest ebb tide. The animal is eaten, and forms a very savoury dish; the shells are used to adorn the houses of the common people, in the plaster on the outside of which they are studded, and their pearly iridescence glitters beautifully in the sunshine.

Genus—PATELLA.*—*Plural, Patellæ.*

LIMPET.

Generic Character. Shell univalve, without a regular spire, dilated, conical, entire, concave beneath in proportion as it is convex above.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The shells of this genus are easily distinguished from all others by their conical form and dilated aperture; but they are subject to many peculiarities, and are therefore divided into several natural groups. Some are remarkable for an internal chamber or partition, which however varies greatly in its appearance. In the Patellæ, called the Slippers, it is formed by the columellar lip, which is straight and produced into a flat horizontal plate extending half over the mouth of the shell; these now form a genus called Crepidula. In others, this appendage resembles a cup and is situated at the apex within the shell, which is commonly called from its shape the Cup and Saucer Limpet; † it is now separated from the Patellæ and forms the genus Calyptræa. The apex of many of the Patellæ is perforated,‡ and this peculiarity in the shell

* Plate V. figure 7, 8, and Plate VI. figure 1.
† Plate V. figure 7. ‡ Plate V. figure 8.

is connected with a different formation of the animal, whose gills are situated near the hole through which it receives the needful supply of water; these now belong to the modern genus Fissurella; others which have a fissure or notch at the margin are called Emarginula. In some, the apex is very retuse; whilst in others it is pointed and elegantly recurved.*

This genus is peculiarly interesting to those who love to trace the regular, but almost imperceptible gradations existing in the scale of nature. The species with the recurved apex seem to form the link which connects the Patellæ with spiral shells, whilst the other species, where there is no trace of any volutions, present the intermediate grade between them and the shells entirely destitute of spires.

The animal of the Patella has a large fleshy proboscis, and two tentacula, with the eyes on a small elevation at their base; the mouth has cartilaginous plates for the mastication of its food. It has a ventral foot, fleshy, and furnished with numerous muscular filaments, which uniting on the upper part of the mantle, form a strong muscle by which the body adheres to the shell. By the action of this muscle, the shell can be brought close to the surface to which the foot adheres, or removed to a distance: and it is by means of this instrument, that the animal, when desirous of changing its situation, is able

* Plate VI. figure 1.

to effect a considerable leap. Its locomotive powers, however, are but little exercised : it appears to live habitually in the same spot, and rarely to perform any other movement than that of slightly elevating the shell, that the water it breathes may reach the respiratory organs. These shells are generally found attached to rocks, sea-weed, and other marine substances ; and in such numerous clusters that the stones appear quite studded with them ; they adhere with considerable tenacity, and are not easily displaced. They fix themselves thus securely, by first applying their fleshy foot and the edge of their mantle to the substance on which they take up their abode ; and then they form an internal vacuum by the contraction of their muscles, and the pressure of the external air keeps them firmly fixed to the spot. Thus adhering to a solid basis, and presenting a shell whose conical form is well calculated to break the force of the rough winds and dashing waves, this little animal in its exposed situation, exhibits a striking instance of the wise provision of the Almighty for the protection of his creatures. This genus is found is all parts of the world, but abounds particularly in the Island of Cyprus. Its name signifies a little dish, an appellation suggested by its form. The animal feeds on sea-weed and marine vegetables. The manner in which the Limpet attaches itself to the rocks and thus seeks shelter, is beautifully described and applied in the following verses ;

‘ In Nature’s all-instructive book,
Where can the eye of reason look,
And not some gainful lesson find
To guide, and fortify the mind!
The simple shell on yonder rock
May seem, perchance, this book to mock—
Approach it then, and learn its ways,
And learn the lesson it conveys.
At distance viewed, it seems to lie
On its rough bed so carelessly,
That ’twould an infant’s hand obey
Stretch’d forth to seize it in its play ;
But let that infant’s hand draw near,
It shrinks with quick, instinctive fear,
And clings as close as though the stone
It rests upon, and it, were one ;
And should the strongest arm endeavour
The Limpet from its rock to sever,
’Tis seen its loved support to clasp
With such tenacity of grasp,
We wonder that such strength should dwell
In such a small and simple shell!
And is not this a lesson worth
The study of the sons of earth ?
Who need a rock so much as we ?
Ah! who to such a rock can flee ?
A rock to strengthen, comfort, aid,
To guard, to shelter, and to shade ;
A rock, whence fruits celestial grow
And whence refreshing waters flow—
No rock is like this rock of ours!
Oh then if you have learnt your pow’rs
By a just rule to estimate ;
If justly you can calculate,
How great your need, your strength how frail,
How prone your best resolves to fail,
When humble caution bids you fear
A moment of temptation near,
Let wakeful memory recur
To this your simple monitor,
And wisely shun the trial’s shock
By clinging closely to your rock.’

PATELLA *Græca.*

CANCELLATED LIMPET.

Specific Character. Shell ovate, thick, opaque, strongly reticulated,* some of the longitudinal ridges much coarser than the rest, and frequently tuberculated by the crossing of the transverse striæ; apex lateral, not much elevated, truncated and furnished with an oblong perforation; colour pale, dull brown, or yellowish white; inside smooth, white, sometimes rayed with dull red or brown; margin crenated, sometimes indented; length about three quarters of an inch, breadth scarcely half an inch, height a quarter. It is rarely found on the British coasts of a superior size; some of the foreign specimens are an inch long. This shell belongs to the modern genus Fissurella.

PATELLA *Pellucida.*

BLUE-RAYED LIMPET.

Specific Character. Shell sub-conical, thin, pellucid, smooth; summit slightly recurved, lateral; of a dusky brown colour, rayed with dotted lines of the brightest azure blue, lines varying in number from three to seven; length nearly an inch, breadth not quite three-quarters.

This species is common in many parts of the

* Reticulated, crossed like net work, from the Latin, reticul *um*, a small net.

Cornish and Devonshire coasts; it is never found adhering to rocks, but is picked up after storms, having been thrown on shore by the agitation of the waves, along with the sea-weed to which it is attached. It is found in abundance at Sandwich, and always on the same plant, the stalk of which the animal excavates, probably for food, and forms a cell, in which are sometimes discovered two or three of the same species together.

PATELLA *Ungarica.**

HUNGARIAN BONNET.

Specific Character. Shell conical, thin, semi-transparent, finely striated longitudinally, and wrinkled transversely; summit much recurved, and ending in two or three spiral turns; it is usually covered with a rough epidermis which projects beyond the margin and forms a ciliated† border: beneath, the colour is reddish, the inside glassy white, or flesh colour; the base, which is nearly circular, varies from one to two inches in diameter; the shell is rather more than half as high.

This species, so remarkable for its elegant form, is found on the western shores of Britain, but is not common. It belongs to the new genus Pileopsis.

* Plate VI. figure 1.

† Ciliated, bordered with a fringe like eye-lashes, from the Latin cilia, an eye-lash.

Genus—DENTALIUM.*—*Plural, Dentalia.*

TOOTH OR TUSK SHELL.

Generic Character. Shell univalve, gradually tapering, straight or slightly curved, resembling a tooth without any internal partition, open at both ends.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The shells of this genus are easily known by their very simple construction; they all more or less resemble a miniature tusk, and the name derived from the Latin *dens*, a tooth, refers to this form. There are but few species, and these vary principally in external appearance, in magnitude, in the degree of curvature, and in the ribs or grooves with which some of them are ornamented. One of the largest, called, Dentalium Elephantinum is often three or four inches long, and is strongly marked with longitudinal elevated ribs. One species is so minute that it is scarcely discernible by the naked eye, and resembles a small bristle.

There is but little known of the inhabitant of

* Plate VI. figure 6.

the Dentalium ; some naturalists have supposed it to be free, and independent of its shell, but later observations have led to the discovery of the muscle by which it is attached to its abode, into which it has been observed to shrink deeply for protection from approaching danger.

These shells are found principally on sandy shores, sunk more or less deeply in the ground, and placed in a vertical position.

DENTALIUM *Entalis.*

COMMON TOOTH SHELL.

Specific Character. Shell slightly curved, slender, tapering, smooth, glossy, sometimes marked with a few circular wrinkles or annulations, colour white or yellowish, length an inch and a half ; diameter at the larger end two tenths of an inch, and one fourth as much at the smaller end.

It is commonly found on our coasts, particularly those of the west of England. The animal is very muscular, its shape is like its conical shell, it has a mantle with a fleshy collar through which it can protrude its head and foot. The head is furnished with jaws, and lips bearing teeth.

Genus.—SERPULA.*—*Plural, Serpulæ.*

CREEPER OR WORM SHELL.

Generic Character. Shell univalve, tubular, gradually tapering, usually adhering; cavity often interrupted by dissepiments† at irregular distances.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

These shells are usually found in very irregular and diversified groups adhering to various marine substances. They are invariably tubular, and are either straight, or twisted; sometimes they are isolated and detached, but are more frequently found in clusters consisting of hundreds of spiral tubes curiously interwoven; they are sometimes curled into a spiral form, but, differ materially from the convoluted shells, as they never have any regular number of whorls, or any appearance indicating that this mollusk is directed in forming these convolutions, by an invariable law. The name is derived from the Latin serpo, I creep, and well designates their tortuous ‡ vermiform § appearance. There is very

* Plate VI. figure 2, 3.

† Dissepiments are the partitions in multilocular shells: from the Latin sepes, a hedge, and dis, a prefix signifying division.

‡ Tortuous, from the Latin tort *us* twisted.

§ Vermiform, from vermis, a worm, and forma, a form.

little known of the animal. The Serpulæ abound in almost all situations that are at times covered by the sea; they are found attached to various marine substances, from the firmest rock and the sea-weed that grows upon it, to sea-animals the most rapid in their motions. In situations, where they are not subject to interruptions, they form patches of great thickness and extent. Some of the rocks in the island of Gorre are covered with a crust of them several inches thick, and more than twenty feet square.

SERPULA *Tubularia.*

TUBULAR CREEPER.

Specific Character. Shell taper, opaque, slightly wrinkled transversely; the smaller end is usually convoluted irregularly, flexuous or variously twisted, fixed; the larger end frequently detached for half its length; diameter at the larger end two-tenths of an inch; length four or five inches.

This is by no means a common shell; it is found at Tor Cross, Devonshire; the head of the animal inhabiting it is long, white, banded with pink and green, and has two beautifully feathered tentacula, originating from a single stalk.

SERPULA *Aquaria.**

WATERING POT.

Specific Character. Shell taper, straight, with a convex disk at the summit perforated so as to resemble the rose of a watering pot, having also a radiated border: the colour is white with a slight tinge of pale red or grey; the shell when perfect is nearly a foot long, and more than an inch in diameter at the dilated summit.

This most singular and beautiful shell is rare; it is found in the East Indies. It bears a great resemblance to the spout and rose of a watering-pot. It is now separated from the Serpulæ under the generic name Aspergillum.

Genus.—TEREDO. (*Plural, Teredines.*)

SHIP WORM.

Generic Character. Shell tubular, tapering, flexuous, lodged in woody substances, with two hemispherical valves, covering the head of the animal, and two others of a lanceolate shape near the extremity of the tail.

* Plate VI. figure 3.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

Many doubts have arisen whether this genus ought to be retained among the univalve shells. Some naturalists consider the two hemispherical valves as properly the shell of the animal since it adheres to them by a strong muscle, and has its head lodged in them, and they regard the tube with the posterior valves as only accessory. The use of the tube is to secure to the mollusk a lubricated passage and a protection against the rough surfaces of the wood in which it resides. It is formed by a calcareous secretion, which appears to have a solvent power over the resin, and even over the fibre of the wood. Unless this be the case it is difficult to account for the fact, that these creatures pierce through the stoutest oak timber, as they do not seem to possess any organ sufficiently strong to effect such perforations by a simple mechanical power. On examining fresh specimens, a soft pulpy mass of a chalky appearance, which hardens when exposed to the air, has been discovered at the opening of the hemispherical valves, and is no doubt the secretion with which they lengthen the tube. This is open at both ends, and the animal does not in any way adhere to it; the posterior end is thickened and provided with plates which contract the aperture, and render it very small; this part is always even

with the surface perforated. Near the extremity of the animal's tail are situated the two lanceolate valves, they seem to perform the office of flood-gates, admitting or excluding the water as necessity may require. Linnæus considered that the valves placed at both ends, were of the nature of opercula, and that the tube was the shell of the animal, which he consequently placed amongst the univalves. The name is derived from the Greek τερεω (tereo) I bore, expressive of the manner in which the animal is supposed to effect a settlement in different substances.

TEREDO *Navalis.*

COMMON SHIP-WORM.

Specific Character. Shell thin, brittle, straight, or flexuous, tapering; inside smooth, pervious; the smaller end thick and strong, furnished with plates or laminæ, which contract that part considerably, and leave a very small opening; the anterior valves attached to the head of the animal are of a hemispherical form, brittle, thin, finely striated, and covered with a light brown epidermis; in each there is a long flat curved tooth projecting inwards. The tube is white, sometimes a foot long, seldom so long as the animal; the foreign specimens exceed greatly in size those found in England.

This singular animal has proved exceedingly

destructive to our shipping. It readily enters the stoutest timbers, and ascends the sides of the loftiest ships, most insidiously destroying them. When the hulk of a ship is any time under water, the Teredines appropriate it to their own use, and soon commence the work of destruction. They begin with the softest part, and at first the apertures they make are so small as scarcely to be perceptible. Their manner of carrying on their labour is remarkable; they are careful never to intrude upon the habitation of a neighbour, and even where a piece of wood has been so excavated as to resemble a honeycomb, no communication or passage has been discovered between the perforations, though often separated only by the slightest lamina of wood. They always bore in the direction of the grain of the timber; if they meet in their course with another shell or knot, they make a turn; when the obstacle is small, they wind round it, and then proceed onwards, but when large, rather than continue any distance across the grain, they make a short turn back in the form of a syphon. The attacks of this insidious enemy have not been confined to shipping; our dock yards also bear sad testimony to their work of devastation. In Holland, where the inroads of the sea, and of the great rivers by which that country is intersected, have been restrained with immense labour by dykes, the Teredines have proved very destructive, piercing and even destroying the piles which sustained them.

Many remarks suggest themselves in reading the history of this animal. How insignificant often are the means employed to effect the most important ends; how is the industry of years baffled by the gradual and yet certain work of a little worm. We might at first be at a loss to trace the wisdom or goodness of the Almighty in permitting the existence of an animal fitted only for what appears a work of evil. A further acquaintance with the subject, will however bring us to a very different conclusion. Montague, in speaking of them, says, "that the Teredines and many aquatic animals were created by the Father of the universe for most beneficent purposes, cannot be disputed; for though they may seem to impede, and even to destroy the operations of man, yet they are of such importance in the great scale of nature, that it has been observed, and it would not be difficult to prove, that we should feel the loss of one or two species of larger quadrupeds more than one or two species of these destructive animals. The immense trees and forests of tropical countries, either overthrown by tornadoes, or partially destroyed by insects, when carried by rapid torrents into the rivers, would not only choke them up, but even endanger the navigation of the neighbouring seas, were it not for these small yet powerful agents of dissolution. Nothing can more plainly demonstrate the power of an all-wise ruler of the universe than the work assigned to these animals, whose business it is, to hasten the destruction of useless matter."

Genus.—SABELLA. (*Plural, Sabellæ.*)

SABELLA.

Generic Character. Shell tubular, composed of sandy or calcareous particles, and sometimes fragments of shells agglutinated together, and united to a membranaceous sheath by a cement.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

This genus is now very generally dismissed from the class of Testaceous Mollusca, as the tubes in which the animals are enclosed are more or less composed of extraneous matter, and not of a testaceous secretion prepared by the animal from its own body, and forming a compact solid substance, which is the true character of a shell. Its best claim to retain its position, is, that the mould to which the various particles are attached, is really a calcareous and not an animal substance. The name of the genus is taken from the Latin, sabulum, fine gravel or sand, of which material their habitations most usually consist.

Genus.—NAUTILUS.*—(*Plural, Nautili.*)

SAILOR.

Generic Character. Shell univalve, spirally convoluted, smooth, multilocular; † chambers perforated and connected by a siphunculus or pipe; the dissepiments are convex inwardly, the chambers gradually increase in size from the apex. The animal resides in the last.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The Nautili differ much in size; some being too minute to be observed by the naked eye, while others are a foot in diameter. In some the whorls are contiguous; in others they are detached. The tube which connects the chambers is supposed to admit either air or water as the animal requires; when the shell is stationed at the bottom of the sea the siphon is filled with aqueous fluids; by excluding these the gravity of the shell is diminished, and it rises in consequence to the surface; when on the contrary the animal is inclined to descend, it contracts

* Plate VI. figure 4.

† Multilocular, having many little chambers, from the Latin words, multus, many, and loculum, a little chamber.

itself within its boat, draws in water, and immediately disappears. Though capable of floating on the surface of the sea, it is often found reversed, and like a snail bearing its house upon its back. The name is derived from the Greek word ναυτιλος (nautilos) a sailor.

The animals inhabiting the shells of this and the following genus vary considerably from the other mollusca ; they are called Cephalopodes,* (footed at the head,) because their heads are surrounded by arms or tentacula. Their bodies are fleshy like the other mollusca, and the posterior portion is contained in the mantle of the animal. The mouth is vertical and armed with two corneous mandibles resembling the beak of a parrot. They live in the sea, are carnivorous, and feed on crabs and other marine animals. The position of their arms enables them to seize their prey, and bring it to their mouth. The Cephalopodes which form a multilocular shell, instead of being enclosed within it, envelop it so as only to leave a small portion visible : a tendinous thread which issues from the extremity of the body appears to attach the latter to the shell, it probably has some connection with the siphunculus.

As in the genus Teredo we observed how extensive a work of destruction is carried on by a little worm, here we have to notice the reverse

* Cephalopodes. Having feet on the head, from the Greek κεφαλη (cephale) a head, and ποδες (podes) feet.

of that fact. A very small species of the Multilocular Cephalopodes called Miliola (being about the size of a grain of millet) exhibits the power of reproduction in an equally astonishing degree. Around Paris these shells are found in the fossil state in such prodigious quantities, that small as they are, they form the principal part of the immense masses of stone which constitute several of its quarries.

NAUTILUS *Pompilius.* *

LARGE CHAMBERED NAUTILUS.

Specific character. Shell with an involuted and concealed spire, smooth; aperture cordate; colour whitish, with waved streaks of reddish or yellowish brown, pearly within.

This beautiful shell is often converted by the inhabitants of the East into a drinking cup; on the surface they engrave various ornaments and devices.

NAUTILUS *Spirula.*

CROSIER NAUTILUS.

Specific Character. Shell thin, brittle, transparent, with five cylindrical detached whorls divided into numerous compartments, distinguished on the outside by a depressed circular

* Plate VI. figure 4.

line; the last volution takes a straight direction, and is remote from the adjoining one: aperture orbicular, pearly within; chambers separated by their pearly plates, but communicating with each other by a small siphunculus; white or cream colour.

This shell is so exceedingly brittle that perfect specimens are very rare. The last chamber, which the animal inhabits, is a straight cylinder, but it is so fragile that it is very seldom any vestige of it is preserved. In the broken state in which these shells are found, they resemble a ram's horn, and so they have been described, but when complete, they have more the appearance of the crosier. The mouth of the animal is surrounded by ten arms, two being longer than the others. This Nautilus is found in great numbers in the West Indies.

Genus.—ARGONAUTA.† (*Plural, Argonautæ.*)

PAPER SAILOR.

Generic Character. Shell univalve, involuted, the last whorl very large, having a double tuberculated carina, thin, transparent, unilocular; aperture cordate, entire, contracted. This shell

* Plate VI. figure 5.

has much the appearance of being composed of two pieces united by the keel, and seems to be the link between the univalve and bivalve shells.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The animal inhabiting these elegant shells is soft and fleshy, and has a large portion of its body enveloped in the mantle ; its head is furnished with two eyes, and round its mouth are arranged like rays eight elongated and pointed tentacula or arms. Two of these have a thin membrane extending more than half their length. This singular appendage the animal can expand or draw in at pleasure. The shell is of a thin paperlike substance, resembling in form a kind of boat. Few objects can be conceived more interesting than this beautiful animal seated in its pearly little vessel : two tentacula erected with their membrane unfurled like a sail, whilst the remaining six, suspended over the sides of the little bark, perform the office of oars. When wafted by propitious gales, it calmly rides over the waves : but should a storm threaten, or an enemy approach, it precipitately hauls in its tackle, shrinks into its shell, and drawing in water to add to its weight, seeks protection in the depths of the sea : the danger over, it diminishes the gravity of its shell by ejecting the water, and rises again to the surface.

It has long been a doubt whether this animal is the true inhabitant of the Argonauta, and it is supposed by many naturalists to be one of the eight-armed Sepia or Cuttle-fish, which, like the Hermit Crab, having destroyed the original fabricator of the shell, takes possession of the vacated tenement.

How does this little animal verify the words of the Psalmist, "They that go down to the sea in ships, that do business in great waters, they see the works of the Lord, and his wonders in the deep." Ps. cvii. 23, 24.

The art of navigation, in the imagination of the poet, owed its origin to the expert management of these little instinctive sailors, whilst their shell it is said, suggested the first idea of a vessel. The name Argonauta, is derived from ναυτης (nautes) a sailor, and Argo, the name of the ship in which Jason made his memorable voyage with his companions the Argonauts.

ARGONAUTA *Argo.**

PAPER NAUTILUS.

Specific Character. Shell having a narrow keel sharply toothed on both edges; sides flat, with undulated forked ribs; extremely thin and brittle; colour white, teeth of the keel brown towards the apex. Inhabits the Mediterranean sea, and Indian Ocean.

* Plate VI. fig. 5.

QUESTIONS ON THE UNIVALVE SHELLS.

1. What are the parts of an univalve shell?

2. Give a description of each part, with the derivation of the terms.

3. How is the generic character of univalve shells determined?

4. How is the specific character of univalve shells determined?

5. Give a list of the genera of univalve shells.

6. Name those which have regnlar spires.

7. Name those without spires.

8. Which genera seem to connect the shells with spires, and those without?

9. What shells have longitudinal apertures?

10. Which shells are canaliculated, and which entire?

11. Which of the univalve shells resemble each other? Describe their points of resemblance and also in what respect they differ.

12. In what respect do the shells of warm climates differ from those of colder regions?

13. What is the generic character of the Cone? and what its distinguishing mark?

14. What remarkable instinct is exhibited by the animal of the Cone?

15. Where are Cones found?

16. What is the generic character of the Cypræa, and what its most distinguishing mark?

17. What is there remarkable in the manner

in which the shell of the Cypræa is formed, and increased in size ?

18. What is the generic character of the Bulla, and what its distinguishing mark ?

19. What remarkable organ is possessed by the animal of the Bulla ? Describe the organ and its use.

20. Describe the peculiar habits of the animal of Bulla Fontinalis.

21. Give the generic character of the Voluta, and its distinguishing mark.

22. Into what different families is the Voluta subdivided, and how are they distinguished ?

23. What is the generic character of the Buccinum, and its distinguishing marks ?

24. Describe the different groups into which the genus Buccinum has been subdivided.

25. What is the origin of the name Buccinum ?

26. What use has been made of the Buccinum ?

27. Describe the habits of the Hermit Crab.

28. What is the generic character of Strombus, and what its most characteristic mark ?

29. Describe how the shells called Alatæ, or winged Strombi, are increased at the different stages of the animal's growth.

30. What is the generic character of the Murex, and what is its distinguishing mark ?

31. Describe the different families into which the genus Murex is subdivided, and mention how the forms of these shells are connected with the peculiar habits of their animals.

32. Which are the shells anciently called Purpuræ ?

33. Describe the manner in which the purple dye was obtained and prepared, the different uses to which it was applied, and the circumstance supposed to have led to its discovery.

34. What is the generic character of the Trochus, and what its most distinguishing mark ?

35. Describe a remarkable peculiarity in one species of Trochus

36. What is the generic character of Turbo, and its distinguishing mark ?

37. Which species of Turbo is remarkable, and on what account ?

38. What is the generic character of Helix, and by what mark is it particularly distinguished ?

39. What variety of form is displayed in the Helices ?

40. Detail the interesting facts connected with the natural history of the Helix.

41. How does the Helix Ianthina display the compensatory providence of God ?

42. What is the generic character of the Nerita, and by what mark is it readily known ?

43. What is the generic character of the animal inhabiting the Haliotis ?

44. What is known of the habits of the Haliotis, and what is its distinguishing mark ?

45. What is the generic character of the Patella, and what its most distinguishing mark ?

46. Describe the different groups into which the genus Patella is subdivided.

47. What is there particularly interesting in the natural history of the Limpet?

48. What lesson has the poet drawn from their natural history?

49. What is the generic character of the Dentalium, and what its distinguishing mark?

50. What is the generic character of the Serpula, and its distinguishing mark?

51. In what situations are Serpulæ found, and under what circumstances?

52. What is the generic character of the Teredo?

53. What are the reasons for and against retaining the Teredo amongst the univalve shells?

54. Describe the work of the Teredo Navalis.

55. What is the generic character of the Sabella?

56. What is the generic character of the Nautilus, and its distinguishing mark?

57. What kind of animal inhabits the Nautilus?

58. What is there remarkable in the natural history of the Nautilus?

59. What is the generic character of the Argonauta.

60. What position does the Argonauta appear to occupy in the chain of nature?

61. Describe the habits of the animal inhabiting Argonauta.

BIVALVES.*

The shells belonging to this class are composed of two pieces united by an elastic horny *ligament* :† the part where the valves are joined together, is called the *cardo*, ‡ or hinge, and corresponds in position with the back of the animal : it is either plain or furnished with teeth. The ligament serves not only to connect the valves, but also to open them, and is either external or internal ; the muscle or muscles by which the animal is attached to the shell keep it closed : when these are relaxed, the ligament, which was either in a state of tension or compression according as it was either external or internal, by its efforts to recover its position, opens the valves. If the two valves are quite alike, the shell is said to be *equivalve* ; § if they differ in form or size, it is called *inequivalve*. If the sides of the valve are symmetrical, the valve is said to be *equilateral* ; || if they are not, it is said to be *inequilateral*.

* For the parts of a bivalve shell, see Plate I.

† Ligament, a substance which serves to bind things together, from the Latin, lig*are*, to bind.

‡ Cardo is the Latin word for a hinge.

§ Equivalve, having equal valves, from Latin, equ *us*, equal, and valve.

|| Equilateral, having equal sides, from Latin, equ *us* equal, and latera, sides.

The animals belonging to the bivalve shells are acephalous mollusca, and have not a distinct head ; they have no eyes, and the mouth, which is hidden under the mantle, is only a simple opening for the reception of food, without proboscis, jaws, or any hard parts fitted for mastication. This mouth is surrounded by four flattened moveable expansions, which partake of the nature of tentacula. The *branchiæ*,* or gills, consist of two leaves or expansions on each side of the mollusk, and extend the length of its body. The mantle is large, sometimes it is quite open, and bordered with contractile, irritable filaments; in some instances it is joined in front, forming tubular elongations, called siphons, which conduct the water to the mouth and branchiæ. The muscles are generally very thick and strong, and hard at the place of attachment to the shell ; those which close the valves are called the *adductor* † muscles. Many species have not the power of locomotion, but are immoveably cemented to rocks or stones : a few are attached by a cartilaginous ligament, others by a byssus. These mollusca have no ventral foot similar to that possessed by some of the cephalous mollusca ; but some have a muscular substance usually tongue-shaped and capable of considerable elongation. This organ enables them to creep, or to effecta kind of leap, by which they

* Branchiæ, is derived from the Greek, βραγχια (branchia) the gills of fish.

† Adductor, is derived from adduco, I bring together.

change the position of their shells; sometimes it is transformed into a paw, and sometimes it is employed to fix the silky filaments of a byssus. These mollusks do not appear to possess the different organs of sense, but to be reduced to that of touch; indeed their faculties are altogether much less developed than those of the mollusca cephale. None of the bivalves are terrestrial shells, some few are fluviatile. The generic character of the bivalves is principally derived from the formation of the hinge, and the general appearance of the shell.

PARTS OF A BIVALVE SHELL.

The *valves.*

The *cardo* or *hinge,* the part where the valves are united.

The *beaks* or *apices,* the points of the valves near the hinge.

The *base,* the part of the shell opposite the beaks.

The *umbones* or *bosses,* the swelled parts near the beaks.

The *ligament,* the elastic horny substance, which connects the two valves.

The *margin* of valves.

The *area* or *anterior slope,* the margin of the valves near the ligament.

The *areola* or *posterior slope,* the margin of the valves, the other side of the ligament.

The *cavity.*

The *disk,* the convex part of the valves between the umbones and margin.

The *length,* the direction of the shell from the beak to the base.

The *breadth,* the direction at right angles with the length.

The *auricŭlæ* * or *ears,* small appendages placed at the sides of the hinge.

The *circumference.*

The *muscular impressions,* marks in the inside of the shell made by the adhesion of the adductor muscles.

The *right valve,* the valve nearest to the right hand, when the shell is placed on its base with the area opposite to the person looking at it.

The *left valve.*

The *teeth,* pointed protuberances at the hinge.

The *cardinal teeth,* the central teeth, or those near the centre of the hinge.

The *lateral teeth,* the teeth near the sides.

Genus.—MYA.†—(*Plural, Myæ.*)

GAPER.

Generic Character. Shell bivalve, equivalve,

* Auricula, a small ear; the diminutive of the Latin auris, an ear.

† Plate VII. fig. 1, 2.

inequilateral, mostly gaping at both ends, generally smooth, or only slightly striated; shape suboval, broader than it is long; hinge with a strong, patulous,* or spoon-shaped tooth, sometimes inserted into the opposite valve.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The points of generic resemblance in the Myæ are wanting in many of the species. The coarse large tooth is the characteristic of the hinge, but sometimes it is not more than a thickened callosity.† Some species are altogether destitute of teeth; these have a rounded cavity for the reception of the cartilage. The gaping of the valves is another distinguishing feature, but it does not always occur. In form also the shells differ considerably; some are oblong and truncated, as if a part of the shell had been cut off; others are orbicular, and many are angular from the addition of ears at the hinge. The Myæ are generally covered with a thick brown or green epidermis; when this is removed, the surface exhibits a beautiful iridescent mother-of-pearl lustre. Some of the species grow to a great size; others are remarkable for

* Patulous, lying open, spreading, from the Latin, pat *ere*, to lie open.

† Callosity, hardness of skin or flesh, from Latin call *us*, which has the same signification; hence our English word callous.

their thick, solid, and substantial shells, and have in consequence been formed into a distinct genus, called Unio. Many of the mollusks of this genus burrow in the sand or mud, boring a channel through which they thrust a contractile trunk inclosing two tubes. The Myæ furnish food not only for man, but also for many aquatic birds.

MYA *Truncata.**

TRUNCATED GAPER.

Specific Character. Shell ovate, convex, truncated at the anterior end, where it gapes considerably, curved at the areola, wrinkled transversely, and covered with a brownish yellow tough epidermis, extending an inch or two beyond the gaping end, like a thick membrane, through which the animal protrudes its tube; hinge with a rounded tooth projecting forwards; inside white; length from one to two inches; breadth from two to three.

These shells inhabit the sand or gravel about low water mark on most of the northern coasts of Europe. In Greenland, their mollusks are the food of man and different animals. When taken alive, the epidermis of the shell is found joined to the tube or proboscis of the animal, having

* Plate VII. fig. 3.

become a thick, tough, coriaceous* skin for its protection. The animal is capable of extending this tube to the distance of nine or ten inches, and of contracting it to about three, but cannot withdraw it entirely into the shell.

MYA *Margaratifera.*

PEARL-BEARING OYSTER.

Specific Character. Shell strong, ponderous, thick ; shape ovate, oblong, front compressed, margin a little contracted in the middle, giving a somewhat curved outline to the circumference ; hinge consisting of a cardinal tooth in one valve, which is thick, obtusely conical, and locking into a bifurcated † tooth in the other valve ; shell about two inches long, and four broad ; covered with a black epidermis decorticated ‡ at the umbones ; inside a greenish pearly hue.

This shell is one of a very interesting group, now formed into a distinct genus called Unio. It inhabits only rocky torrents, and the precipitous streams of mountainous districts. Many are found in the cataracts and

* Coriaceous, like leather, derived from the Latin cori *um*, skin, leather.

† Bifurcated, having a fork of two teeth : from the Latin bis, twice ; and furca, a fork.

‡ Decorticated, having the bark or outer skin taken off ; from the Latin de, off : and cortex, the bark of a tree.

rapid rivers of America, and by their solid and thick shells manifest the providential care that fitted them for the dangerous spots they occupy. When we look at the ponderous Mya driven by the powerful torrent, and compare it with the light and delicate Ianthina, borne gently on the surface of the waves, shall we coldly attribute such adaptation to circumstances to the blind dealing of chance, and not rather delight to recognise the beneficent wisdom of our heavenly Father, pervading all his works, and suiting each animal to the place he assigns it?

The Mya Margaratifera is found in several of our rivers, particularly those of Wales; also in Ireland, where the peasantry use the valves as spoons. This species has long been celebrated for producing pearls of a good colour and sometimes of a considerable size. These ornaments appear to be exclusively the production of the bivalve testacea, and are found only in the shells which have a coating of mother-of-pearl in the inside of their valves. Pearls are said to be produced by a disease of the animal, occasioning a partial secretion of the substance, which forms the inner coating of the shell. The British islands, especially Ireland, have been noted for their pearl fisheries. The Conway was formerly celebrated for this production: a large one which was taken in that river, and presented by Sir Richard Wynne the chamberlain, to Catherine the consort of Charles II. is said still to adorn the British crown.

Genus.—SOLEN.*—(*Plural, Solênes.*)

RAZOR SHELL.

Generic Character. Shell bivalve, equivalve, gaping at both ends ; form oblong, transversely elongated ; hinge has a subulate, reflected tooth, sometimes double, not inserted into the opposite valve. Most of the shells are brittle; some have an internal rib extending from the hinge to the opposite margin.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

There is in general but little difficulty in determining the Solenes : they are recognized by their oblong form, their disproportionate breadth, and their gaping at both extremities. A few of the species, however, are oval, and these have their hinge nearly central.†

The history of this genus affords various instances of ingenuity in the application of very simple means. The mollusk is furnished with a long pliable cylindrical leg ; when it wishes to bore a hole for its residence, it extends this instrument from the inferior end of the shell, using it as a pointed shovel to excavate the sand. When the tunnel is partly formed, the animal

* Plate VII. fig. 3, 4, 5. † Plate VII. fig. 5.

advances the leg a little farther, fixes it by its point as a hook in the ground, and using this as a fulcrum, descends in safety, continuing the operation till the shell is buried about two inches under ground. When it wishes to regain the surface, the leg is rolled up into a spherical form, and stretched very tight; by means of the ball thus formed, the little creature is preserved from slipping backward, while by the action of its muscular power, it throws the shell forward. The peculiar habits of the Solen render no other than perpendicular motion necessary to it, and therefore while the form of its shell, and the powers with which it is gifted, are admirably calculated for movement in this direction, it is unable to advance horizontally. It requires a safe retreat and a supply of food; the former it obtains by withdrawing into its recess, and the latter by ascending its channel when the tide comes in and brings the little marine insects which form its food. The retreat of the Solen is marked by a small depression on the sand; sometimes the shells are dug out by the fishermen, but as this is a laborious employment, they are often entrapped by stratagem. For this purpose, at the reflux of of the tide, when the men can approach them, a little salt is placed round their perforations, which melting, is mistaken by the animal for the return of the tide, and thus decoyed, they elevate themselves in the expectation of finding their prey. So rapid, however, are their actions

that great dexterity is requisite to catch them, before they again sink into their retreat, and if they are successful in escaping, they are not easily tempted again to the surface. In many places this animal is valued as food. The name Solen, is derived from the Greek σωλην (solen) a tube. The French, in allusion to the shape of the shells, call them *manches de couteaux*.

Several species of Solen are common on the coasts of Britain.

SOLEN *Siliqua*.*

POD RAZOR SHELL.

Specific Character. Shell straight, subcylindrical, truncated at one end, and slightly rounded at the other; hinge lateral, with a single tooth in one valve, and a lateral rib locking between two teeth in the other, which has also a rib; outside covered with an olive brown skin striated transversely, each stria afterwards taking a longitudinal direction; beneath the epidermis the shell is greyish white with purplish streaks; length about one inch, breadth from one open end to the other, seven or eight inches.

This shell is common on most of our sandy shores; it is found buried a foot or more in depth near low water. In the neighbourhood of Belfast, specimens of this shell are found more than ten inches in length.

* Plate VII. fig. 4.

SOLEN *Radiatus.**

RADIATED RAZOR SHELL.

Specific Character. Shell oval, smooth, thin, brittle, striated concentrically; when stripped of its green epidermis, it appears both within and without of a delicate violet colour, with from two to four white longitudinal rays, which become broader towards the margin; hinge with two teeth in each valve, and a strong white depressed rib extending somewhat obliquely from the hinge towards the margin; shell about an inch, or an inch and quarter long, and from three to four inches broad.

It is found in the Indian Ocean.

Genus.—TELLINA.†—(*Plural*, *Tellinæ.*)

TELLEN.

Generic Character. Shell bivalve, equivalve, inequilateral; shape either ovate and thickish, ovate and compressed, or suborbicular; the area often compressed, having a flexuous plait or fold, and its margin curved inwards, so that it

* Plate VII. fig. 5. † Plate VII. fig. 6, 7, 8, 9.

always narrower than the areola. The hinge has either one or two central teeth in each valve, one of them often bifid ; * the lateral teeth are remote, and sometimes wanting in one valve ; the beaks are short, and usually lean towards the ligament, which is external.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

This and the following genus are so very similar, that it is often difficult to discriminate between them. If however a shell have its anterior slope compressed, or any indication of its margin being curved inwards, it may be known immediately as a Tellina. The Tellinæ are very beautiful, and are particularly remarkable for the coloured radiations with which they are adorned. They have generally a fine polish, and are sometimes delicately marked with minute striæ. They are found buried in the sand or fine gravel of the sea shore; where they are commonly the prey of Buccina, and other carnivorous mollusks, who pierce the shell, and devour the inhabitant. The mantle of the animal is formed in the front into two siphons ; the foot which it thrusts out of its shell when desiring to change its position, is generally flat, but sometimes it is straight and lengthened into a kind of leg.

* Bifid, cleft in two, from the Latin bis twice, and fid*i*, I have cleft.

TELLINA *Lingua Felis.**

CAT'S TONGUE TELLEN.

Specific Character. Shell suboval, thickish, somewhat angular at the anterior end, rough, covered with pointed, rather arched erect scales, disposed in a quincunx † order; colour white, often with pale pink rays, and the umbones of a fine pink; length about an inch and quarter, breadth about an inch and three quarters.

It inhabits the Indian Ocean.

TELLINA *Radiata.*

RADIATED TELLEN.

Specific Character. Shell ovate oblong, reflected at the anterior end, striated transversely, highly polished; colour sometimes wholly white, more commonly white with red rays, or yellow transverse bands; the hinge is not central, it has two small teeth in one valve, and one in the other, and the lateral teeth are remote; it is about an inch, or an inch and half long, and more than twice as broad.

* Plate VII. fig. 8.

† Quincunx, disposed alternately as in rows or spots, the spots of each row being opposite the space between two spots of the next row; from Latin, quinq*ue*, five, and unx, ounce, because the weight representing five ounces was stamped thus ⁙

The Tellina Radiata is found very abundantly in the West Indies; it also inhabits the European ocean.

TELLINA *Carnaria.**

ROSY TELLEN.

Specific Character. Shell suborbicular, rather more produced on one side than the other, subpellucid, marked with delicate minute crowded striæ, which at the centre are oblique, at the shorter end curved and flexuous, at the produced end straight, and which meeting the oblique striæ of the centre form with them angles; the hinge which is towards the posterior side, has two small teeth in one valve, and one in the other, with strong laminated lateral teeth; flesh colour both within and without, length about three quarters of an inch, breadth rather more.

* Carnaria is derived from the latin carn*e*, flesh, this species being so called from their flesh colour.

Genus.—CARDIUM.*—(*Plural, Cardia.*)

COCKLE.

Generic Character. Shell bivalve, equivalve, nearly equilateral; shape, convex, the contour of many of the species when viewed with either of the slopes in front, exhibits the form of a heart; surface either ribbed, striated, or furrowed longitudinally; margins toothed, the ribs or furrows of the two valves being so arranged as to alternate at the margins, and to fit closely into each other; the hinge has four teeth in each valve, the two central are oblique, approximating, and articulating with the teeth of the other valve, two lateral teeth remote; the beaks are turned inwards; the unbones are turgid; the ligament is external.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The Cardium is readily distinguished from the shells of other genera by the peculiarity of its teeth and its cordate form; its ribs or striæ also are invariably longitudinal. The mollusks of this genus are furnished with two short unequal tubes, fringed with hairs at their extremities; they have a strong muscular foot which enables them to move with great rapidity.

* Plate VIII. figures 1, 2.

They live buried under the sand, but select a spot within reach of the waves, as they require frequent supplies of water, and to obtain it, are continually protruding their tubes. Many of the species afford nutriment to the poorer classes. The name is derived from the Greek καρδια (cardia) a heart.

CARDIUM *Edule.**

COMMON COCKLE.

Specific Character. Shell convex, sometimes produced at the posterior end, with about twenty-six longitudinal ribs and transverse wrinkled striæ, which in old specimens appear somewhat imbricated; colour whitish, or pale ferruginous; about an inch and a quarter long, and an inch and a half broad.

This species is very common in most of our inlets and bays near the mouth of rivers, where the shore is sandy. They are found buried three or four inches under the surface. The mollusks when boiled, afford a wholesome nourishment.

CARDIUM *Tuberculatum.*†

TUBERCULATED COCKLE.

Specific Character. Shell somewhat orbicular, ponderous, slightly truncated at the anterior

* Edule, eatable, from the Latin ed *ere*, to eat.

† Plate VIII. fig. 2.

side, with twenty-one ribs, the anterior ones having sharp tubercles, and the posterior thick transverse scaly plates ; colour, pale brown, with darker transverse bands ; breadth not quite four inches, and rather exceeding the length.

This shell, and the Cardium Echinatum, which it greatly resembles, are found in abundance on the Paignton sands in Torbay, where at low tide they may be observed with their fringed tubes just appearing above the surface of the sea. The neighbouring cottagers collect them in baskets, and after cleansing them in cold spring water, fry the mollusks in a batter made of crumbs of bread, which make a wholesome and savoury dish ; they call them Red Noses.

Genus.—MACTRA.*—(*Plural*, *Mactræ.*)

KNEADING-TROUGH.

Generic Character. Shell bivalve, equivalve, inequilateral, sometimes gaping ; shape generally nearly triangular ; hinge with the cardinal tooth complicated,† and an adjacent cavity filled

* Plate VIII. figures 3, 4.

† Complicated, folded together, from the Latin con, with, together, and plica *re*, to fold.

by the ligament which is internal, the lateral teeth laminar, double in one valve, inserted.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The shells of this genus are clearly marked by their angular central tooth, and internal ligament. They vary little in form or colouring, and do not display much beauty; they are usually semipellucid, and of a thin delicate appearance; the surface is seldom diversified by inequalities. The prevailing colour is blueish, or yellowish white, sometimes radiated. The animal has not the power of progressive motion, but by the assistance of a small compressed muscular foot, it is enabled to change its position, a little: this organ projects at one end of the shell, and at the other are two tubes formed by the mantle. The name Mactra is derived from the Greek μακτρα, (mactra) a kneading-trough.

MACTRA *Stultorum.**

SIMPLETON'S KNEADING-TROUGH.

Specific Character. Shell subtriangular, convex, thin, brittle, semipellucid; colour white

* Plate VIII. fig. 4.

grey, or pale brown, radiate more or less from the hinge with paler stripes, sometimes of a purplish hue about the beaks, and inside of the valves; the umbones are gibbous; length an inch and a quarter, the breadth one and three quarters. Common on most sandy coasts.

MACTRA *Compressa or Piperata.*

PEPPER MACTRA.

Specific Character. Shell subtriangular, roundish, compressed, thin, semipellucid, finely striated; umbones small, central; hinge without lateral teeth, cartilage cavity large, triangular, cardinal teeth small, a single one locking into a bifid one in the opposite valve; of a yellowish, reddish, or white colour often stained with black occasioned by the mud in which it resides; about an inch and quarter long, and an inch and half broad.

This is one of the most beautiful of the British species of Mactra; it is chiefly found at the mouth of inlets or rivers, not remote from fresh water; for though it always seeks a spot within reach of the flux of the tide, it delights in situations over which fresh water occasionally flows. It lives in the mud, buried about five or six inches deep. The animal has two slender tubes of a yellowish colour placed near together at the anterior end of the shell: one about three inches

long it protudes in search of its food, which consists of insects; these may be seen passing up its transparent siphon, drawn in with the current of water it is continually receiving, and which it discharges at the shorter tube, retaining only the nutritious matter it contained.

Genus—DONAX *—(*Plural, Donăces.*)

WEDGE SHELL.

Generic Character. Shell bivalve, equivalve, inequilateral; the form like a wedge, broad, thick, and obtuse at the anterior end, and gradually narrowing and lessening at the posterior; the margin is often crenulate, and usually gaping; the hinge has two central teeth in each valve, and one remote lateral one; the ligament is external.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The wedge-like form of the donaces easily distinguishes them. The derivation of the name from δοναξ, (donax) an arrow, may have been

* Plate VIII. figures 5, 6.

adopted either as indicative of the sagittate form, or of the rapidity with which, in consequence of its peculiar shape, the animal can dart into the sand, whenever danger threatens. One species (Donax Irus) perforates the hardest limestone, but by what means it effects a lodgment in such a substance, has not been ascertained ; pieces of stone are often thrown ashore on the Devonshire coast filled with these shells fitting into the apertures which they have pierced. The shells of this genus are generally of a fine rich purple colour, sometimes marked with rays of purple on a white ground. Many of the species are of a yellow olive hue. The animal has two long slender tubes not joined together, and a lamellar foot. The Donaces are marine littoral shells.

DONAX *Denticulata.*

TOOTHED DONAX.

Specific Character. Shell strong, thick, ovate, wedge-shaped, with longitudinal striæ, the interstices punctured ; * anterior slope rough, with transverse striæ, and elevated in the middle in a kind of keel ; white or lead colour, usually with a few purple rays proceeding from the umbones, inside purple ; very concave under

* Punctured, pricked or marked with small dots, from the Latin punct*um*, a point or dot.

the umbones; margin denticulated; about half an inch long and nearly an inch broad.

This is described as a British species, but it is rarely found on our coasts. It inhabits the West Indies, Africa, and the Mediterranean.

Genus—VENUS—(*Plural*, *Veneres.*)

VENUS.

Generic Character. Shell bivalve, equivalve, inequilateral, closed; shape ovate, suborbicular, or subcordate; both the area and areola are well defined, the area is generally flattened, and the areola has often the impression of a heart; the hinge has three approximate cardinal teeth, the middle one is longitudinal, the others diverging, there is a lateral tooth in a few species; the beaks are turned towards the areola, that is from the ligament.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The shells of this genus, preeminent for the elegance of their form, and the beauty of their colouring, have in consequence, been designated by the name of the fabulous goddess of beauty. The three approximate teeth, and the inclination.

* Plate VIII. figures 7, 8.

of the beaks towards the areola, at once determine a shell to be a Venus, but these marks are sometimes wanting; in a few species there are four cardinal teeth in each valve, and this is the distinguishing mark of the genus separated from this, under the name Cytherea. Those Veneres which have only two teeth in each valve, belong to the modern genus Crassina.

The Venus is diffused over every part of the world, and in many countries affords to animals and birds a nutritious food. It is curious to observe the contrivances by which the sea-fowl endeavour to procure the mollusks of this and other genera; they have been seen to take advantage of a moment, when the shell is open, to drop a pebble between its valves, which being thus prevented from closing, the inmate is left exposed to their attacks. Sometimes when they find the shell so hard as to resist all their efforts to break it with their beaks, they ascend to some lofty eminence, and letting it drop upon rough or craggy rocks, it is crushed in the fall, and the animal thus becomes their prey. The mollusk of the Venus has two siphons formed by the mantle, and a lamellar foot.

VENUS *Mercenaria.*

MONEY VENUS.

Specific Character. Shell ponderous, ob-

liquely heart-shaped, slightly striated transversely; posterior depression cordiform; inner margin crenated; the outside is greyish or brownish, the inside is white, with a violet-coloured spot at the anterior side; the length is about two inches and three-quarters, the breadth about three inches and a half.

The Indians of North America cut these shells into beads, some white and some black; of these they form their wampum, or treaty-belts, which are symbolical of friendship. They also string them together and use them for money. The females cover the shoes they wear in dancing with these shells, which in their movements being struck together produce a sound resembling the tinkling of the bells used by the Israelitish women, and mentioned in Isa. iii. 16.

VENUS *Dysera.**

RIBBED VENUS.

Specific Character. Shell triangular, convex, heart-shaped, marked with distinct concentric raised ridges, which are closely cancellated; † the longitudinal striæ are also crossed by fine

* Plate VIII. figure 8.

† Cancellated, crossed like the bars of a window, from the Latin cancelli, lattice.

transverse lines; margin crenated; colour grey, or ivory white, variously marked with chesnut brown spots, the area and areola are of the same colour as the spots; diameter about an inch.

Found on the shores of Germany, America, and the East Indies.

Genus—SPONDYLUS.*—(*Plural, Spondyli.*)

THORNY OYSTER.

Generic Character. Shell bivalve, inequivalve, inequilateral, fixed, strong, solid; surface coarse and rough, with either lamellar or subulate spines; the hinge has two strong recurved teeth in each valve, with an intermediate sinus for the ligament; the lower valve is convex, and is produced at the apex into a projecting beak which appears as if it had been sliced off by a sharp instrument, presenting a triangular flattened surface, having a groove which receives the decaying part of the ligament. The shell is often eared.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The shells of this genus are remarkable, not

* Plate VIII. figures 9, 10.

only for the brilliancy of colouring, which most of them display, and for the singularity of their external form, but also for the clearness and precision of the characters which distinguish them from the shells of other genera. The roughness and irregularity of their appearance, their two strong incurved teeth, with the intermediate sinus for the ligament, are their discriminative generic marks. The genus contains only three species, one of which has not the flattened beak and internal ligament, and its shells are remarkable for being plaited longitudinally like a fan half opened; they have been separated by modern conchologists from the Spondylus under the significant name of Plicatula.* The Spondyli adhere to rocks, corals, and other marine substances, at considerable depths in the sea, they are separated from them with very great difficulty, they are found often in groups forming large masses. The animal has the edge of its mantle fringed with short tentacular filaments; it has a small radiated foot. From a supposed resemblance of the Spondylus to the oyster it has been called the thorny Oyster; its scientific name is derived from the Greek σπονδυλος (spondulos) the head of an artichoke.

* Plicatula, a little fold, from plica a fold. Plate VIII. figure 10.

SPONDYLUS *Gœdaropus.**

THORNY OYSTER.

Specific Character. Shell slightly curved, spinous, varies greatly in colour, size, and the form of the spines, the latter are generally laminated or tongueshaped, sometimes foliated; the colour varies from saffron, to orange and scarlet; the size is about two inches in diameter.

It is found adhering to rocks in the Mediterranean.

Genus—CHAMA.† (*Plural, Chamæ.*)

CLAM OR CLAMP.

Generic Character. Shell bivalve, solid exterior usually coarse; hinge has a gibbous callosity inserted obliquely into a corresponding sinus in the opposite valve; this callosity or tooth is either simple or crenated; beaks recurved; form various.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

This genus, as it stands in the Linnæan classification, contains twenty-six species, but some

* Plate VIII. figure 9. † Plate IX. figures 1, 2, 3.

of these are remarkably dissimilar in their appearance. It includes regular, and irregular, equivalve and inequivalve shells, also some that are attached to marine substances, and others that are free. The callous ridge at the hinge is the most decided character of the genus. The name is derived from χημη (chemé) a gaping, and is applicable to many of the species; it is probable that all those which have an opening at the margin, possess a byssus, by which they are fastened to rugged substances. This genus affords subject of amazement in the uncommon size to which some of its species attain. The Giant Clam (Chama Gigas) is a specimen of unusual magnitude in a shell: it is indeed the largest of all testaceous productions. One of these shells described by Linnæus, weighed four hundred and ninety-eight pounds; and he says that its inhabitant furnished one hundred and twenty men with a day's food. So great were the weight of the shell and the strength of the muscles, that by suddenly closing its valves, it cut asunder a cable. Another specimen brought from Sumatra, is preserved in Arno's Vale, in Ireland, its weight is five hundred and seven pounds; the largest valve measured four feet six inches in length, and two feet five inches and a half in breadth. A specimen of this extraordinary species, forms a very elegant baptismal font in the church of St. Sulpice, in Paris, it was presented by the Venetians to Francis I. Large pearls are occasionally found in the

Chamæ; one exhibited at Sir Joseph Banks', was valued at between two and three hundred pounds. The colour of Chama Gigas, is a dingy white: the hinge is furnished with a cartilage of a dull colour, which when cut and polished, is as beautifully iridescent as Opal.

CHAMA *Cor.**

HEART CLAM.

Specific Character. Shell equivalve, globose, heart-shaped when viewed from the posterior side; thick, strong, smooth, or only slightly striated transversely: umbones large and prominent, apices involute, and turned to one side: colour pale yellowish brown, covered with a darker epidermis, decorticated at the umbones. Shell about three inches long, and two and three quarters broad.

This shell has but very rarely been found in the British seas; it is much prized on account of the singular and graceful beauty of its form.

It belongs to the new genus Isocardia.

CHAMA *Hippopus.* †

BEAR'S PAW CLAM.

Specific Character. Shell equivalve, inequilateral, thick, heavy, longitudinally ribbed and

* Plate IX. figure 3. † Plate IX. figure 2.

muricated ; * posterior slope heart-shaped, closed ; margin in front deeply sinuous ; the colour is white or yellowish, with scattered reddish or purplish spots; commonly about two inches long, and three inches and a quarter inside, but it sometimes occurs double this size.

It inhabits the East Indian ocean.

Genus—ARCA.† (*Plural, Arcæ.*)

ARK.

Generic Character. Shell bivalve, equivalve, inequilateral ; form various, often oblong, sometimes orvicular ; hinge with numerous small sharp teeth in each valve, alternately inserted between each other, arranged sometimes in a straight, sometimes in a curved line ; beaks generally remote ; ligament external.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The shells of this genus are very readily known, by their numerous small teeth. Some of the species attach themselves to rocks by a kind of byssus : these have always the shell more or less gaping ; but the greater part of the Arks live buried in the sand at a short distance from

* Muricated, having little pointed knots, from the Latin murex, the sharp point of a rock.

† Plate IX. figures 4, 5, 6.

the shore ; all are marine. The mollusk has no external siphons, it has a kind of compressed peduncle, terminated by tendinous filaments, which are affixed to rocks. The shells of this genus which have the teeth arranged in a curved line, have been formed into a new genus called Pectunculus; * their form is orbicular, and they are not attached to rocks,

ARCA *Noæ.*†

NOAH'S ARK.

Specific Character. Shell oblong, roundish at one end, elongated at the other, narrow, and inclining to angular; beaks lateral, remote from each other, the apices incurved with a broad smooth space between them; teeth in a straight line; surface strongly striated longitudinally, and crossed with transverse lines ; margins sinuous and somewhat gaping , of a pale rufous colour, with dark oblique bands ; the broad flat space between the apices has a few distant grooves radiating from the umbones ; length about an inch, breadth two.

This singular shell much resembles the hulk of a ship ; the flattened area and areola may be considered as the deck, the pointed end the prow, the gibbous and rounded end the stern, and the acute edge of the united margins has the appear-

* Plate IX. figure 5. † Plate IX. figure 6.

ance of the keel. The form of the shell suggested the name of Noah's Ark, and from this fancied resemblance in one species to the ark, the genus owes its designation.

This shell is affixed to rocks by a very strong tendinous substance, there is an open space in the front of the valves, through which it issues.

It inhabits the Mediterranean, Indian ocean, West Indies, and Britain.

ARCA *Undata.**

LETTERED ARK.

Specific Character. Shell suborbicular, nearly smooth, with faint reticulated † striæ ; margin crenated ; teeth in a curved line ; colour white, variegated with yellowish red spots, in undulated transverse bands.

Inhabits the West Indies, and shores of Italy. It belongs to the modern genus Pectunculus.

* Plate IX. figure 5.

† Reticulated, having the appearance of net work, from the latin reticulum, a small net.

Genus—OSTREA.*—(*Plural, Ostreæ.*)

OYSTER, SCALLOP, OR PECTEN.

Generic Character. Shell bivalve, generally inequivalve, inequilateral, more or less eared; hinge without teeth, having an ovate sinus, in which is fixed an elastic cartilage, and generally lateral transverse grooves.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

This genus contains shells very different in their general appearance, but united by the peculiarity in the hinge, which is toothless, and has an elastic cartilage inserted into a sinus. It may be divided into two families, the Pecten or Scallop, and the Oyster, which are separated by very marked distinctions.

The Pecten is of a regular orbicular form, and eared; its surface is adorned with divergent ribs, which proceed from the apices to the circumference, where they terminate in a scalloped margin. The shells of this division usually display brilliant colours.

The second division contains the species more or less resembling the common oyster; these

* Plate IX. figures 7, 8;

shells are irregular in their form, have a rugged and laminated exterior, with one valve more concave than the other, are generally without ears, and their colour is grey or black.

The Pectens are described as possessing astonishing powers of locomotion, considering the inferiority of their organization ; but dexterity and ingenuity frequently compensate for natural deficiency. They have the power of progressive motion, both on land and in the water. When the animal happens to be left on the shore by the retiring tide, it opens its valves to their full extent, and closing them with great muscular power, is thrown forward five or six inches by a sudden leap. In this manner it reaches the sea ; should the weather be calm, it raises one of its valves, which catching the breeze, acts as a kind of sail, while the other resting on the surface, supports the floating animal ; when danger threatens, the shell is closed, and sinks securely to the bottom of the sea. Many of the Pectens possess the power of forming threads, by which they anchor themselves to floating timber, and by this means find protection when the sea is agitated by storms and tempests. These varied means of escaping danger are no doubt afforded as a necessary protection against their numerous enemies. The pilgrims who in former days visited Jerusalem, to pay their devotions at the holy sepulchre, on their return wore these shells in their caps as trophies of their achievement in crossing the sea for this sacred

purpose ; and in commemoration of this superstitious act of devotion, it was often granted them to have Pectens engraved in their coats of arms, that a record of their religious zeal might be handed down to posterity.

The shells of the second division differ from the Pectens as much in their habits as in their appearance. They are reputed to be some of the most sluggish of animals, and to have very limited powers and faculties ; but whilst we cannot fail to observe this destitution, we trace the goodness of the Creator, who has placed them in situations not exposed to danger, and bestowed upon them an organization that requires but little to satisfy it. The only nourishment they need is brought to them by the ever-flowing waves, and they scarcely exhibit any symptom o life, but that of opening their valves to receive the water, and then closing them for security. Firmly attached to the rocks, and enclosed within their strong testaceous dwelling, they are protected against surrounding dangers. They sometimes effect a change in their position by a curious contrivance ; they manage to bolster up one valve in the sand or mnd, and having thus fixed themselves erect, they open their shells, and the flowing or reflux of the tide forces them over by the pressure of the water. The animal has neither siphon nor foot.

OSTREA *Edulis.*

COMMON OYSTER.

Specific Character. Shell more or less orbicular, inclining to oval, but subject to much variation in form and size, imbricated with scaly laminæ; upper valve small and flattened, the other convex; inside pearly white, outside dull brown.

Oysters are generally found with their lower valves fixed to rocks or loose stones, and frequently to one another. Most of our rocky coasts abound with these shells, but Essex and Suffolk chiefly are celebrated for them. They are dredged up by a kind of net, with an iron scraper at the mouth, and are immediately stowed in pits formed for the purpose in the salt marshes, which are overflowed only at spring tide, and from which sluices let the salt water escape, retaining a depth of about eighteen feet. The water being stagnant, in warm weather it becomes green, and in a few days the oysters acquire the same tinge; they are then held in great estimation in the market, but they do not attain their greatest perfection under six or eight weeks.

Oysters are not considered fit for the table till they are about a year and half old, and the fishermen know their age by the increase in the size of the distance which separate the circles of laminæ in the convex valve. When young

shells happen to be taken, they are always rejected and cast back into the sea. Great Britain has for many ages been noted for its oysters, which in former times were sent as a peculiar delicacy to the epicures of Rome.

OSTREA *Malleus.**

HAMMER OYSTER.

Specific Character. Shell flexuous, elongated at the base, often produced into two lobes giving it somewhat the form of a hammer, from whence it derives its name; outside imbricated with scaly laminæ; the colour generally dark grey or blackish; inside very glossy, pearly, and tinged with blue; it is about five or six inches long, and four or five across from the extremities of the two lateral lobes.

This shell is much prized on account of its very singular appearance. It is found in the Indian Ocean: its animal forms a byssus which passes through a small opening in the shell near the beaks. It now is arranged in the genus Malleus.

PECTEN *Maximus.*

GREAT SCALLOP.

Specific Character. Shell inequivalve with

* Plate IX. figure 8.

equal auricles; upper valve flattish, depressed near the hinge, lower valve convex; the surface has about fourteen rounded ribs, is longitudinally grooved, and very finely striated transversely; the lower valve is white, tinged with red; upper valve reddish brown or spotted with pink and brown; inside white with a reddish brown margin; length five inches, breadth six.

This shell is not uncommon on some of our coasts, particularly at the mouth of large rivers; it is frequently sold for the use of the table, and is much esteemed as a nutritious diet. It is asserted by fishermen, that they are taken in the greatest quantities after a fall of snow. This was the species worn by the Pilgrims who visited the Holy Land.

Genus—ANOMIA.* (*Plural, Anomiæ.*)

ANOMIA, OR ANTIQUE LAMP.

Generic Character. Shell bivalve, inequivalve, form suborbicular, one valve flattened, and often perforated in the disk, the other more concave, and sometimes having its beak produced and curved over the hinge, and perforated at the apex; hinge toothless, having a linear projection which is united under the beak to the opposite valve by a strong ligament.

* Plate IX. figure 9; Plate X. figure 1.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

This genus contains a variety of shells materially differing in their appearance. The perforation in one of the valves for the emission of a ligament, by which the animal adheres to marine substances, is, perhaps, the most general, though not an invariable characteristic.

The Anomiæ are now arranged in two principal groups, very clearly distinguished from each other. The shells of one division retain the name of Anomia, and very much resemble a small oyster in their appearance ; like them they are fixed and stationary, living and perishing on the spot where the egg was first deposited. They are attached by means of a bony appendage, having a dilated base ; this is in fact only a prolongation of the adductor muscle of the animal ossified at its outer extremity. When the mollusk contracts the muscle, the dilated portion is drawn over the perforation of the flattened valve and covers it, acting as an operculum. So firmly are the shells fixed by this organ, that they cannot be removed from their retreat, without destructive violence, the ligament and operculum being left on the rock to which they were cemented. The form of the Anomia, like that of all stationary shells, is very irregular, being usually modified by the substances to which it adheres. The prevailing co-

lour of this genus is a dingy yellow, or dusky white; the shells are generally thin, fragile, delicate, and would be ill-fitted to contend with the dangers of their dwelling in the boisterous ocean, had not He who placed them amidst its perils, exercised his compensatory providence, and anchored them securely in its depths. The animal belonging to the shells, is very similar to the oyster.

The other family of this genus now bears the name of Terebratula. The shells which it contains, are distinguished by the graceful elegance of their form, which resembles a Grecian lamp, and from hence they are called the Antique Lamps. The concave valve of the Terebratula has its beak produced, curved over the other valve, and perforated at the apex; the smaller valve is furnished with two slender shelly processes, which are sometimes short, simple, and recurved; sometimes long, branching and crossing each other; their use is not ascertained, but it is supposed that they are supports for the animal. The Terebratulæ inhabit the depths of the ocean; they are parasitical, and are attached to various submarine substances by a tough short stalk which differs from the ligament of the Anomia in being formed of numerous closely united fibres, separating a little at the end, by which they are fixed. The mollusk which inhabits this shell is remarkable for two long fringed arms, rolled up in a spiral form within the shell when at rest, but which it protrudes when hunger prompts it to seek for food.

ANOMIA *Ephippium.**

WRINKLED ANOMIA.

Specific Character. Shell suborbicular, irregular, wrinkled, sinuous at the margin; inside pearly and iridescent; colour yellow, reddish or white: varies from two to three inches in diameter.

This shell belongs to the division still bearing the name of Anomia. It adheres to other bodies, and particularly oysters, and receives the impression of the substances to which it is affixed, its form being modelled by the circumstances under which it adds to its size. Some specimens have been taken from the Pecten Maximus exhibiting clearly the impression of its ribs.

ANOMIA *Psittacea.* †

PARROT BEAK ANOMIA.

Specific Character. Shell oval, horny, pellucid; the beak much produced, curved, and perforated, the hole subtriangular; margin sinuated, entire; surface finely striated longitudinally; colour is blackish, or greenish brown; length about three quarters of an inch, exceeding the breadth.

This shell belongs to the Terebratulæ: it inhabits the Indian Sea, and Greenland.

* Plate X. figure 1. † Plate IX. figure 10.

Genus—MYTILUS.* (*Plural, Mytili.*)

MUSCLE.

Generic Character. Shell bivalve, rough, generally affixed by a byssus to marine substances; shape generally a long oval, sometimes lobed, sometimes elongated at the beaks; hinge mostly without teeth, marked by a furrow or by a subulate line, which is crenated in some of the species.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

Though all the Mytili are not inseparably attached to other subtances, all are by some means rendered stationary; the silky filaments produced by some of the species are entwined in the coralines and stones at the bottom of the sea, and securely anchor the group of muscles found there. Others of the species perforate rocks or even large shells, and form for themselves at once their residence and grave. The Mytili which have their beaks nearly terminal and pointed, and are of a dark colour, much resemble a mouse, and from the circumstance of a few species being like this animal, the genus has received its name, which is derived

* Plate X. figure 2.

from μυτιλος (mutilos) the diminutive of μῦς (mus) a mouse. Some of the species have their base elongated with lobes on each side, and bear a resemblance to a bird in full flight.* The name Mytilus is now confined to the shells whose beaks are terminal.

MYTILUS *Edulis.* †

COMMON MUSCLE.

Specific Character. Shell oval, pointed at the beaks; sides much sloped, flattish at the anterior, and rather angular and carinate at the posterior end; hinge terminal; beneath the margin are several tooth-like crenulations; colour often of a rich blue when deprived of its epidermis which is brown; inside blue about the margin, and whitish in the middle, length from two to three inches, and about half as broad.

This shell is the most common of all the British species, and is found in large beds, attached by a byssus. The mollusks have a tongue-shaped muscular foot, capable of great powers of elongation and contraction; with this instrument they are able to effect a progressive motion. Forming a furrow in the sand, and placing their shell erect, they stretch out the foot, which being rather viscid, adheres to the ground, and when an effort is made to contract it,

* Plate X. figure 3. † Plate X. figure 2.

the shell is drawn along the groove. Thus alternately extending and contracting this muscular instrument, the Mytilus contrives to creep to a convenient situation for anchorage, and by means of this same foot it then forms a coarse byssus, which fixes it to the chosen spot. Often towards the end of autumn a little crab is found sheltering itself within the valves of the muscle. This little creature is called the Pisum, or Pea Crab: it is supposed so have been placed in the shell of the Mytilus and other Bivalves, to assist by its sagacity, the more limited powers of its host, whom it repays for a safe retreat, by going in search of provender, and sharing it with him.

MYTILUS *Margaritiferus.*

PEARL-BEARING MUSCLE.

Specific Character. Shell suborbicular, compressed, the margin rounded, except on the hinge side where it is straight and transverse; surface imbricated with transverse membranaceous scales, having the laminæ toothed in rays; colour commonly greenish or pale chesnut, inside pearly and iridescent; the full grown shells are sometimes ten or twelve inches long and rather less in breadth: they are thick, and ponderous, but young specimens are thin, brittle, and slightly eared.

* Plate X. figure 3.

This species now forming the genus Melagrina, is much celebrated for producing pearls. They are thought to be occasioned by a disease in the Mollusk, and to be produced by a partial secretion of the substance of which it forms the inner coating of its shell; it is arranged in the pearl in concentric layers. Acids have the same effect upon pearls as upon other carbonates of lime, and Cleopatra is said to have dissolved in vinegar one of great value in order to display her magnificence by this costly draught. The pearl fishery is a very dangerous employment; it is principally carried on in the Persian Gulph and the neighbourhood of Ceylon; the season for the fishery lasts about a fortnight. Numerous boats are dispatched to the station where it is carried on, each containing twenty men, ten of whom are employed in rowing and assisting the divers. They descend alternately in parties of five, and thus time is afforded for all to recover themselves after their violent exertion. The diver has a rope attached under his arms, the end of which is given to the men in the boat; round his neck is slung a net, distended at the opening by a hoop. Closing his nostrils, he commits himself to the sea, with a perforated stone of ten or twenty pounds weight affixed to his foot, to accelerate his descent. He sinks generally a depth of twenty or thirty yards; then quickly proceeding to his work, he tears the muscles from their bed, fills his net, makes a signal and is drawn up again to the surface.

Many and great are the dangers attendant on this employment. The greedy shark often marks the diver for his prey, his only chance of safety under such circumstances, is by muddying the water, and so eluding the animal's observation. A large flat fish also sometimes attacks him, and keeps him under water till he is drowned. When drawn up in safety to his vessel, he often in consequence of his exertion discharges blood from his mouth and nostrils. The divers rest and labour alternately, during periods of about ten minutes.

Genus—PINNA—(*Plural, Pinnæ.*)

SEA WING.

Generic Character. Shell bivalve, equivalve, fragile, thin, gaping at one end, and furnished with a byssus; shape subtriangular, narrow at the beaks, and expanding to a considerable breadth at the opposite extremity; hinge without teeth; valves united by a long external ligament.

* Plate X. figure 3.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The Pinna seems to form the connecting link between the univalves and bivalves, for though it is composed of two valves, yet it is incapable of moving on its hinge. It is generally found at a short distance from the shore, fixed in the mud at its smaller end, and standing erect. The animal forms a byssus, the fibres of which are agglutinated, to the sand, gravel, roots of marine plants, broken shells, or any matter within its reach. The byssus of the Pinna is much more fine and delicate than that of the muscle ; the filaments are long, silky, and of a bright lustre ; the natural colour is of a rich golden brown, but it readily receives any tint. The animal possesses a kind of tubular instrument, furnished with a gland which secretes a glutinous substance : by means of a slight pressure, a drop of this liquid is deposited on the spot, to which the byssus is to be attached ; by the retraction of the foot, a silken filament is drawn out, and this operation being repeated some thousands of times, a beautiful tuft of silky fibres, is produced. The Pinnæ are much sought after on the coasts of Sardinia and Corsica for the sake of the byssus; they are fished up with an instrument which consists of two semicircular bars of iron fastened together at each end, but three

inches distant from each other at the centre. At one end is a hollow handle, in which a pole is fixed, at the other is a ring, to which a cord is fastened. When a Pinna is discovered, the iron is let down slowly over the shell, which is then twisted round and drawn out. When a sufficient number have been caught, the silk is cut off, and after being twice soaked in tepid water, and once in soap and water, is spread out to dry in some cool and shady place. Whilst it is yet moist, it is again softly rubbed and separated with the hand, and then spread out again. When thoroughly freed from moisture, it is drawn through a comb with the teeth wide apart, and afterwards through a similar instrument, with finer and closer teeth. The more common silk is thus prepared, but that which is destined for finer works, is afterwards drawn through closer iron combs or cards. It is spun, two or three of the threads being mixed with one of real silk, and then knitted into gloves, stockings, and even whole garments. When the piece is knitted, it is washed in clean water mixed with lemon juice, gently beaten between the hands, and smoothed with a warm iron. The shells of the Pinna are often ornamented with elevated longitudinal ribs, crossed by striæ, sometimes terminated by imbricated arched scales, or prominent tubular spines. Some of the young shells of this genus are less than an inch in length, whilst the adults often exceed three feet. The Pinna as well as the Muscle, was much

celebrated by the ancients; they supposed it to harbour within its shell a small crustaceous animal, a kind of shrimp, which was said to be of the greatest use to its companion, by warning it of the vicinity of the prey upon which it subsists, or of the approach of its great enemy the Sepia. Many stories are related of the amiable habits of this pair, and of the mutual services they render each other. The truth of these accounts are much confirmed by small animals of the crustaceous tribe being continually found in the shells of the Pinna and Muscle. The ancients have celebrated these histories, by making them the subject of poetry; the following verses are translated from a latin author, and are very descriptive of the habits of the Pinnæ.

In clouded deeps below the Pinna hides,
And through the silent path obscurely glides;
A stupid wretch, and void of thoughtful care,
He forms no bait, nor lays the tempting snare;
But the dull sluggard boasts a crab his friend,
Whose busy eyes the coming prey attend.
One room contains them, and the partners dwell
Beneath the convex of one sloping shell;
Deep in the watery vast the comrades rove,
And mutual interests binds their constant love.
That wiser friend the lucky juncture tells,
When in the circuit of the gaping shells
Fish, wandering, enter; then the bearded guide,
Warns the dull mate, and pricks his tender side;
He knows the hint, nor at the treatment grieves,
But hugs the advantage, and the pain forgives:
His closing shells the Pinna sudden joins,
And 'twixt the pressing sides his prey confines.
Thus fed by mutual aid the friendly pair
Divide their gains, and all their plunder share.

The name Pinna, which is sometimes spelled with one n, is supposed to be derived from πινος (pinos) the dirt or mud; but the name given it by British conchologists would lead us to take its derivation from the Latin, pinna, a large feather.

PINNA *Pectinata.**

SPINY SEA WING.

Specific Character. Shell triangular, oblong, with about eleven longitudinal ribs, having concave spines, which increase in size as they approach the broadest end; the other side destitute of ribs, but obliquely striated; shell thin, pellucid, brittle, of a light brown colour, darker towards the beaks; inside of a pearly hue; breadth three inches at the gaping end, which is slightly rounded; length six inches and a half. This shell inhabits India; it has also been found on the coasts of Dorset and Sussex.

QUESTIONS ON THE BIVALVE SHELLS.

1. Describe the part of a Bivalve shell which unites the two valves.

2. By what means are the animals able to open these valves?

* Plate X. figure 4.

3. What is the meaning of the terms *equivalve, inequivalve, equilateral, inequilateral*, and what is their derivation?

4. Describe the mollusk inhabiting bivalve shells?

5. How is the generic character of bivalve shells determined?

6. Name the parts of a bivalve shell, and describe the situation of each part.

7. What is the generic character of the Mya, and what are its distinguishing marks?

8. Describe the manner in which the shell of the Mya Margaratifera is peculiarly suited to the situations it occupies.

9. What are pearls, and in what kind of shells are they found?

10. What is the generic character of the Solen, and how is it distinguished?

11. Describe the habits of the Solen.

12. What is the generic character of the Tellina, and its distinguishing mark?

13. What is the generic character of the Cardium, and its distinguishing marks?

14. Which species of tne Cardium afford food to the poorer classes?

15. What is the general appearance of the Mactræ?

16. What is the generic character of the Donax?

17. What is the generic character of the Venus, and its distinguishing mark?

18. To what use is the Venus Mercenaria converted?

19. What is the generic character of the Spondylus ?

20. What is the generic character of the Chama, and its distinguishing mark ?

21. Give an account of the Chama Gigas ?

22. What is the generic character of the Arca, and its distinguishing mark ?

23. What difference occurs in the arrangement of the teeth of the Arca ?

24. What is the generic character of the Ostrea, and its distinguishing mark ?

25. Describe the two great families into which the Ostrea is divided.

26. Describe the difference in the habits of the Pecten and the Oyster.

27. Describe the manner of taking and fattening the common oyster.

28. What is the generic character of the Anomia ?

29. Describe the two families into which the Anomia is divided.

30. What is the generic character of the Mytilus ?

31. Describe the habits of the common muscle.

32. Describe the pearl fishery.

33. What is the generic character of the Pinna ?

34. Why is the Pinna considered as a link between the univalves and bivalves ?

35. Describe the habits of the animal inhabiting the Pinna.

MULTIVALVES.

This class according to Linnæus, contains three genera. The generic character is chiefly determined by the number of valves and their position.

Genus.—PHOLAS.*—(*Plural. Pholades.*)

STONE PIERCER.

Generic Character. Shell with two primary valves gaping at both ends, and several smaller accessory valves situated upon the hinge and posterior slope; hinge recurved, each valve has a long tooth curved inwards.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The shells of this genus are thin, fragile, and usually either of a pure or dusky white, adorned with beautiful minute fret work: the reticulations in some species are so delicate and fine as to resemble lace; in others, they are coarser, and approaching to small basket work. The

* Plate X. figure 8.

Pholades were ranked by Linnæus amongst the multivalves, but by modern conchologists they are generally placed with the bivalves. The two principal valves connected by a hinge, associate them closely to the latter, and the small testaceous plates around the hinge may be considered as mere appendages, for they do not act the part of valves. The Pholas appear the connecting link between the classes of bivalves and multivalves. So gradual are the steps by which the scale of nature proceeds, that it is often difficult to ascertain precisely the line which separates its great divisions,

The Pholades are all borers, perforating wood, clay, limestone, and sometimes burying themselves in the sand, forming a retreat in which they pass their lives. The name marks their peculiar propensity, being derived from φωλεος, (pholeos) a hiding place. The largest species, and the finest specimens are most frequently found in chalk, which being the softest of calcareous substances, admits of a more easy and rapid progress to the animal than the indurated stones in which they are sometimes discovered. How they effect their lodgment, is still a subject of doubt and inquiry. Many have supposed that a continued rotatory * motion would in time produce such a cavity as they inhabit, but as it is exactly fitted to their size, it cannot be easily imagined that the animal could perform this motion within it. Another circumstance opposed to this opinion

* Rotatory, like a wheel, from the Latin rota, a wheel.

is, that the mollusks whose shells are perfectly smooth, are capable of producing the same excavation as those which have a surface as rough as a file. Many have supposed that these animals possess some liquid which acts as a solvent upon the substance they enter. This appears the more probable, as they are known to emit a phosphorescent light.

The entrance is the smallest part of the dwelling of the Pholades, and hence it is evident that they must have penetrated the rock when young and small, and enlarged their perforations as they themselves increased in dimensions. The position of the hole is always oblique to the horizon: its form that of a truncated cone, terminated by a rounded cavity. This cavity receives the body, while the farthest end is occupied by the proboscis, which is continually protruded to the orifice to procure the sea water, upon which it subsists. The proboscis is long, pliable, and fleshy, terminated by a corneous substance, which is dentated like a saw at its extremity. There is an opening between the valves, through which it is projected, and a case into which it fits. At the approach of danger, these mollusks, by means of this instrument eject water to a considerable height, and its dentated margin leads us to suppose, that they also employ it in the work of perforation.

PHOLAS *Candida.**

WHITE STONE PIERCER.

Specific Character. Shell oval, obtuse, nearly closed at the anterior end, thin, fragile, almost transparent, striated transversely, and crossed by finer striæ in a radiated form from the umbones, a few of the radii at the larger end set with short spines; hinge smooth and reflected, teeth slender and curved; one valve has a curved lamina above the tooth; there is a single accessory valve; the colour is yellowish white; it is about three quarters of an inch long, and three inches broad.

These Pholades inhabit marine rocks; they are found in great numbers on the Devonshire coast; the stone in which they are imbedded is a cementation of the finest sand and limestone; it is very soft when first taken from the bed, and so absorbent as to afford sufficient moisture for the purposes of life, and for the peculiar actions of the mollusk. The animal secretes a mild phosphorescent solution, which would be of sufficient power to decompose the rock by the contact of its gradually increasing bulk.

* Plate X. figure 8.

Genus—CHITON.*—(*Plural*, *Chitŏnes.*)

COAT OF MAIL.

Generic Character. Shell multivalve, composed of eight valves, rarely of seven or six; form convex oval; the valves are arranged in an imbricated manner, the margin of one being incumbent on that of the next; they are surrounded and connected by an elastic coriaceous membrane, which allows of the free movement of the valves, it is either scaly, hairy, or spinous.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

The Chitons are readily distinguished from all other testaceous mollusca by the form of their shell, which very much resembles a small vessel or boat turned upside down, and by the peculiar arrangement of its moveable valves attached by a coriaceous membrane. This latter substance is capable of sufficient expansion and contraction to admit of considerable play in the valves, so that the animal can roll up its shell into the form of a ball, having all the appearance of a wood-louse. Thus covered by its scales it lies like a pebble at the bottom of the sea, and so

* Plate X. figure 5.

contrives frequently to escape the vigilance of its enemies. The mollusks of the Chitons are of the same form as their shells, the plates of which are fixed in the mantle ; the gills surround their bodies ; they breathe only water, and have a fleshy foot, upon which they creep. Their abode is in the sea at an inconsiderable depth near the shore. They fix themselves for a time to rocks and stones, but they can remove at pleasure. The situation and formation of the valves resemble the plates which constitute a suit of armour, or coat of mail ; and to this resemblance the shell owes its name, which is derived from χιτων, (chiton) a coat of mail.

CHITON *Fascicularis.*

TUFTED CHITON.

Specific Character. Shell with eight valves, apparently smooth, but when viewed through a glass, found to be rough like shagreen, except on the elevated dorsal ridge ; the margin is surrounded with tufts of whitish hairs at the junction of each valve, there are also two tufts in front, making altogether eighteen. The colour is brown or dark grey, often mottled ; the length is rather less than an inch.

The animal of this Chiton adheres to oysters and other shells, and with them inhabits the deep : it is also found on stones. It is not uncommon on the coast of Devonshire ; on those of Barbary it occurs of a much larger size.

CHITON *Squamosus.**

SCALY CHITON.

Specific Character. Shell with eight valves, one half of each valve is striated longitudinally, and the other half transversely ; the margin scaly ; the outside is dark brown, more or less variegated with olive, and the inside is light bluish green ; the margin is beautifully chequered with light green and dark olive scales.

Inhabits the coasts of America.

Genus—LEPAS,† (*Plural, Lepades.*)

BARNACLE.

Generic Character. Shell multivalve, more or less of a conical form, either affixed by their base, or by a peduncle ; valves erect, oval, unequal, varying in number, most frequently six.

OBSERVATIONS ON THE SHELL AND ITS INHABITANT.

This genus consists of two principal divisions; the shells contained in the one are sessile, or affixed at their base, those of the other are peduncled.

* Plate X. figure 5. † Plate X. figures 6, 7.

Though dissimilar in their appearance, these shells are united by many points of resemblance; they are all more or less of a conical form, composed of several valves, and are parasitical. The animals inhabiting them are very similar, and differ much from other mollusks. They have no head or eyes, the mouth has jaws, with horny laminæ or erect teeth; but the most singular part of their structure consists in the numerous tentacular, curled, articulated arms; these vary in number, some of the species have as many as twenty-four. They are arranged in pairs, and are all inserted together; the twelve longest are erect and arched, appearing like curled feathers; they are clear and horny; each joint is furnished with two rows of hair on the concave side. The animals make use of these organs to catch their prey, and are continually extending and contracting them. The twelve smallest are placed in front, they are more flexible, and more thickly set with hairs than the others.

The sessile shells * are now formed into a distinct genus called Balanus: they adhere immediately to marine substances at their base, and remain immoveably fixed for life; the form of the shell is conical, and the valves of which it is composed, are so strongly cemented as almost to appear like a single piece. From the construction of the shell, its immoveable walls, and its large opening at the apex, the animal would be in a very exposed and perilous situation,

* Plate X. figure 6.

had not the compensatory providence of the Creator been exerted in affording it a safeguard. This consists of a very efficient operculum, composed of four testaceous pieces, moveable at pleasure, and articulating with the sides of the shell, sometimes near the base, sometimes towards the middle. The union of these valves forms a pointed cone, which completely covers the opening at the apex, and protects the mollusk, who can open it at pleasure to put out its arms, and draw in food. The increase in the height of these shells is clearly indicated on their lateral valves, whilst at the base are traces of extension in width ; it is probable that at each period of growth, the animal disunites its valves and connects them again, having added the necessary portion to their size.

The Linnæan name of Lepas is now confined to the division containing the Pedunculed shells.* The mollusk inhabiting them may be considered as different from those of the Balanus, because the tube which supports the shell is in fact a part of the animal : it is organized, living, and furnished with muscles which give the Lepas the power of regulating its movements. The shell is composed of five valves, two on each side, and one long and narrow on the dorsal ridge ; these valves are united by a membrane ; the form of the shell is that of a flattened cone ; the base is sustained by the tubular flexible peduncle, by which the shell is attached to marine substances.

* Plate X. figure 7.

LEPAS *Tintinnabulum.**

BELL-SHAPED BARNACLE.

Specific Character. Shell sessile, the valves irregularly and strongly ribbed longitudinally, and the interstices delicately striated transversely; the form is sometimes conical, sometimes cylindrical; the colour is pinkish inclining to purple; the diameter, which is sometimes exceeded by the height, varies from half an inch to two inches.

This shell is found in the West Indies, and coasts of Africa, and often on the bottom of ships arriving from more southern latitudes; but its claim to be considered as a native of Britain is very doubtful.

LEPAS *Anatifera.*†

DUCK BARNACLE.

Specific Character. Shell compressed, somewhat triangular, composed of five valves; the two lower ones are large, triangular, and faintly striated; the two superior valves long and tapering downwards to an obtuse point, the upper part angular on each side, the top rounded; these valves are also slightly striated; the dorsal valve is long, slender and rounded; the

* Plate X. figure 6. † Plate X. figure 7.

cartilages that connect the valves and the peduncle are usually of a reddish orange colour ; the valves are blueish white ; the length is about an inch and a half, the breadth of the largest part is an inch; the peduncle is sometimes a foot long.

This species is found in all parts of the world, adhering in great quantities to the bottom of ships. It attaches itself particularly to wood : sometimes pieces of timber are thrown on shore completely covered with it. A most strange idea formerly prevailed, that the Barnacle goose was produced from these shells.

QUESTIONS ON THE MULTIVALVE SHELLS.

1. How is the generic character of Multivalve shells determined ?
2. What is the generic character of the Pholas ?
3. Why is the Pholas now generally considered as a Bivalve shell ?
4. What are the habits of the Pholades ?
5. How is the Pholas supposed to perforate the different substances it inhabits ?
6. What is the generic character of the Chiton ?
7. Describe the habits of the Chiton.

8. What is the generic character of the Lepas?

9. Describe the two families into which the Lepas is divided.

10. Describe the animal which inhabits the Lepas.

USES OF SHELLS AND THEIR INHABITANTS.

Testaceous bodies are not only to be admired for their beauty, but valued for their usefulness. Several of their animals afford a very nutritious diet. The oyster supplies the table of the rich with a wholesome delicacy; in many maritime situations the poor population are almost entirely supported by various shell fish, as muscles, cockles, pectens, solens, &c. The medicinal qualities of the snail have rendered it a suitable sustenance for the invalid. Mollusks not only contribute to supply the wants of man, but they form the subsistence of other animals; they are the prey of various fishes, and are a favourite food of seafowl, who exert much ingenuity in getting at them: when they find their beaks insufficient to pierce a shell, they will ascend with it to some neighbouring eminence, from whence they drop it, that it may be crushed against the rocks. The monkey also regales himself with shellfish; at the reflux of the tide, when the

Mollusks for want of water, keep their shells open, he stations himself on the sea shore, aware of the danger of inserting his paws between the valves, he drops in a stone or two, by which he prevents their closing, and is enabled to extract his prey with impunity. The shells also of Testaceous animals are useful in various ways. In America the greatest quantity of the lime used for agricultural and architectural purposes is made of calcined shells. The public streets of Christianstadt and Santa Cruz are paved with the Strombus Gigas.

In uncivilized countries the natives not only delight to deck their persons with shells, but where the working of iron is still unknown, they often employ shells as its substitute, and convert them into agricultural or domestic implements, and also warlike instruments. The military horn of many of the African tribes is formed of the Murex Tritonis. The blue and white belts of the Indians of North America, used as symbols of peace and amity, in opposition to the war hatchet, is made from the Venus Mercenaria; and the gorget of the chieftain's dress, is constructed of the Mytilus Margaratiferus. Among the Friendly Isles the permission to wear the Cypræa Aurantia or Orange Cowry marks the highest rank of the country. The Cypræa Moneta or Money Cowry is the current money of many nations of India and Africa, and the liberty of a man is often bartered for a certain weight of these shells. In Grecian

History we read that the suffrages of the Athenians were on certain occasions marked upon a shell. Pearls, the effect of disease in certain Mollusca, form a portion of the revenue of many kingdoms, and are among the most costly ornaments of the noble and the wealthy. In former times the dye extracted from the Purpura was a most valuable article of commerce, but it has now been superseded by that which the Cochineal furnishes in so much greater abundance.

A LIST OF THE GENERA OF SHELLS
AS ARRANGED BY LINNÆUS.

MULTIVALVES.

Singular.	*Plural.*
Chiton.	Chitōnes.
Lepas.	Lepădes.
Pholas.	Pholădes.

BIVALVES.

Mya.	Myæ.
Solen.	Solēnes.
Tellina.	Tellĭnæ.
Cardium.	Cardia.
Mactra.	Mactræ.
Donax.	Donăces.
Venus.	Venĕres.
Spondylus.	Spondyli.
Chama.	Chamæ.
Arca.	Arcæ.
Ostrea.	Ostreæ.
Anomia.	Anomiæ.
Mytilus.	Mytili.
Pinna.	Pinnæ.

UNIVALVES.

Singular.	*Plural.*
Argonauta.	Argonautæ.
Nautilus.	Nautili.
Conus.	Coni.
Cypræa.	Cyprææ.
Bulla.	Bullæ.
Volūta.	Volutæ.
Buccinum.	Buccina.
Strombus.	Strombi.
Murex.	Murĭces.
Trochus.	Trochi.
Turbo.	Turbĭnes.
Helix.	Helĭces.
Nerīta.	Nerītæ.
Haliōtis.	Haliotĭdes.
Patella.	Patellæ.
Dentalium.	Dentalia.
Serpŭla.	Serpŭlæ.
Terēdo.	Teredĭnes.
Sabella.	Sabellæ.

TABLE OF THE

LINNÆAN GENERA OF SHELLS,

WITH LAMMARCK'S DIVISION OF THESE GENERA.

Lin.	Lam.
I. Chiton.	Chiton.[1] Chitonellus.
II. Lepas.	Tubinella Coronula, Balanus.[2] Acasta. Creusia. Pyrgoma. Anatifa.[3] Pollicipes. Cineras. Otion.
III. Pholas.	Pholas.[4] Gastrochæna.
IV. Mya.	Panopæa. Glycimeris. Mya.[5] Anatina. Lutraria. *part.* Amphidesma. *part.* Corbula. Unio. Hyria. Vulsella.
V. Solen.	Solen.[6] Anatina. *part.* Sanguinolaria. Hiatella.
VI. Tellina.	Mya. *part.* Amphidesma. *part.* Pandora. Psammobia. Psammotæa. Tellina.[7] Lucina.[8] Cyclas. Cyrena.
VII. Cardium.	Cardium.[9]
VIII. Mactra.	Lutraria. *nearly all.* Mactra.[10] Crassatella. *part.* Amphidesma. *part.*
IX. Donax.	Petricola. *part.* Venerupis. *part.* Donax.[11] Capsa.
X. Venus.	Petricola. *part.* Venerupis. *part.* Sanguinolaria. *part.* Corbis. Lucina. *part* Donax. *part.* Crassina. Cyrena. *part.* Galathea. Cyprina. Cytherea. Venus.[12]
XI. Spondylus.	Plicatula.[13] Spondylus.[14]
XII. Chama.	Cardita. Cypricardia. Isocardia.[15] Chama. Tridacna. Hippopus.[16]

1 Plate 10. fig. 5. 2 Plate 10. fig. 6. 3 Plate 10. fig. 7. 4 Plate 10. fig. 8.
5 Plate 10. fig. 7, 8. 6 Plate 7. fig. 3. 4. 7 Plate 7. fig. 6, 8.9. 8 Plate 7. fig. 7.
9 Plate 8. fig. 1, 2. 10 Plate 8. fig. 3, 4, 9. 11 Plate 8. fig. 5, 6. 12 Plate 8. fig. 7.
13 Plate 8. fig. 9. 14 Plate 8. fig. 10. 15 Plate 9. fig. 3. 16 Plate 9. fig. 2.

LIN.	LAM.
XIII. Arca.	Nucula. Pectunculus.[1] Arca.[2] Cucullæa. *part.*
XIV. Ostrea.	Cucullæa. *part.* Perna. Malleus.[3] Pedum Lima. Pecten.[4] Gryphæa. Ostrea.
XV. Anomia.	Placuna. Anomia.[5] Crania. Orbicula. Terebratula.[6] Hyalæa.
XVI. Mytilus.	Saxicava. Anadonta. Modiola. Mytilus.[7] Avicula. Melleagrina.[8] Ostrea. *some.*
XVII. Pinna.	Pinna.
XVIII. Argonauta.	Argonauta.[9] Carinaria.
XIX. Nautilus.	Orthocera. Nodosaria. Spirula. Cristellaria. Nautilus.[10]
XX. Conus.	Conus.[11]
XXI. Cypræa.	Cypræa.[12]

LIN	LAM.
XXII. Bulla.	Bullæa. Acera. Bulla.[13] Bulimus. Achatina. Physa.[14] *part.* Ovula.[15] Terebellum.
XXIII. Voluta.	Auricula. Ancilla. Tornatella. Turbinella. Cancellaria. Columbella. Mitra.[16] Voluta. Marginella. Volvaria. Achatina. Oliva.[17]
XXIV. Buccinum.	Concholepas. Achatina *part.* Phasianella. Pleurotoma. Turbinella. *part.* Cancellaria. *part* Pyrula. *part.* Murex. *part* Triton. Cassidaria. Cassis.[18] Purpura. Monoceros. Harpa.[19] Dolium.[20] Buccinum. Eburna. Terebra.[21]
XXV. Strombus.	Pirena. Cerithium. *part.* Pleurotoma. *part.* Rostellaria.[22] Pterocera. Strombus. Cassadaria. *part.* Purpura.

1 Plate 9. fig. 5. 2 Plate fig. 6. 3 Plate 9. fig. 8. 4 Plate 9. fig. 7,
5 Plate 10. fig. 1. 6 Plate 9. fig. 9. 7 Plate 10. fig. 2. 8 Plate 10. fig. 3.
9 Plate 6. fig. 5. 10 Plate 6. fig. 4. 11 Plate 2. fig. 1. 12 Plate 2. fig. 2, 4, 5.
13 Plate 2. fig. 6. 14 Plate 2. fig. 9. 15 Plate 2. fig. 8 16 Plate 2. fig. 11.
17 Plate 2. fig. 10. 18 Plate 3. fig. 3. 19 Plate 3. fig. 2. 20 Plate 3. fig. 1.
21 Plate 3. fig. 4. 22 Plate 3. fig. 5.

LIN.	LAM.
XXVI. Murex.	Cerithina. Pleurotoma. Turbinella. *part.* Fasciolaria. Fusus. Pyrula. Struthiolaria. Ranella.[1] Murex.[2] Triton.[3] Prienula. Purpura. *part.*
XXVII. Trochus.	Pyramidella.[4] Solarium.[5] Rotella. Trochus. Monodonta. *part.* Cerithrum. *part.*
XXVIII. Turbo.	Pupa. Clausilia. Auricula. *part.* Cyclostoma. Planorbis. *part.* Paludina. Scalaria.[6] Delphinula. Trochus. *part.* Monodonta. *part.* Turbo. Turritella.
XXIX. Helix.	Helix.[7] Carocolla. Anostoma. Helicina. *part.* Pupa. *some.* Bulimus. *part.* Succinea. Auricula. *part.* Cyclostoma. *part.*
	Planorbis.[8] Lymnæa.[9] Melania. Melanopsis. Paludina. *part.* Valvata. Ampullaria. Natica. Ianthina. Sigaretus.
XXX. Nerita.	Navicella. Neritina.[10] Nerita.[11] Natica.
XXXI. Haliotis.	Stomatia. Haliotis.[12]
XXXII. Patella.	Lingula. Patella. Umbrella. Parmophorus. Emarginula. Fissurella.[13] Pileopsis.[14] Calyptræa.[15] Crepidula. Ancylus. Stomatella.
XXXIII. Dentalium.	Dentalium.[16]
XXXIV. Serpula.	Siliquaria. Spirorbis. Serpula. Vermilia. Aspergillum.[17] Septaria. *part.* Vermetus.[18]
XXXV. Teredo.	Fistulana. Septaria. *part.* Teredo.

1 Plate 3. fig. 2. 2 Plate 4. fig. 1. 3 Plate 4. fig. 3. 4 Plate 4. fig. 6.
5 Plate 6. fig. 5. 6 Plate 4. fig. 7, 8. 7 Plate 4. fig. 1. 8 Plate 4. fig 2.
9 Plate 4. fig. 3. 10 Plate 5. fig. 5. 11 Plate 5. fig. 4. 12 Plate 5. fig. 6.
13 Plate 5. fig. 8. 14 Plate 6. fig. 1. 15 Plate 5. fig. 4. 16 Plate 6. fig. 6.
17 Plate 6. fig. 3. 18 Plate 6. fig. 2.

EXPLANATION OF TERMS.

Acephala. Without a head from the Greek κεφαλη (cephale) a head.

Apex. In univalve shells, the top of the spire.

Apices. The plural of apex. In bivalve shells, the points over the hinge: called also the Beaks.

Aperture. The entrance or opening of the shell.

Auriculæ. Small earlike appendages placed at the sides of the hinge of some bivalve shells: the diminutive of auris, an ear.

Area, or *Anterior slope.* The side of the beaks where the ligament is situated.

Areola, or *Posterior slope.* The side of the beaks opposite to that where the ligament is placed.

Articulated. Having joints; from articul *us,* a joint.

Annulated. Marked with rings; from annul *us.* a ring.

Alatæ. Winged; from ala, a wing.

Adductor Muscle. The muscle that closes the valves; from adduco, I bring together.

Base. In univalve shells, the extremity oppo-

site to the apex. In bivalve shells that part of the margin which is opposite to the beaks.

Bivalve. A shell with two valves; from bis, twice, and valve.

Bifid. Cleft in two; from bis, twice, and fid *i*, I have cleft.

Bifurcated. Having a fork of two teeth; from bis, twice, and furc *a*, a fork.

Branchiæ. Gills; from the Greek βραγχια, (branchia) the gills of fish.

Cardo or *Hinge.* In bivalves, that part of the circumference where the valves cohere.

Carinate. Furnished with a keel-like elevated ridge; from carina, a keel.

Columella. The pillar round which the whorls form their spiral circuit; from colum *ella*, a little column.

Convoluted. Rolling regularly over each other; from con, together; and volut *us*, rolled.

Cephalopodes. Having feet on the head; from the Greek κεφαλη, (cephale) a head, and ποδες, (podes) feet.

Cephala. Having a head; from the Greek κεφαλη (cephale) a head.

Corneous. Horny; from cornu, a horn.

Crenated. Notched; from cren *a*, the notch of an arrow.

Coriaceous. Like leather; from cori *um*, skin, leather.

Callosity. Hardness of skin or flesh; from call *us*, which has the same signification.

Ciliated. Furnished with a fringe like eyelashes; from cilia, an eyelash.

Cordate. Heart-shaped; from the Latin (cor) a heart.

Contracted. The mouth is called contracted, when the lips are not separated by any channel or sinus; it then holds liquids though filled up to the brim.

Congener. One of the same genus; from con, together and genus, a kind.

Coronated. Crowned or girt towards the apex.

Cancellated. Crossed like the bars of a latticed window; from cancelli, lattice.

Complicated. Folded together; from con, with, together, and plica*re*, to fold.

Digitations or *Claws.* Finger-like lobes; from digit*us*, a finger.

Dextral. Righthanded, turning round the pillar from left to right, the usual course of the whorls; from dextra, the right hand.

Dorsal. Belonging to the back; from dors*um*, the back.

Deciduous. Falling, not lasting; from decido, I fall.

Dentated. Toothed; from dens, a tooth.

Diaphanous. Capable of transmitting light, transparent; from the Greek δια *(dia)* through, and φαινω (phaino) I appear.

Decorticated. Having the bark or outer skin taken off; from de, off, and cortex, bark.

Dissepiment. A division between two chambers in a shell; from sep*es*, a hedge, and dis,

a prefex, signifying division.

Decussated. Crossed like an X; from decussis, the mark X (ten).

Disk. The convex part of the valves between the umbones and the margin, applied also to any extended or rounded surface; as in Haliotis, from the Latin discus, a dish or platter.

Effuse. Having the lips separated by a sinus or gutter, so that if the shell were filled with water, it would flow out at the sinus before it reached the margin; from fus*us*, poured out.

Epidermis. The membranaceous covering of some species of shells; from the Greek επι *(epi)* upon, and δερμα *(derma)* a skin.

Eroded. Gnawed out, from the Latin *e*, out, and rod *ere*, to gnaw.

Entire. The mouth is said to be entire, when the lips are not separated by a canal.

Equivalve. Having equal valves; from equ*us* equal, and valve.

Equilateral. Having both sides equal; from equ*us*, equal, and latera, sides.

Emarginated. Notched, or having the margin excavated by a sinus.

Ferruginous. The colour of rust or iron-mould; from ferrug*o*, iron rust.

Flexuous. Winding full of turns and meanders.

Fusiform. Shaped like a spindle; swollen in the middle, and tapering to each end; from fusis, a spindle.

Fluviatile. Belonging to fresh water; from fluvi*us*, a river.

Globose, Globular. Approaching the form of a globe.

Genus. A separate family, distinguished from all others by certain permanent marks, called *generic* characters; from gen *us*, a kind.

Gibbous. Convex, swelling out, from gibbus, a swelling, a hunch on the back.

Gaping. The valves so partially closing, that the margins do not touch at every part of the circumference.

Imbricated. Lying one over another like the tiles of a house; from imbrex, a tile.

Iridescent. Displaying the varied colours of the rainbow; from iridesc*ere*, to shine like a rainbow, in Latin *iris*.

Insterstice. Space between one part and another.

Inequivalve. Having unequal valves; from in, not, equ *us*, equal, and valve.

Inequilateral. Having sides not uniform; from in, not, equ *us*, equal, and latera, sides.

Involuted. Rolled inwards; from involut *us*, rolled up in.

Littoral. Belonging to the shore; from litt *us*, a shore.

Lateral. At the sides; from later *a*, sides.

Longitudinal. In the direction of the length of a shell; (i. e.) from the apex to the base.

Laminated. Having thin layers or scales called laminæ.

Linear. Having the character of a line ; extremely narrow in proportion to its breadth, and of nearly equal diameter throughout.

Length. In Bivalves, the dimension extending from the hinge to the opposite margin ; in Univalves, that from the apex to the base.

Ligament. A cartilage which connects the valves ; from lig *are,* to bind.

Lanceolate. Shaped like the head of a lance.

Lips. The margins of the mouth of a univalve shell. The *columellar lip* is the margin nearest the columella. The *outer lip* is the outer margin of the aperture.

Locomotion. The power of moving voluntarily from place to place ; from loc *us,* place, and motion.

Lubricated. Slippery ; having a very smooth surface ; from lubric *us,* slippery.

Multivalve. Having several valves, from mult *us,* many.

Mollusca. The animals inhabiting shells ; the name is derived from mollis, soft. They are divided into two classes : those which have a head called *Mollusca Cephala,* from the Greek κεφαλη, (cephale) a head ; and those without a head *Mollusca acephala,* from the Greek α (a) without, and κεφαλη.

Muricated. Having little pointed knobs; from murex, the sharp point of a rock.

Marine. Belonging to the sea; from mare, the sea.

Multilocular. Having several chambers, from mult *us* many, and locul *um*, a little chamber.

Operculum or Lid. A plate or door, with which some species close the aperture of their shells, from oper *ior*, I cover.

Orbicular. Quite round, or circular.

Parallel. Running in the same direction as another thing, being always at the same distance from it; from the Greek παρα (para) by the side of, and αλληλων (allelon) each other.

Pellucid. So clear that the light is seen through; from per, through, and lux, light.

Pervious. Easily passed through; from per, through, and via a way.

Plicated. Folded or plaited; from plica, a fold.

Punctured. Pricked or marked with small dots; from punct *um*, a point or dot.

Patulous, lying open or spreading; from pat *ere*, to lye open.

Quincunx. Disposed alternately as in rows of spots, when the spots of each row are opposite to the space between two spots of the next row; from quin*que*, five, and unx, ounce, as the weight representing five ounces was stamped thus :·:

Rotatory. Like a wheel; from rota, a wheel.

Rostrated. Having a beak from rostr*um*, a beak.

Retuse. Having the lower whorls of the spire pressed into the body whorl, from *re*- back, and tus*us*, beaten.

Reversed. Applied to spiral shells, whose volutions turn in the contrary direction to the generality of shells, If when a shell is placed on its base, with the front facing the person looking at it, the aperture is on the right side of the pillar, the shell is said to be *regular* or *dextral*, if the aperture is on the left side of the pillar, it is said to be *reversed* or *sinistral.*

Retractile. Capable of being drawn back; from re, back, and tract*us*, drawn.

Reticulated. Crossed like net work; from reticul*um*, a small net.

Revolute. Rolled back; from re, back, and volut*us*, rolled.

Rugose. Rough or wrinkled; from rug*a*, a wrinkle.

Rufous. Of a reddish colour.

Spire. The upper whorls collectively, from the Greek σπειρ (speir), convolutions gradually increasing in diameter.

Suture. The circular line of the spire, where one volution meets another; from sutur*a*, a seam.

Species. The subdivision of a genus, and distinguished from all others of the genus

by permanent marks called *specific* characters.

Striated. Marked with fine striæ, or lines, either hollow or raised; from stria, a stripe.

Sinus. A gutter, or curvature; from sin*us*, a curved line.

Sinuous. Having a curvature.

Subulate. Tapering, or pointed; from subul*a*, a pointed tool.

Sagittate. Arrow-like; from sagitta, an arrow.

Siphon. A pipe through which liquids are conveyed.

Sub. In composition means almost, or approaching to.

Setaceous. Bristle shaped; from seta, a bristle.

Semi. Half.

Sinistral. On the left hand; from sinistra, the left hand.

Sides. The right side of a univalve is that opposite the right hand of the person looking at it, when the shell is placed on its base with the aperture in front: the left side is that opposite the left hand, the shell being in the same position.

Terrestrial. Belonging to the earth; from terra, earth.

Testaceous. Composed of the materials which form shells; from the Latin testa, a shell.

Tentacula. The feelers of the mollusca; from the Latin tento, I try.

Turbinate. The body swelling, and spire comparatively small; from the Latin turbin *is*, of a whirlwind.

Turreted. The whorls gradually decreasing to a fine point; the length of turreted shells greatly exceeds their breadth.

Turgid. Swollen, puffed up.

Teeth. The pointed protuberances at the hinge of bivalve shells; the *cardinal* or central *teeth* are those situated on the hinge; the *lateral teeth* are those at the sides of the hinge, and are often remote.

Tuberculated. Covered with tubercles, or small protuberances.

Tortuous. Twisted; from the Latin tort *us*, twisted.

Transverse. Placed across, or crossways.

Truncated. Cut short or abruptly off at the end.

Umbones, or *Bosses.* The swelling parts of bivalve shells near the beaks; from umbo, the boss of a shield. The highest points of these are considered the *summits.*

Umbilicus. A small hollow at the base of the columella, visible underneath.

Undulating. Wave-like; from undula, a little wave.

Univalve. A shell composed of one valve; from un*us*, one, and valve.

Volution or *Whorls.* The distinct turns of the spire.

Varices. Longitudinal gibbous sutures formed

in the growth of the shell at certain distances on the whorl ; from varix, a swollen vein.

Vermiform. Resembling a worm ; from the Latin vermes, a worm ; and forma, a form.

Ventricose. Inflated. Swelled in the middle.

THE END.

EXPLANATION OF THE PLATES.

PLATE I.

a.	Spire.	*r.*	Area or Anterior slope.
b.	Body whorl.	*s.*	Areola or Posterior slope.
c.	Beak.	*t.*	Beaks.
d.	Base.	*u.*	Hinge.
e.	Canal.	*v.*	Ligament.
f.	Aperture.	*w.*	Disk.
g.	Outer lip.	*x.*	Umbo.
h.	Columellar lip.	*y.*	Base.
i.	Whorls.	*z.*	Length.
k.	Suture.	*a.**	Breadth.
l.	Apex.	*b.**	Auricles.
m.	Back.	*c.**	Left valve.
n.	Varices.	*d.**	Right valve.
o.	Columella.	*e.**	Valves.
p.	Dissepiments.		
q.	Umbilicus.		

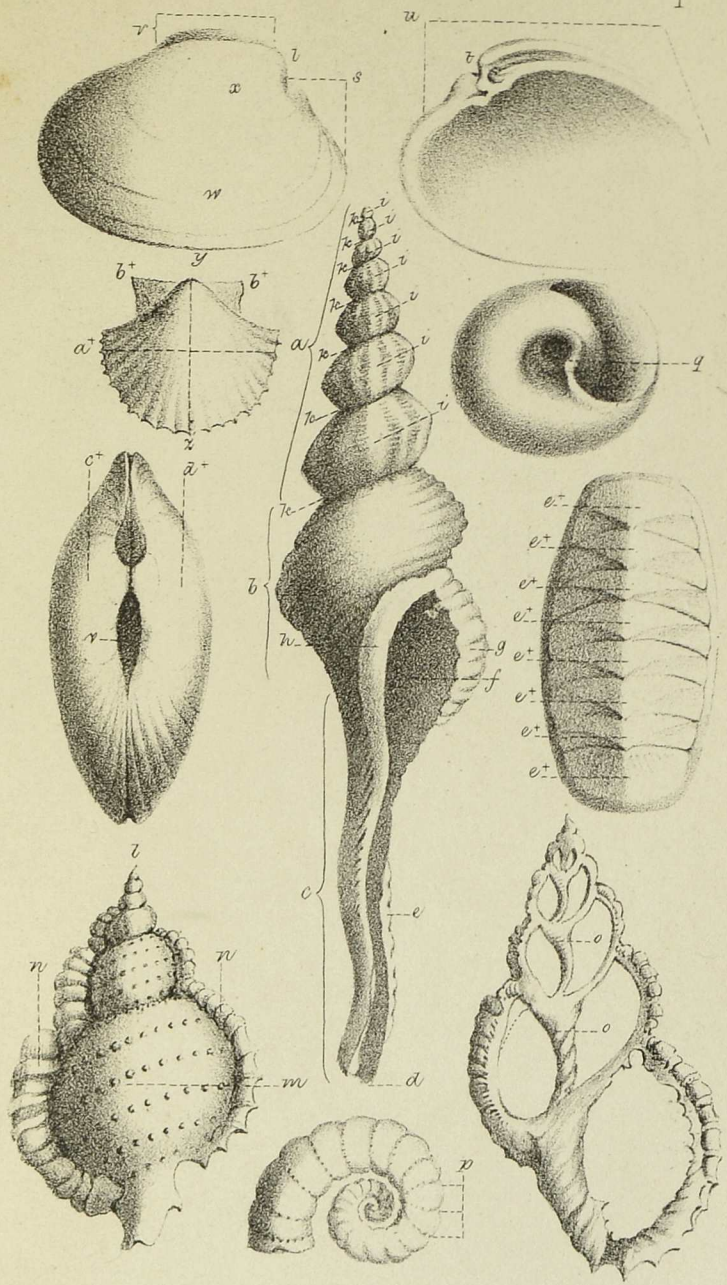
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PLATE II.

Fig.		
1.	Conus *marmoreus.*	Marble Cone.
2.	Cypræa *arabica*	Nutmeg Cowry.
3.	The same, *young.*	
4.	Cypræa *moneta*	Money Cowry.
5.	Cypræa *europæa*	Nun Cowry.
6.	Bulla *lignaria*	Wood Dipper.
7.	Gizzard of *Ditto.*	
8.	Bulla *volva.*[1]	Weaver's Shuttle.
9.	Bulla *fontinalis.*[2]	Stream Dipper.
10.	Voluta *oliva.*[3]	Olive Volute.
11.	Voluta *episcopalis.*[4]	Bishop's Mitre.

[1] Ovula *Volva* of Lamarck.
[2] Physa *Fontinalis* Ditto.
[3] Oliva Ditto.
[4] Mitra *Episcopalis* Ditto.

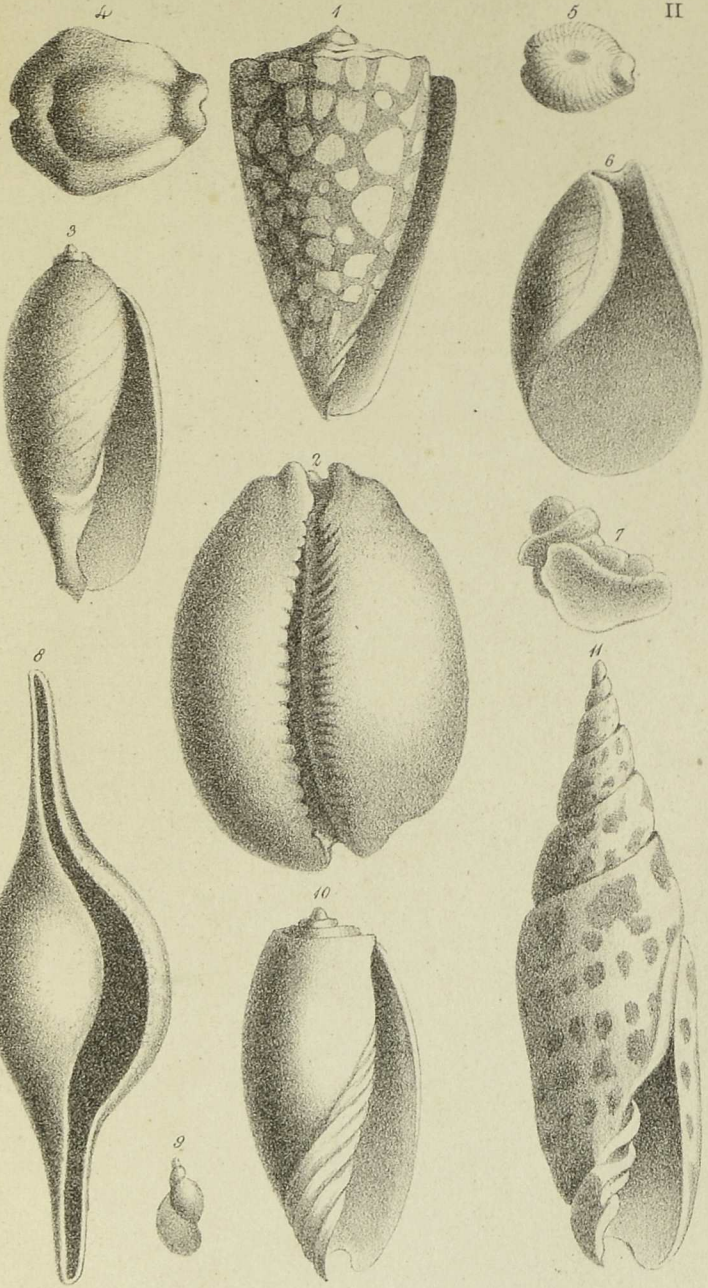
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PLATE III.

FIG.

1. Buccinum *dolium* [1] . Spotted Tun.
2. Buccinum *harpa* [2] . Harp Shell.
3. Buccinum *flammeum* [3] Triangular Helmet.
4. Buccinum *subulatum* [4] Tiger Spire.
5. Strombus *pes pelicani* [5] Pelican's Foot.
6. The same, *young* . .

[1] Dolium *Maculatum* of Lamarck.
[2] Harpa *Ventricosa* ditto.
[3] Cassis *Flammea* ditto.
[4] Terebra *Maculata* ditto.
[5] Rostellaria *Pes Pelicani* ditto.

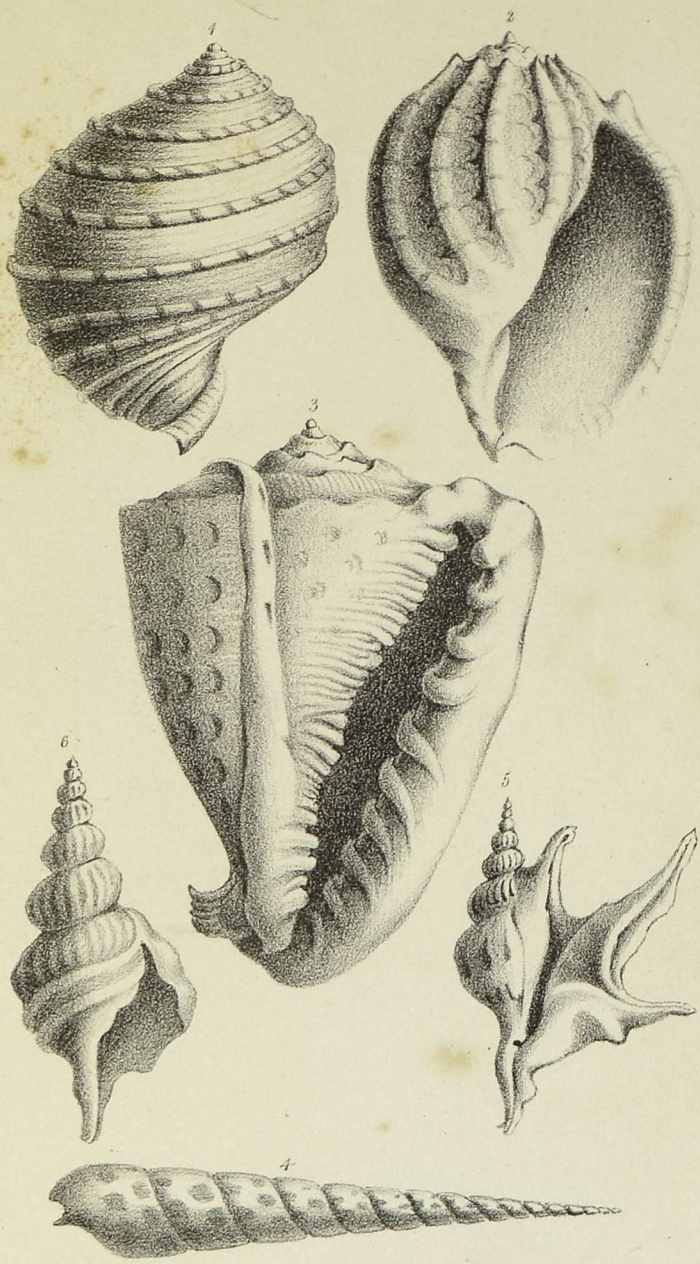
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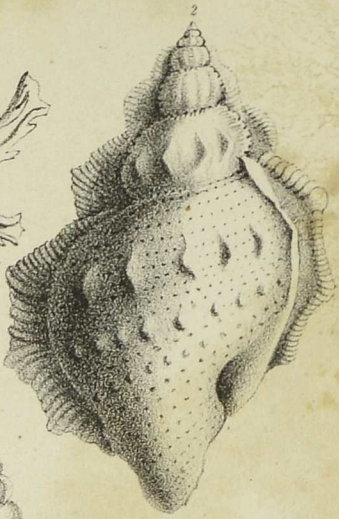
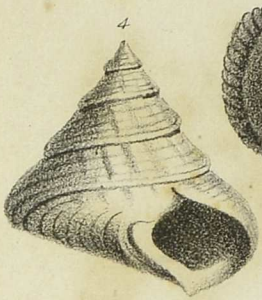
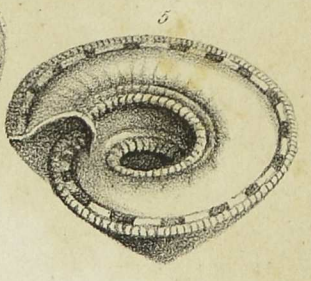
PLATE IV.

Fig.		
1.	Murex *ramosus* . .	Branched Murex.
2.	Murex *rana*[1] . . .	Frog Murex.
3.	Murex *maculosus*[2] .	Spotted Murex.
4.	Trochus *zizyphinus* .	Livid Top Shell.
5.	Trochus *perspectivus*[3]	Staircase Shell.
6.	Trochus *dolabratus*[4] .	Zebra Shell.
7.	Turbo *scalaris*[5] . .	Wentle Trap.
8.	Turbo *clathrus*[6] . .	False Wentle Trap.

[1] Ranella *Crumersia* of Lamarck.
[2] Triton *Maculosus* ditto.
[3] Solarium *Perspectivum* ditto.
[4] Pyramidella *Dolabrata* ditto.
[5] Scalaria *Pretiosa* ditto.
[6] Scalaria *Communis* ditto.







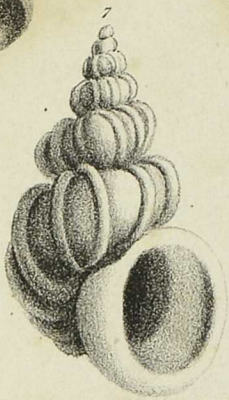


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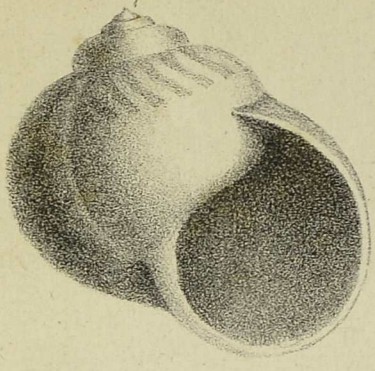
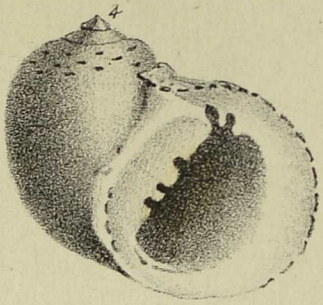
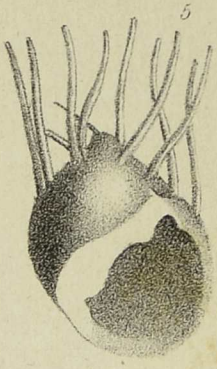
PLATE V.

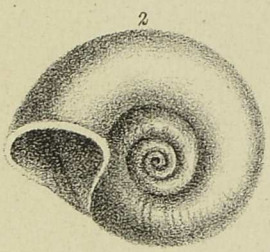
Fig.		
1.	Helix *pomatia* . . .	Eatable Snail.
2.	Helix *cornea*[1] . . .	Horn Snail.
3.	Helix *stagnalis*[2] . .	Lake Snail.
4.	Nerita *peloronta* . .	Bleeding Tooth.
5.	Nerita *corona*[3] . . .	Coronated Nerite.
6.	Haliotis *tuberculata* .	Common Sea-ear.
7.	Patella *equestris*[4] . .	Cup and Saucer Limpet.
8.	Patella *nodosa*[5] . .	Knotted Limpet.

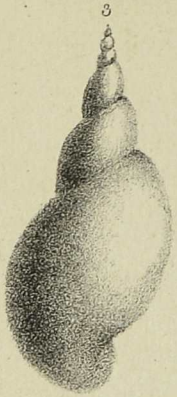
[1] Planorbis *corneous* of Lamarck.
[2] Hymnæa *stagnalis* ditto.
[3] Neritina *corona* ditto.
[4] Calyptræa *equestris* ditto.
[5] Fissurella *nodosa* ditto.

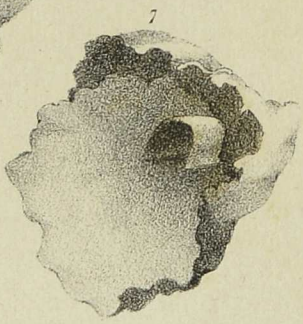












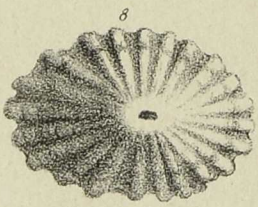


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PLATE VI.

FIG.		
1.	Patella *ungarica*[1] .	Hungarian Bonnet.
2.	Serpula *lumbricalis*[2] .	Cork Screw Shell.
3.	Serpula *aquaria*[3] .	Watering Pot.
4.	Nautilus *Pompilius*	Large Chambered Nautilus.
5.	Argonauta *argo* . .	Paper Nautilus.
6.	Dentalium *entalis* .	Dog's Tooth.

[1] Pileopsis *Ungarica* by Lamarck.
[2] Vermetus *Lumbricalis* by ditto
[3] Aspergellum *Javanum* by ditto

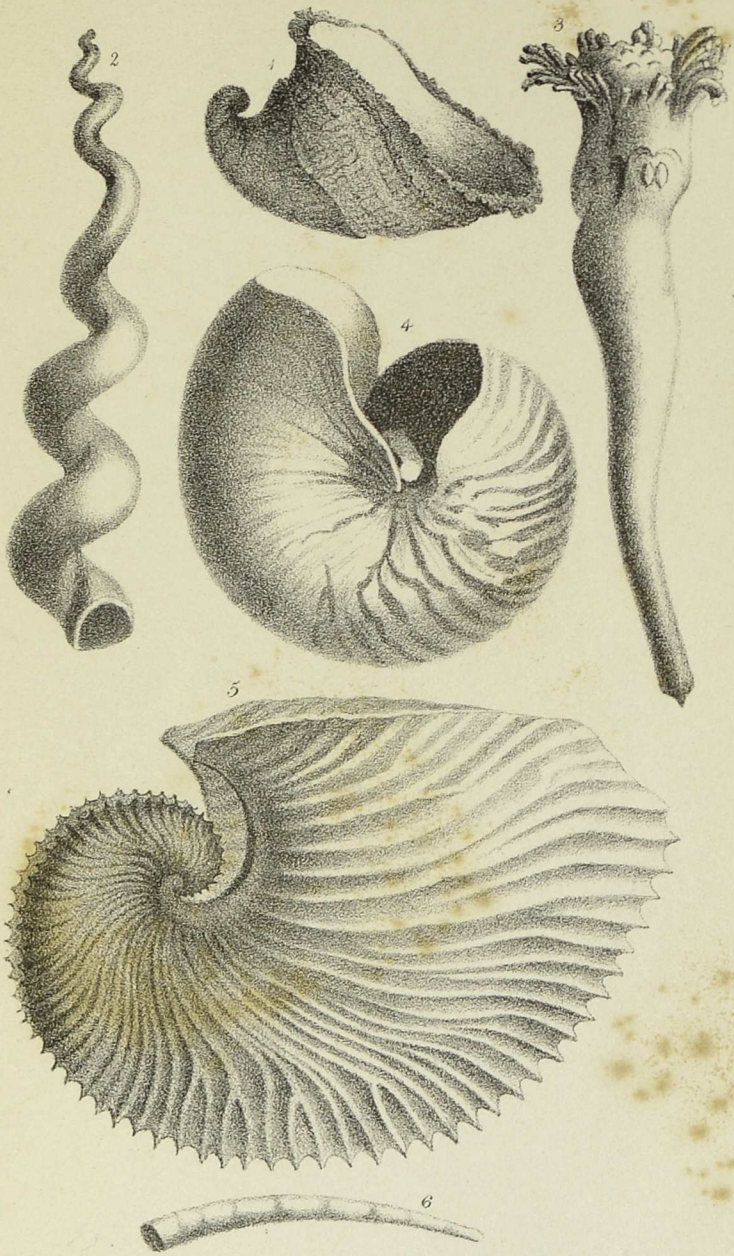

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PLATE VII.

FIG.		
1.	Hinge of Mya.	
2.	Mya *truncata* . .	Truncated Gaper.
3.	Hinge of Solen.	
4.	Solen *siliqua* . .	Pod Razor Shell.
5.	Solen *radiatus* . .	Radiated Solen.
6.	Hinge of Tellina.	
7.	Tellina *carnaria* [1] .	Rosy Tellen.
8.	Tellina *lingua felis* .	Cat's Tongue Tellen.
9.	Tellina *Madagascariensis*.	Madagascar Tellen.

[1] Lucnia *Carnaria* of Lamarck.

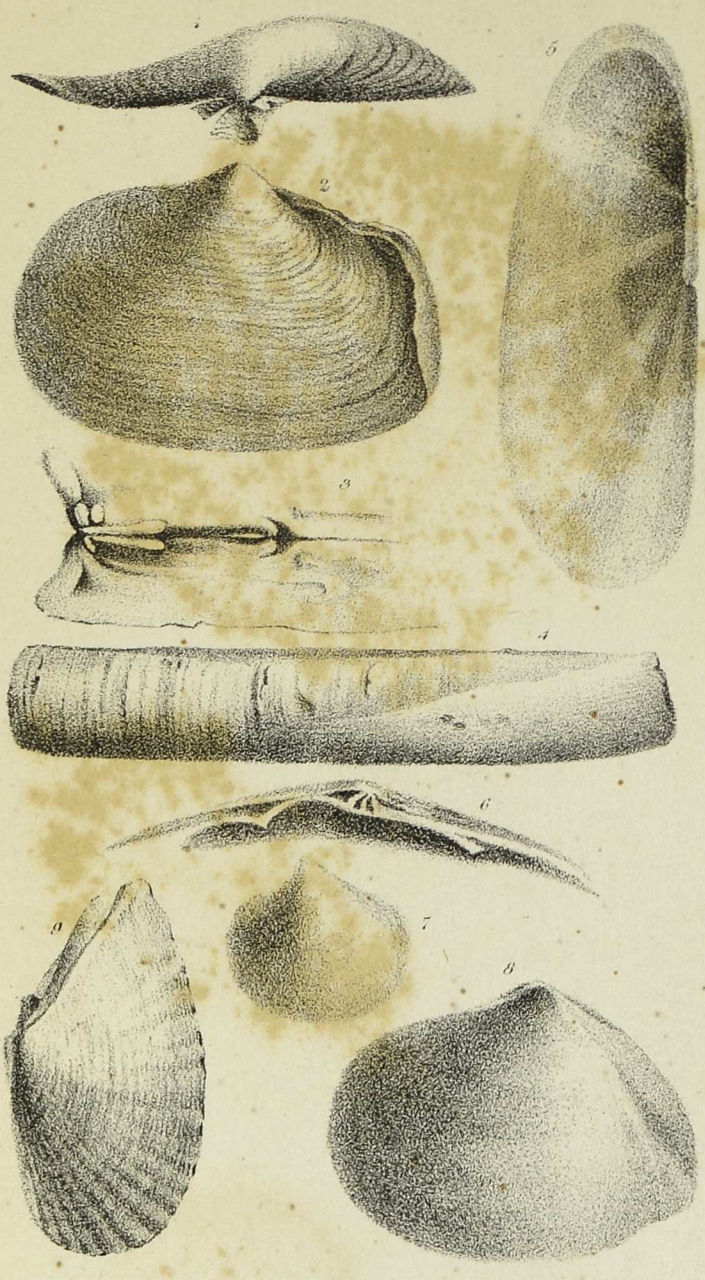
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PLATE VIII.

FIG.		
1.	Hinge of Cardium.	
2.	Cardium *edule* . .	Common Cockle.
3.	Hinge of Mactra.	
4.	Mactra *stultorum*.	Simpleton's Kneading-trough.
5.	Hinge of Donax.	
6.	Donax *denticulata* .	Toothed Donax.
7.	Hinge of Venus.	
8.	Venus *dysera* . . .	Ribbed Venus.
9.	Spondylus *gœdaropus*	Thorny Oyster.
10.	Spondylus *plicatula*[1]	Cat's Paw.

[1] Plicatula *ramosa* of Lamarck.

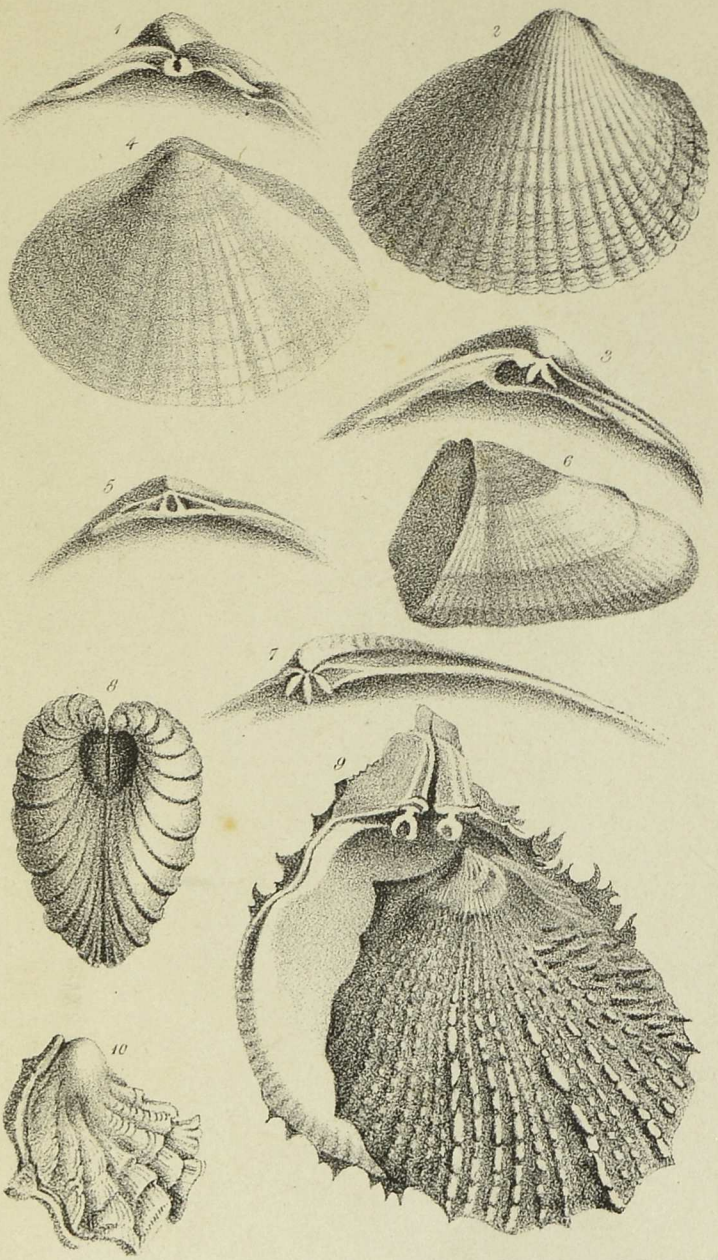

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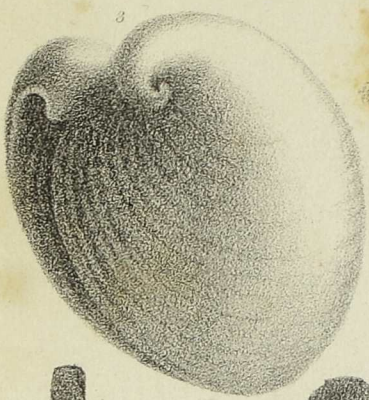
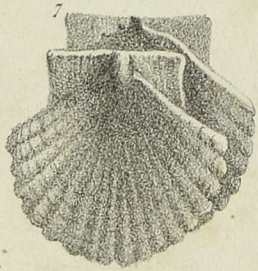
PLATE IX.

FIG.

1. Hinge of Chama.
2. Chama *hippopus* [1] . . Bear's Paw Clam.
3. Chama *cor* [2] . . . . Heart Clam.
4. Hinge of Arca.
5. Arca *undata* [3] . . . Lettered Ark.
6. Arca *Noæ* . . . . Noah's Ark.
7. Ostrea *violacea* [4] . . Violet Scallop.
8. Ostrea *malleus* [5] . . . HammerOyster.
9. Anomia *psittacea*.[6] { Parrot Beak Anomia.

[1] Hippopus *maculatus* of Lamarck
[2] Isocardia cor ditto.
[3] Pectunculus *undulatus* ditto.
[4] Pecten *violacea* ditto.
[5] Malleus *Vulgaris* ditto.
[6] Terebratula *psittacea* ditto.





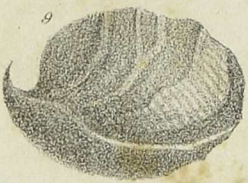


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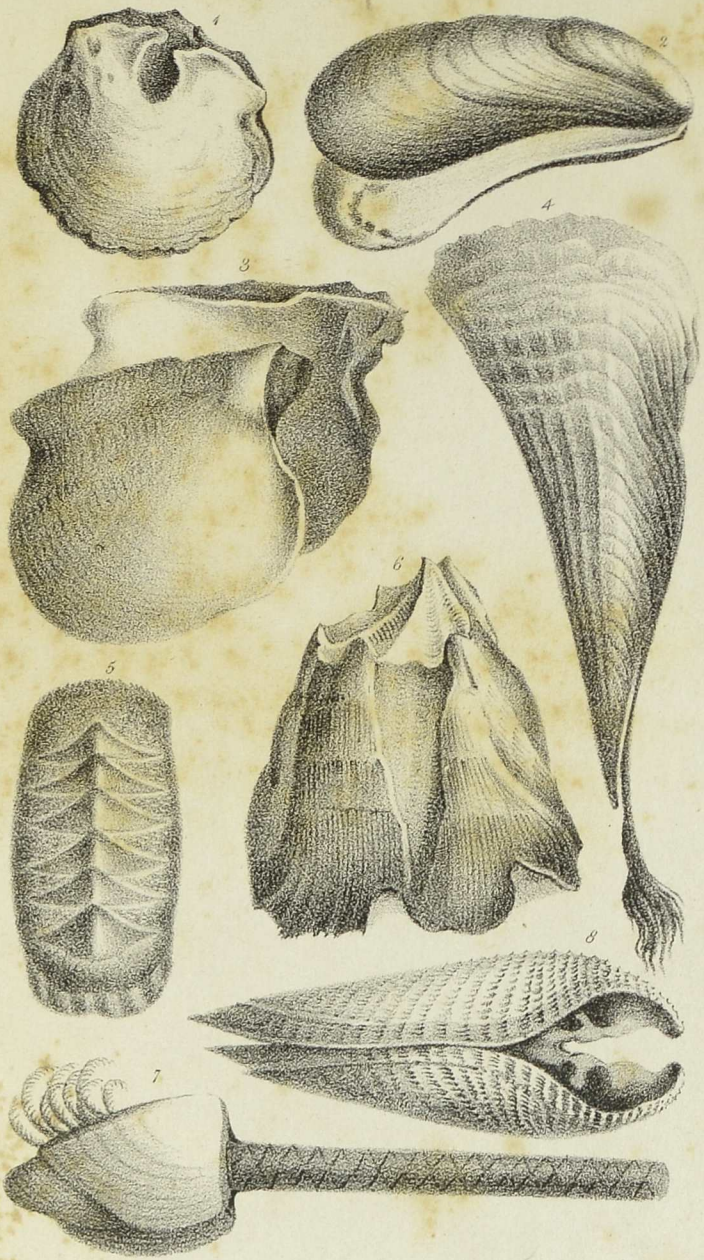
PLATE X.

FIG.		
1.	Anomia *ephippium* .	Wrinkled Anomia.
2.	Mytilus *edulis* . . .	Common Muscle.
3.	Mytilus *margaritiferus* [1]	Pearl-bearing Muscle.
4.	Pinna *pectinata* . . .	Spiny Sea Wing.
5.	Chiton *squamosus* . .	Scaly Chiton.
6.	Lepas *tintinnabulum* [2]	Bell-shaped Barnacle.
7.	Lepas *anatifera* [3] . .	Duck Barnacle.
8.	Pholas *candida* . . .	White Stone-piercer.

[1] Meleagrina *margaratifera* of Lamarck
[2] Balanus *tintinnabulum* ditto.
[3] Anatifa *lævis* ditto.



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