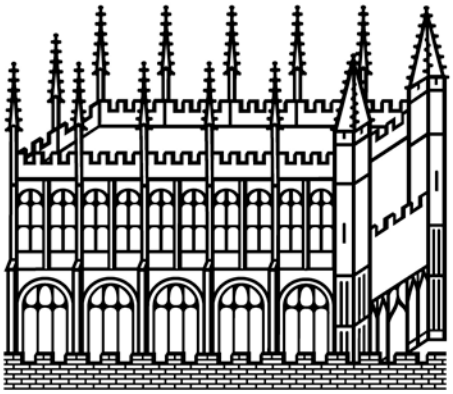

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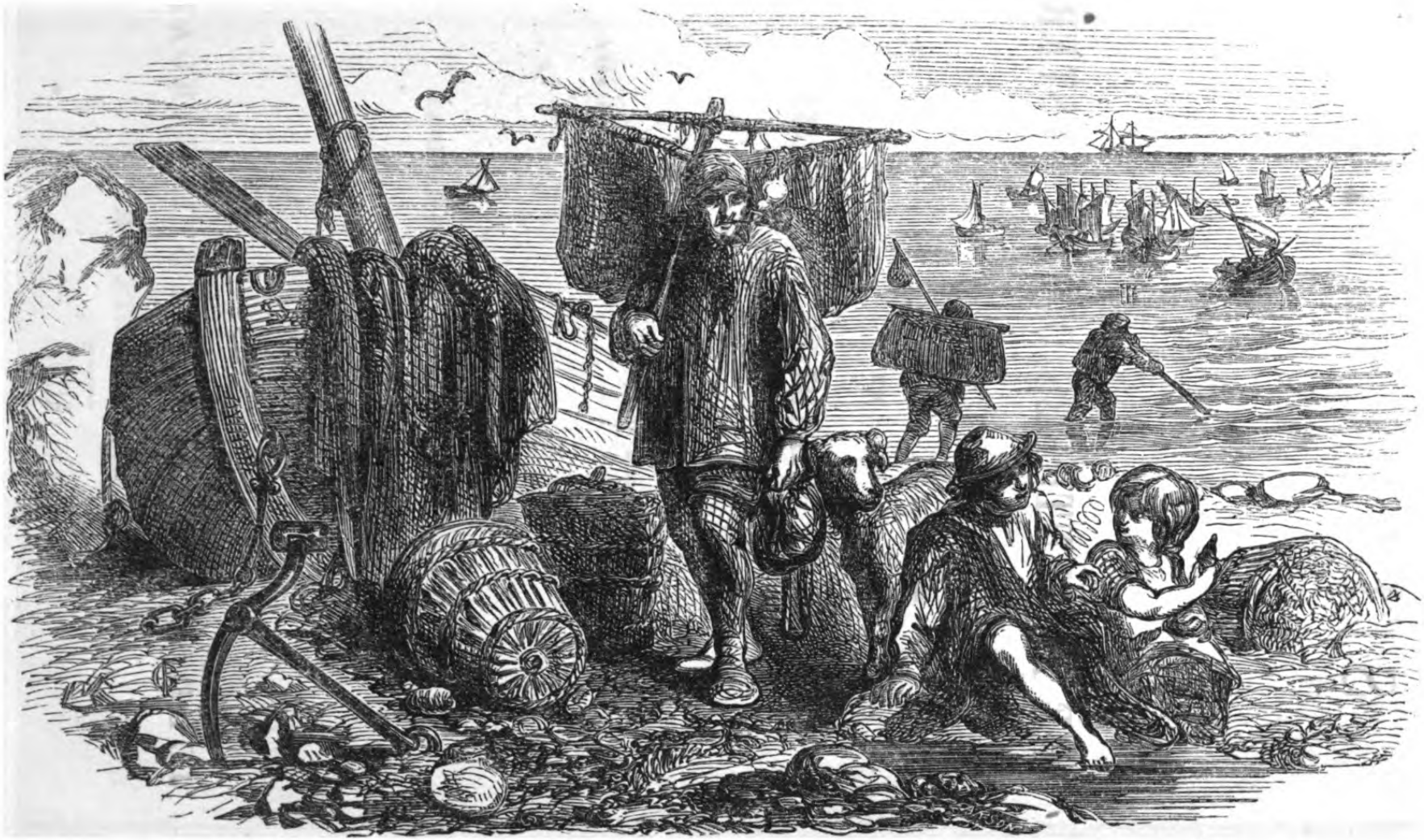
SILVERSHELL
OR THE
LIFE OF AN OYSTER



OYSTER DREDGING.

SILVERSHELL;

OR,

THE ADVENTURES OF AN OYSTER.

BY

TEH REV. CHARLES WILLIAMS.

"Dost know how an Oyster makes his shell?"

SHAKESPEARE.

SECOND EDITION, WITH MANY ENGRAVINGS.

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INTRODUCTION.

"THE life of an oyster, forsooth! Why, what can possibly be said about that?"

"Much," it may be replied to such a question,—"much, too, that is generally unknown."

To the many, not only of the ignorant and stolid, but of the cultivated and intellectual, an oyster is simply a delicacy. The mere oyster-eater eagerly seizes that double-shell, thrusts his knife forcibly between its valves, gives it a hasty wrench, and extracting daintily the little creature within, instantly swallows it, without consideration. He may think, indeed, that if one oyster be agreeable, two or three dozen will be still more so; and that there is, therefore, a large amount of pleasure accessible whenever the head is removed from a barrel of "Milton" or "Colchester natives." But all he does is just to gratify his palate, and to excite or to satisfy the cravings of his stomach.

Now we are of opinion that an oyster, only regarded as a thing to be eaten, and having actually but a low place in the ascending series of animals, not only demands, but will richly reward, an en-

lightened examination. Never were there such facilities for engaging in it as at the present time, when the microscope throws new light on what was previously known, and brings into full view so much that was but recently entirely concealed. Gratefully do we acknowledge our obligations to the illustrious men who have so energetically employed this instrument in the past, and heartily would we encourage them in their present and future labours.

In offering, therefore, the Biography of an Oyster, we say with George Wither, when he presented his book to his Sovereign,

> "Good sir! reject it not, although it bring
> Appearances of some fantastic thing
> At first unfolding;"

while the "caveat" of good old Thomas Adams may well be added: "Do not open it at adventures, and by reading the broken pieces of two or three lines judge it; but read it through, and then I ask no pardon if thou dislikest it. Farewell."

THE

ADVENTURES OF AN OYSTER.

CHAPTER I.

WHO WAS SILVER-SHELL?

SILVER-SHELL WAS NOT A FISH—A MOLLUSK DESCRIBED—SILVER-SHELL WAS NOT A FLUVIATILE CREATURE—THE OYSTERS WHICH GROW ON TREES—MARINE RANGE OF THE OYSTER—ANSWER TO THE QUESTION FIRST PROPOSED.

SILVER-SHELL was an Oyster: but "thereby hangs a tale" that will take some little time in telling. The narrator, however, is ready: a listener only is needed.

There are many instances in which the name of a creature gives some indication of what it is: as, a bird is designated "the cuckoo" from its well-known note; and an insect is called "the carpenter bee" from its movements resembling those of that well-known artisan; but the oyster cannot be cited as an example of this kind. Its earliest names in Greek and Latin are

derived from the words οστρεον and οστρεα, the terms applied to bones, which attracted earlier attention than shells, and from their being alike hard substances. In all the languages of modern Europe the classic root is still observable; as the German *auster*, the Dutch *oester*, the Swedish *ostra*, the Danish *öster*, the French *huître*, and the Russian *ystritz* sufficiently evince. The Chinese are more minutely descriptive; they have three differently sounding words to denote a large, a small, and a round oyster.

Silver-shell, like the rest of its race, was usually described as a shell-*fish*; but it was so very erroneously. A fish has a bony or cartilaginous skeleton; it swims, too, by the action of its fins; and in these respects, not to mention others, it is clearly distinguished in its structure from the oyster. In no sense of the word is the term *fish* applicable to this animal.

The place assigned to it by naturalists among the *mollusca* gives a clue to its just appreciation; that appellation being derived from the Latin word *mollis*, which means *soft*, and applied to all soft-bodied creatures, whether having shells or not. The oyster is, therefore, properly speaking, a mollusk, and is protected by an upper and an under shell. The upper shell is flat, thinner than the other, and marked by tolerably regular crescentic lines; the under shell is convex externally and concave internally; its outer surface is

rugged, with bold transverse marks of growth, longitudinal ridges, and intervening furrows. It is much stouter than the flat shell, and is sometimes very thick and coarse.

Let it not be supposed, however, that anything more than a general description is given, when we say that, because of the oyster's testaceous dwelling, it is distinguished from many soft-bodied animals as a *shelly* mollusk. Among these creatures a remarkable diversity prevails. Great indeed is the contrast between the coarse, rough, yet finely sculptured and coloured individuals, usually denominated Rock Oysters, and the sleek-looking creatures deposited in a barrel, bearing the name of "Burnham," or "Milton," or "Colchester." But so liable are the distinctive marks of these animals to change, and thence to form individual varieties, that it is extremely difficult to establish any brief description of the edible oyster, the *ostrea edulis*. Not merely have the oysters of different coasts their peculiarities, but every bay, estuary, harbour, or space in the sea has its local vicissitudes as to the supplies of food, depth of water, currents, tides, and other influential causes, all of which manifestly affect the figure or the shells of this species of oyster.

Silver-shell, a testaceous mollusk, was not to be classed with fluviatile beings. An oyster is commonly associated with a river: with the Mersey, which rises

in Yorkshire from different sources, in Clough Moss and Holme Moss; the Swale, which divides the Isle of Sheppey from the rest of Kent; and the Colne, which flows in the neighbourhood of Colchester. The term "natives," so familiar throughout the country, also sustains the idea that the oyster is derived from *river*-water. In this, however, there is a popular error; no river on the face of the earth provides for the production of this delicacy. It is, undoubtedly, of *marine* origin.

In the islands of the west, it is evident that the early voyagers were not such fabricators of stories as they have been sometimes supposed. They declared, for instance, that there oysters might be seen *growing on trees;* and the statement was not merely denounced as incredible, but as absolutely false. But, as many facts attested by Bruce met with direct contradiction, yet have since been placed beyond all doubt by the testimony of numerous and unimpeachable witnesses, so has it proved with the one just mentioned. How wise is it, then, to guard against extremes! The scepticism on which some pride themselves is closely allied with the credulity they affect to despise. Many are the statements of science which are not merely startling but confounding; they may even involve what we have previously deemed to be impossible; yet the more we listen to them intelligently, the more shall we be

disposed to take up a central position far away from the two opposite evils.

If we do so in the present instance, we shall find that the common mangrove, and also others of its tribe,* are to be observed all along the shores of the tropics, both in the new and the old world, rooting themselves in the mud—the very soil for which they are expressly designed—and forming dense forests, even at the verge of the ocean, and below high-water mark. Peculiar as the plants of this family are for the germination of their seeds, even while attached to the branches, they are equally so for the numerous root-like projections which serve as so many supports to the stem; hence, on the retiring of the tide, and on the margins of the great rivers which are fringed by these trees in tropical climates, the stems may often be seen covered with oysters. The species thus found is expressly called the "*tree* oyster."† The negroes living on the sea-shore, or the river bank, are accustomed to lop off a branch from a mangrove laden with well-filled shells, obtaining by one stroke of the axe a bounteous and valuable supply. A branch which has many offsets is a sufficient burden for any one man to carry; and Adanson states, that the oysters they yield are as delicate in taste as our own.

Oysters abound in other parts of the world, as in the islands of the East Indian Archipelago, having on

* Rhizophoreæ. † Ostrea arborea.

the east the Pacific, on the west the Indian Ocean, on the north the Indo-Chinese countries and China, and on the south New Holland and New Guinea.

A bay on the south-west of New Holland, and north of King George's Sound, discovered by Vancouver, is called Oyster Harbour, from the number of these creatures that are found there. Another spot, of a similar kind, is situated in the Bay of Bengal, and called Oyster Island; it is surrounded by rocks, and is extremely dangerous to vessels from its rising very little above the level of the sea. The island abounds with small rock oysters, which the natives of the opposite coast detach with hammers, and then carry to Chittagong, from whence they are conveyed to Dacca and Calcutta.

Oysters of good repute are obtained in many parts of the British coasts. There are two oyster banks, one off Guernsey, the other off Jersey; they belong to the region of oyster banks which extends along the coasts of Norway.

But where, it may be asked, was Silver-shell born? This inquiry, then, we proceed to answer.

CHAPTER II.

THE BIRTHPLACE OF SILVER-SHELL.

THE COAST OF NORMANDY—GREASE-SPOTS FLOATING ON THE SEA—THEIR EXAMINATION BY THE MICROSCOPE—THE INFANT OYSTER AND ITS FIRST NUTRIMENT—ITS ATTACHMENT TO THE ROCK.

It is a morning in spring; and, leaving for other times the buildings of the Norman coast, with its various other objects of interest, to the observing, let us hasten together to the sea-shore, and inhale the healthy breeze which is being wafted over the waters.

Going close to their edge, we may discover patches of small bubbles, as of oil, or grease, floating on their

Fig. 1.

Eggs of oysters, as seen by the microscope. The germ of the shell is observable in each.

surface. The sight is not unusual at certain periods, for such floating masses are widely distributed by the flux and reflux of the tide; and, strange to say, they are secure while other substances are in peril, for they are not exposed to destruction like the eggs and fry of various creatures, nor are they employed as bait or food for any tenants of the waters. Curious, then, is such a mass; but far more curious still will it appear if a portion of it be taken and minutely examined.

The earliest account we have of such inspection is that of the celebrated Anthony Van Leeuwenhoeck, who, in a letter to the Royal Society, describes his being, on the 3rd of September, 1697, at the house of a relation in Rotterdam, where he was regaled with English oysters, which had come that morning from Zealand. He opened about twenty-five, among which he found one which, when he held it so that the round part of the shell came next to him, the breadth of the oyster against his right hand appeared to be covered with a slimy substance. Doubting what it was, he rubbed some of it between his two fingers, and felt something sharp, but as this impression might have been produced by fine sand, he laid a part of it on paper, and when he had returned home, and examined it by the microscope, "I saw," he says, "that all that imagined slime was nothing but young oysters; and, though afterwards twenty-five oysters were opened in my presence, yet

I could not find one more in which such a slime, or rather young oysters, could be seen by the natural eye."*

The floating slime is, therefore, precisely the same substance that Leeuwenhoeck thus examined. It is called *the spat,* and is in itself worthy of notice. So far from being an accidental appendage, it is an indispensable provision for the minute oysters, to which, both among animals and vegetables, there are many analogies. Within the husky covering of a grain of wheat, for example, is deposited not only the little germ of the future produce, but the albumen which is to yield it nourishment until the fibrous root it sends forth can derive support from the earth in which it is sown. In like manner, the chick in the egg finds all that it requires, till the time of its escape, in the yolk by which it is surrounded. Now, just what the albumen is to the germ—just what the yolk is to the chick, is that floating substance to the little oysters it contains. Even the eye might tell that it fully answers its purpose, but the ear cannot be placed in a sufficiently favourable position to hear the sounds — drop — drop — drop, though, at a certain crisis, the minute creatures must have received so much nutriment as to become too heavy to float, and therefore fall, in succession, into the depths beneath.

* "Philosophical Transactions."

A part of the Norman coast, then, was the birthplace of Silver-shell; and, after floating on the waters, it fell with others on a rock beneath, like the little masses of grease-like spots which may now be observed scattered about the shore, and even on the loose stones left bare by the retiring of the waves.

The first circumstance in Silver-shell's history, after falling from the surface of the waves, was its adhesion to the rock which was to be for a time its dwelling-place. How then could this be produced? The common mussel obtains a mooring to its bed by a silken cable which it has the power of spinning for this purpose; and, strange to say, this very *byssus*, or *beard*, has been employed to give strength to the works of man. At a long bridge over the Towridge river, in the county of Devon, the tide flows so rapidly that mortar, failing to keep it in repair, the interstices are filled with mussels, whose strong threads fixed to the stonework prevent the bridge from being driven away; and so important is the aid of these little creatures that to remove them, except in the presence of the corporate authorities, is a crime, exposing the delinquent to the penalty of transportation.* But Silver-shell had no such power to attach itself to the rock; it was utterly unable to spin a thread.

The teredo obtains a dwelling-place by means no

* Daniell's "Rural Sports."

less remarkable than the mussel. It perforates wood, even the soundest and hardest oak, and lives securely in the cavity it forms. Nor let it be supposed that these creatures only do extensive mischief to ships, piers, and submarine wood-buildings; for they render important service also. But for them the rivers in tropical regions would be choked up by accumulated driftwood, while fertile banks would be changed into morasses; and the navigation of the sea would be interrupted by the floating timber. Silver-shell, however, had not the excavating auger of the teredo.

The common cockle digs its way into the sand, and there finds a home; but Silver-shell had not the curiously-formed foot with which its neighbour gains security from its foes. Yet it had all that was really necessary for its safety, for it could emit from its shell, young as it was, a calcareous and adhesive substance which held it fast to the rock. There it continued to live and grow during successive months.

CHAPTER III.

THE STRUCTURE OF SILVER-SHELL.

THE PHRASE "STUPID AS AN OYSTER"—HEADLESS BEINGS—THE MANTLE OF SILVER-SHELL—THE STOMACH—THE LIVER—THE HEART—THE BREATHING ORGANS—THE ORGANS OF NUTRITION.

SILVER-SHELL, taking to its bed, while we rise from ours, to gain a subsistence, may, at a hasty glance, be undervalued. "Stupid as an oyster" has become a proverb. Of this Shakespeare was cognisant, as is evident when Benedick, describing the strange change that had passed on Claudio, says—"He was wont to speak plain and to the purpose, like an honest man and a soldier, and now is he turned orthographer; his words are a very fantastical banquet—just so many strange dishes. May I be so converted, and see with these eyes? I cannot tell; I think not; I will not be sworn, but love may transform me to an oyster; but I'll take my oath on it, till he have made an oyster of me, he shall never make me such a fool."*

It is said of some persons, "they have no head." Not that they are supposed to resemble the sign of

* "Much Ado about Nothing," act ii., scene 3.

"the good woman," which is still sometimes to be seen as a headless figure; much less that they walk abroad as the Parisians say St. Denis did, carrying his head in his hand. The declaration is evidently figurative, and denotes that such persons make no proper use of their heads, and act with so total a want of all thought and discretion, that it is as if they had actually none.

But to say an oyster has no head is to state a literal fact. Accordingly it is ranged by naturalists among *headless* beings;* and unquestionably it is manifestly inferior to those which are gifted with a brain. Such creatures, prepared for a higher order of instinct, often delight and astonish us; as the spider, when spinning its web on the garden wall with admirable precision; or the bees, in all the economy of the hive, subject as they are to the authority of a queenly presence, from which, like the attendants of a court, no one retires except by a backward movement. If, however, there are tribes of beings far superior to the oyster, it is still fully prepared for the condition it is destined to occupy. Its internal structure is admirably perfect, and, however regarded, it is obviously suited to a passive life. A creature designed for locomotion has evidences of existing things, sometimes to supply its wants, and at others to apprise it of danger; but of these the oyster is destitute, for, being destined to rely entirely on its fixed resources, any other powers would tantalise it in vain.

* Acalephæ.

Fig. 2.

Oyster in shell, the upper valve removed. *a*, upper portion of the mantle, covering the mouth with its four lips; *b*, *c*, the mantle; *d*, the breathing organs; *e*, portion of the lobes of the mantle, between which is the extremity of the intestinal canal; *f*, part of the heart; *g*, adductor muscles.

The body occupies the great concavity of the under shell (2), presenting to view a squared margin, opposite

to the hinge, and a projecting margin along its two sides. The surfaces of the body have a lacework of fat when the oyster is in good condition. The marginal borders, proceeding alike from the upper and under surfaces, are gradually extended as they advance towards the edges of the shells, and they form the outline of those extended membranes to which the names of the pallium, the coverlet, and the mantle have been given.

That a clear idea may be formed of this very remarkable portion of the oyster, it may be still further observed, that if one of these creatures be placed with its concave shell downwards, and having the hinge next the observer, the right and left sides will then be determined. The lower folds of the mantle then become united on the right side, nearly opposite to the muscular ligament, and they form an entrance to the interior of the branchiæ, or breathing organs, which has been termed the branchial porch. The mantle is free throughout its circumference, except a part of its margin on the straight side, where it forms a kind of hood.

The oyster has a mouth (6), placed at the narrowest part of the body—a simple orifice with no kind of teeth, but bordered by four thin lips, ranged on the two sides of the aperture, and is represented covered by a part of the mantle. The tube called the œsophagus, from two Greek words, meaning "I eat,"

and "to carry," and more commonly the gullet, is extremely short, so that in such creatures the mouth appears to open into the stomach.

The stomach is a kind of bag (3), placed immediately behind the opening of the mouth; and when, in any instance, the stomach is cut open, it will show the apertures of several large vessels, by which the bile is conveyed from the liver—an organ which entirely surrounds the stomach. The liver is very large, of a greenish and sometimes a dark chocolate colour. Ex-

Fig. 3.

Section of the stomach, showing the apertures by which the bile enters from the liver.

ternally it exhibits a regular series of equal-sized granules (4), which may be shown by boiling the oyster, and then tearing off its loosened external covering. Internally it presents arborescent vessels, which converge into excretory ducts, as they approach the

stomach. The minute vessels of the liver assume a grape-like figure, common to all the higher orders of animals. The intestine is comparatively short, bending

Fig. 4.

Small part of the liver magnified.

on itself, winding round the liver, and terminating at the part opposite the mouth.

Instead of what is, properly speaking, a brain, two minute detached nodules are observable, each having a few slender nervous threads passing to the neighbouring parts, the longest being affixed to the gullet, and thus it is evident that the chief preserving sense is given to test the articles of food.

The heart, a beautiful structure (5), is situated in a cavity between the folds of the intestine. It has two chambers: an *auricle*—a name derived from the resemblance of this part in man to the external ear; and a *ventricle*, so called—why, is not very clear—from the stomach. The auricle has walls, extremely thin, composed of the most delicate bundles of muscular fibre; it receives the blood from the respiratory

Fig. 5.

The heart.—The auricle, *a*; the ventricle, *b*; *c*, the trunk which brings the blood from the breathing organs; *d*, the aorta, which, conveying the blood from the heart, completes the circulation.

apparatus, and, by contracting, transmits it through two intermediate canals into the more muscular ventricle,

from whence it is propelled throughout the body. The vessels connected with it are as admirably adapted to their proper service, and are as beautifully arranged as these parts are in the camel, the elephant, or even in man. There are three principal branches: one leading to the mouth, the second to the liver and stomach, and the third to the hinder part of the body.

The fluid contained in the heart does not coagulate spontaneously, and it holds in solution the same proportion of sea-salt with the surrounding water. Two other remarkable facts may be noticed: the muscular flesh of the ventricle is soft and tender, like that of a chick in the first stage of incubation; the auricle is of a black colour throughout its tissue.

Another power is still required:—

"The vital air
Pervades the swarming seas and heaving earths,
Where teeming Nature broods her myriad births;
Fills the fine lungs of all that breathe or bud,
Warms the new heart, and dyes the gushing blood;
With life's first spark inspires the organic frame,
And, as it wastes, renews the subtle flame."

Accordingly, the oyster has organs of breathing which may be more readily understood by the examination, often practicable, of another creature.

Such, for example, is the Pholas, of which we have several British species, occasionally contenting themselves with houses of clay, but commonly boring an

abode in sandstone or limestone rock, and, consequently, the precursors of the long series of cave-dwellers of which we have read in various parts of the earth. Their colonies may frequently be observed at low water mark in the masses of stone left uncovered by the retirement of the tide. How these recesses are made has long been a question which men of science have laboured to answer. But, though much has been said as to an acid with which the creature is provided, which, supposing it to operate, would associate its story with that told of Hannibal in his passage of the Alps, we are disposed to think that the rough points on the surface of the shell—hard in themselves as flint—acting like an auger on wood, rasp away all that is necessary to form its stony excavation.

If the reader should have the opportunity in some ramble on the coast, let him strike the beach with a stick, or only tread heavily, and he may, perchance, frighten a pholas, and cause it to spirt water from its sandy dwelling, and, thus apprised of its site, dislodge it as a prize. Let it now be placed in a vessel of sea-water, and two currents will be observed issuing with surprising force: the one inhalant, and the other exhalant; the former having an orifice somewhat like a trumpet, exquisitely fringed, carries into the body of the creature all the floating particles the water contains, the latter showing that they tarry on their way,

for the out-going stream is perfectly clear. Here is, in fact, an animal-filtering machine; even turbid water becomes clear in the passage; and if indigo be thrown into clear water the effect will be strikingly manifest. If, too, the pholas, be suddenly taken out of the vessel, the orifices will be closed so that no water can escape, though soon after they will relax, and it will again be spirted out. In this way, then, does the oyster receive and expel water, from vessels similar in their kind, and thus its respiration is absolutely complete.

Messrs. Alder and Hancock, to whose researches natural history is greatly indebted, have described this beautiful structure as seen under the microscope. Between the gill-plates there are tubes, not like those with which we are familiar, as pipes of lead or clay, each consisting of one substance. The walls of the tubes, so to speak, are a regular net-work, composed of blood-vessels, those passing transversely being the stronger and more prominent. The vessels placed lengthwise, standing a little distance from each other, give to the meshes the form of parallelograms—figures greater in length than width. The meshes, moreover, are open spaces, fringed internally with a narrow membrane and active vibratile cilia, which may be described as extremely fine hairs, the name given to them being taken from the Latin word for eye-lashes. Thus the breathing organs of the oyster are nearly the same as

the gills of fishes; they form, in fact, in a kind of network, two double series of vessels on each side the body, imbibing oxygen—that pabulum of life—and emitting the carbonic acid that is generated during the circulation of the blood, as completely as these processes occur in the largest animals.

If, for example, the shell of an oyster be carefully opened, and as little as possible of the fluid within be spilled, a pair of fine scissors will readily remove a portion of one of the gills. Placing this upon a slide, adding a drop or two of the fluid, separating the filaments one from another, and covering the specimen lightly with a thin piece of glass, it is perfectly ready for examination by the microscope. This instrument will show the cilia forming several rows, beating and lashing the water, and producing in it an infinity of currents.

Well might old Leeuwenhoeck exclaim, as he looked through his microscope at the beard of one of these creatures, "The motion I saw in the small component parts of it was so incredibly great, that I could not be satisfied with the spectacle; and it is not in the mind of man to conceive all the motions which I beheld within the compass of a grain of sand." And yet the indefatigable Dutch naturalist beheld but a dim and misty indication of the exquisite ciliary apparatus by which these motions are effected, compared with what

may be witnessed by the aid of the much improved instruments of our own time.

On functions so mysterious and marvellous, shrouding in darkness the proudest ingenuity of man, and leading us directly to contemplate the glory of the Infinite, whose

> " ——— creating hand
> Nothing imperfect, or deficient, left
> Of all that He created,"

depends the growth no less than the life of the oyster. Silver-shell, only a drop at first, was, on the third day after "the spat" was cast, a quarter of an inch in width, and, in three months, was as large as a shilling; how it could become so is an interesting question.

The ocean teems with life. Spenser truly sang:—

> " Oh! what an endlesse worke have I in hand,
> To count the sea's abundant progeny,
> Whose fruitful seed farre passeth those in land,
> And also those which wonne in the' azure sky;
> And much more eath to tell the starres on hy,
> Albe they endless seeme in estimation,
> Then to recount the sea's posterity,
> So fertile be the floods in generation,
> So huge their numbers, and so numberlesse their nation."

But how can the oyster avail itself of the plenteous banquet? Other creatures go hither and thither at pleasure. The lion roams the forest, the eagle soars aloft on mighty wing, the fish glides gently, or darts

rapidly through the waters, and the dragon-fly passes with a brilliant flash through the air, each one to rejoice in the seizure of its prey. There are limes and scallops, too—mollusks like the oyster—which are called "the butterflies of the ocean," not only from the delicacy and beautiful colouring of the wing-like shell, but also from their agile motions. It is only for one of these creatures to open the valves of its shell and suddenly to close them, and it so discharges the water that the lime or the scallop is impelled onwards or upwards. When this force is spent it repeats the operation, thus taking long and rapid leaps, and shooting hither and thither in an irregular and zigzag course.

But the oyster is not thus gifted with the power of flight, or even of motion. It remains day after day, week after week, month after month, it may be year after year, fixed where it was, and has no more ability of transition to another spot, even at the distance of an inch, than the rock itself.

Silver-shell had not even a tongue, which is granted to some little creatures, as the trochus or common top. This tongue is, in fact, an extremely delicate ribbon, of a transparent substance, on which teeth are placed, of a texture glassy and brilliant. These teeth are arranged in three rows: the middle ones being three-pointed, while in the two other rows there is the alternation of a three-pointed tooth with a larger one, which has a

somewhat boat-like appearance. As the teeth project from the surface of the tongue in hooked curves, and all point in the same direction, the tongue acts like a rasp, the projecting teeth abrading the surface of the plants, just as the horny papillæ of the lion's tongue act on the flesh of the stag, or any other of his victims. The periwinkle, too, has a similar structure. And yet of Silver-shell's race firmly attached to their rocky homes it may be said :—

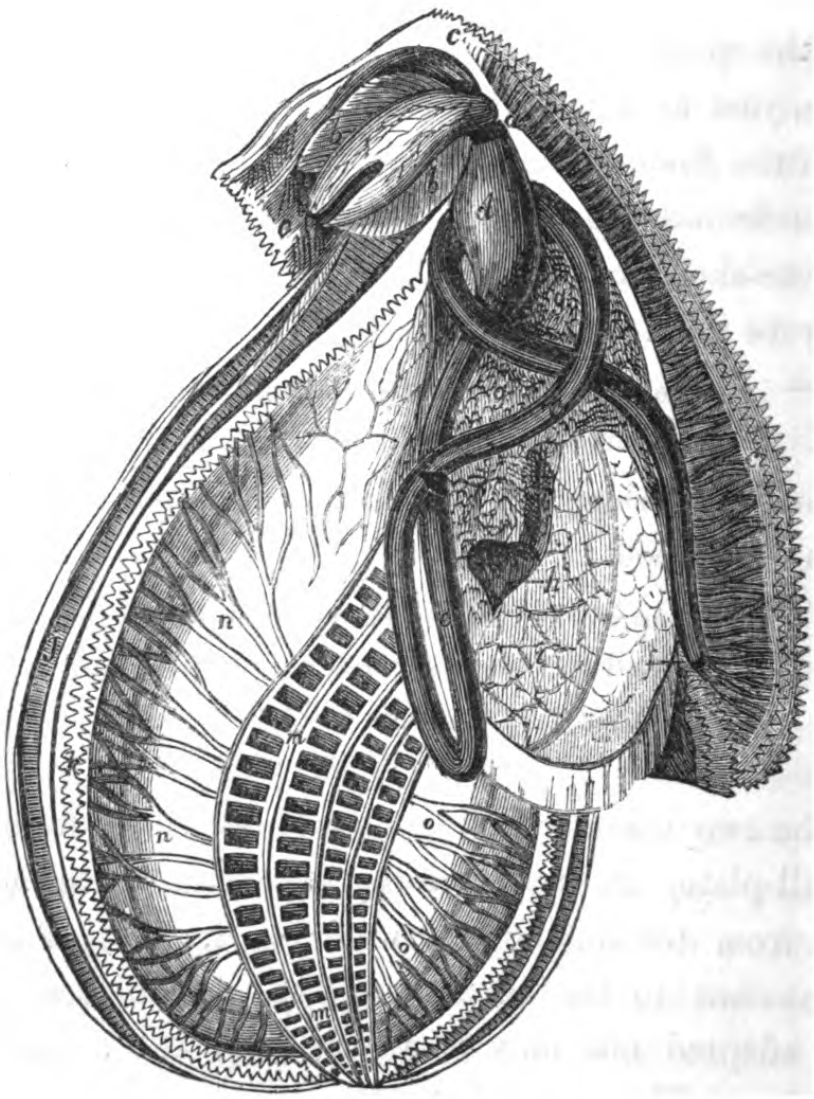
> " —— In their pearly shells at ease, attend
> Moist nourishment."

The mode by which this is obtained may well recall the words of the poet :

> " In human works, though laboured on with pain,
> A thousand movements scarce one purpose gain ;
> In God's, one single can its end produce,
> Yet serves to second, too, some other use."

The two vascular laminæ already described, forming the gill-plate, are really sieves to separate suspended atoms from the surrounding water, on its passage from the inhalant to the exhalant orifice, a structure perfectly adapted not only to a breathing, but a feeding apparatus. The action that takes place is as remarkable as the structure. For the tubes that pass between these living sieves lead directly to the exhalant syphon. Thus, when from this the water flows out, there is a tendency to form a vacuum in the chamber and in all

Fig. 6.



Organs of the oyster:—(*a*), the mouth; (*b*), the lips; (*c*, *c*), the mantle; (*d*), the stomach; (*e*), the intestine; (*f*), its extremity; (*g*), part of the liver; (*h*), the heart; (*i*), the adductor muscle; (*j*), the margin of the breathing organs; (*k*), the right lobe of the mantle; (*n*, *n*, *o*, *o*), the vessels which distribute themselves through the mantle; (*m*), the large canal receiving the vessels of the breathing organs.

the tubes within the gill laminæ; and by this means, combined with the action of the cilia lining the meshes, the water introduced into the branchial chamber by the inhalant tube is drawn to the meshes, and all the suspended particles of matter are retained on the surface of the gill. The water being filtered, as it were, allows the particles to accumulate, and then by the aid of other cilia they are formed into defined streams. This is certainly one of the most beautifully adapted organic mechanisms that can be observed. As a breathing organ it is perfect; and as an organ for securing food it is surely unrivalled for the exquisite beauty of its structure.*

To adopt the eloquent words of Professor T. R. Jones,† "Wonderful, indeed, is the elaborate mechanism employed to effect the double purpose of renewing the respired fluid, and feeding the helpless inhabitants of these shells! Every filament of the branchial fringe, examined under a powerful microscope, is found to be covered with countless cilia in constant vibration, causing, by their united efforts, powerful and rapid currents, which, sweeping over the entire surface of the gills, hurry towards the mouth whatever floating animalcules or nutritious particles may be brought within the limits of their action, and thus bring streams of

* "Annals of Natural History," vol. viii., p. 375, 376.

† "Animal Kingdom."

nutritive molecules to the very aperture through which they are conveyed to the stomach, the lips and labial fringes acting as sentinels to admit or refuse entrance, as the matter supplied may be of a wholesome or pernicious character. So energetic is the ciliary movement over the entire extent of the branchial organs, that if any portion of the gills be cut off with scissors it immediately swims away, and continues to row itself in a given direction as long as the cilia on its surface continue their movements." Nor should we omit to observe that several transparent arborescing blood vessels are placed between the outer membrane and the substances of the body, and on the lips of the oyster, which are visible to the unaided eye, from their continuity with the opaque fat. As all the impressions made on the oyster are those of immediate contact, every part of its exterior surface appears highly sensitive. Fishermen say that if the water is clear where these creatures are lying in their beds, they may be seen to close their shells whenever the shadow of a boat passes over them. The muscular borders of the mantle, especially, are irritable; they are, in fact, adapted to withdraw themselves from hurtful impressions, and, by pulling the associated tendons against the central muscle, this also becomes excited, and the oyster immediately closes its shells.

Attention is sometimes directed to a "little wonder." We remember, for instance, an ingenious mechanic

constructing, many years ago, a working steam-engine, the packing-case of which was a walnut-shell. A visitor who was looking at it, finding it suddenly stop, inquired the cause, when the engineer replying that the safety-valve was not quite right, he exclaimed, in astonishment: "Safety-valve! I have not yet been able to see the fly-wheel!"

We have heard of mechanism still more minute. Yet, let the smallest machine ever constructed be produced, and it shrinks into abject insignificance when compared with Silver-shell, which had all the organs now described, when as a tiny drop it alighted on the rock where, for a time, it was to live and grow. Yes! even then did that vitalised atom inhale the air, select its appropriate food, swallow it, digest it, and derive nutriment from it, while the liver rendered its essential service, and the aerating organs purifying the blood, the heart urged the little stream through all the vessels of the oyster's frame! The mighty ocean, as its waves rolled over it, was subservient to its life and its pleasures. The billows wafted fresh and choice food within its reach, and the flow of the current fed it without requiring an effort; while every atom of water that came in contact with its delicate gills, yielded its imprisoned air to freshen and invigorate the little creature's blood.

In another respect, as certainly, the most exquisite

of minute machines can bear no comparison with Silver-shell. The watch, so small that it might be worn on a finger-ring, justly demands praise for the hands that have fashioned it with exquisite skill. But what would be said, if it grew to the size of a chronometer, maintaining throughout the form of its respective parts, and all combining in continuous operation the same accuracy and harmony of movement? Yet Silver-shell thus grew: so small at first, that two million such beings would occupy only a single square inch; in six months it would cover half-a-crown, and in twelve a crown piece.

Were there only one such creature, what a marvel it would be! Is it less amazing because Silver-shell was only a unit among countless millions? Other wonders, however, remain to be narrated.

CHAPTER IV.

THE HOUSE THAT SILVER-SHELL BUILT.

THE FIRST SHELL—WONDERFUL PROVISION FOR ITS GROWTH—SECRETORY POWER—IRIDESCENCE—THE ADDUCTOR MUSCLES—CREATURES LIVING ON SHELLS—WHAT IS LIFE?

NOT very long ago a penchant for natural history was somewhat perilous. A correspondent of "The Idler," conducted like "The Rambler" by Johnson, writes:—"All the faults of my life were for nine months circulated through the town with the most active malignity, because I happened to catch a moth of peculiar variegation; and because I once outbid all the lovers of shells, and carried off a nautilus, it was hinted that the validity of my uncle's will ought to be disputed." Such a pursuit was considered a species of insanity, and a will has been declared invalid, if the testator was a naturalist. Our lot has fallen on far happier times: a conchological collection may be formed with only the ordinary perils to the purse; but assuredly it is desirable that an acquaintance should be made with its inmate—its architect and builder—while due attention is demanded for the curiously-wrought edifice.

Silver-*shell* might properly be so denominated even when it first fell from the briny waters on one of the rocks beneath; for not only was there a minute animal, but a covering for it of two valves, or shelly plates, exquisitely adapted to its comfort and security. All mollusks having shells, whether *univalve,* like the limpet; *bivalve,* like the mussel or the oyster; or *multivalve,* like the balanus, so plentifully scattered over the rocks of our coasts, are similarly provided for; the minute creature having, at its first development, a shelly covering of one or more pieces.

But Silver-shell, as we have seen, grew rapidly, and hence, were there no provision against it, serious evil might arise. Every mother knows how suddenly her schoolboy's jacket sleeve sometimes fails to cover his wrists, while his trowsers stand high above his shoes, from that advance to which robust youth is prone—a state which led Hood to remark:—

> "Then a schoolboy, my tailor was nothing in fault,
> For an urchin will grow to a lad by degrees;
> But how well I remember that pepper-and-salt
> That was up to my elbows and down to my knees;"

and there is, perhaps a mingling of pleasure and vexation in her bosom as she says, "How soon you outgrow your clothes!" This fact reminds us of Queen Elizabeth's paying a visit to one of her favourites, Sir Christopher Hatton, and expressing her surprise on

finding him in what she considered a very humble dwelling, when her host replied, in true courtier phrase, "Your Majesty's bounty has made *me* too large for my house."

Now no such accident occurred to Silver-shell: his clothes could not become too short; his house could not become too small. And why? Because the shell grew exactly in proportion to the size of its inmate Shakespeare has made the fool ask Lear, "Dost know how an oyster makes its shell?" only to remind the poor king, however, of his houseless state; but were it repeated now among oyster-eaters, it is probable that but few would be prepared for an intelligent reply.

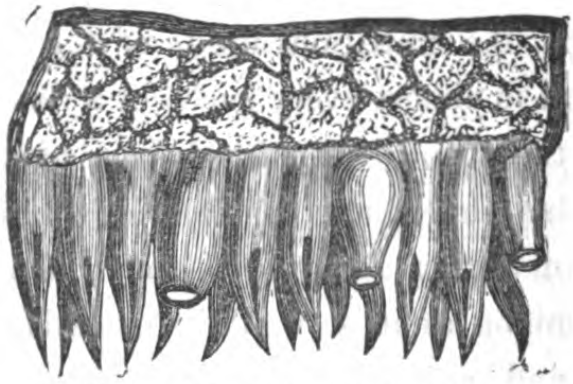
In offering one, it should be observed that an oyster is endowed, like other animals, as well as plants, with a power of secretion: the process of separating certain matters from the nutritious fluids of the body. It is probable that in almost every such act a double purpose is served; the blood being freed from particles which would become superfluous or injurious, and the fluid separated answering some secondary purpose. The process, common as it is, in all its essential features, to vegetables and animals, is everywhere performed by the same agency, the development of single cells, each possessing its own independent vitality. It is a part of their regular actions to secrete and withdraw certain ingredients from the nutritious fluids, and after-

wards to set them free again, either by passing through in perspirable vapour, or the rupture of the cell-wall.

Now the oyster secretes a calcareous, earthy matter, precisely adapted to the enlargement of its dwelling, by means of its mantle, the outer membranous layer which invests its body. Whatever, indeed, be the form of a shell, and shells partake of a marvellous variety, the additions required by growth, according to the law of its kind, both in shape and colour, are ascribable to the wonder-working mantle of the inmate.

Duly provided for its work by the secretion of the necessary matter (7), and by the instinct for its proper use, Silver-shell first began the enlargement of its shell; for this, the margin of the mantle protruded, and firmly

Fig. 7.



Vessels of the mantle, magnified.

adhered all round the circumference of the valve with which it corresponded. Thus the calcareous matter was gradually deposited in a soft state on the extreme edge

of the shell, and, becoming hardened, it was converted into a shelly layer; the process being repeated at intervals, every newly-formed layer enlarged the diameter of the shell. Thus the shell corresponded in its increase with the growth of its tenant.

Nor was this all: a minute mechanism might have been traced in each layer. On the outer surface of oyster shells there are fine thread-like lines, or streaks, which are called *striæ*. And on this fact Lord Brougham and Sir C. Bell remark: "We should be inclined to say that the earthy matter crystallises, were it not that the striated or fibrous appearance differs in the direction of the fibres in each successive stratum, each layer having the striæ composing it parallel to one another, but directed obliquely to those of the layer previously formed, and the shell exhibiting a strong texture arranged upon well known mechanical principles."

The oyster does not adorn its shell, as some of the soft-bodied creatures do theirs. Their various and often splendid hues are owing to glands situated on the margin of the mantle, and curiously endowed with the power of depositing colouring matter. In many instances an accordance is observable between the patterns or tracings on the shell and the colours as arranged in the organ that secretes them. Thus, in the Banded Snail there are just as many coloured spots on the edge of

this organ as there are zones on the shell, and when a part of the shell is removed, for the sake of experiment, the piece reproduced is brown exactly opposite the dark portion of the organ, and yellow in the other parts. Silver-shell, however, diffused throughout its exterior only a brown tint. The inner part of an oyster-shell is a great contrast to its exterior. As we examine it, we cannot fail to be struck with its silver-like hue and its exquisite smoothness, so completely adapted to the form and the comfort of the little in-dweller ; and, when held to the light, a slight iridescence is frequently discoverable. The hard, silvery, brilliant internal layer of several kinds of shells reminds us of those described by Landor :—

> " Of pearly hue
> Within, and they that lustre have imbibed
> In the sun's palace porch, where, when unyoked,
> His chariot wheel stands midway in the wave; "

and the internal layer of oyster-shells is often variegated with changing purple and azure.

The cause of this effect has been fully explained by Sir David Brewster, as suggested to him accidentally. He had fixed a piece of mother-of-pearl to an instrument for measuring angles by a cement of resin and bees-wax. On removing it from the cement when in a hard state, by insinuating the edge of a knife, and making it spring up, he found that the plate of mother-of-pearl

had left a clean impression of its own surface, and had actually given the cement the property of exhibiting its peculiar colours. The discovery was therefore made, to his great surprise and delight, that the cause, whatever it might be, of the colours of mother-of-pearl, whenever apparent, does not depend on its chemical nature, but resides on its surface. In the examination of this substance with high magnifying powers, he perceived a grooved structure, closely resembling the delicate texture of the skin at the top of an infant's finger, or the minute corrugations often observable on surfaces which are covered with oil-paint or varnish. The wax, which exhibited the same colours, presented also a similar assemblage of grooves. Thus, as Sir Isaac Newton has shown that a series of grooves breaks up a beam of light that falls upon them into a number of separate parts, each of which is reflected to the eye from the bottom and sides of the little grooves, and assumes a particular colour according to the angle at which it is reflected, the cause of the iridescence was placed beyond all doubt. Subsequent experiments proved that this singularly beautiful appearance can be transferred to balsam of Tolu, or to gum-arabic, by allowing a thin film to be pressed and to solidify between two pieces of mother-of-pearl; or it may be communicated by hammering to a clean surface of lead, or to the well-known compound of mercury and bismuth,

which forms a fusible metal. Different specimens of shell give, of course, very different results as to the fineness and number of the grooves. Sometimes a magnifying power of six or eight times will render them readily perceptible; in some instances two thousand grooves have been counted in the space of an inch, while in others their number was wholly incalculable. It is very remarkable that grinding will not obliterate these grooves. It might naturally be supposed that, as the grooves must be separated by slight ridges, those ridges would be worn down in the process of grinding. But as the ridges wear down, so also do the grooves; so that, however thin the film may be rendered by grinding, the grooves and the colours resulting from them will still be apparent. Still further; if the surface have any scratches or dents, the bottoms and sides are grooved just as if the surface had been level.

It follows from these facts that any mechanical contrivance by which similar grooves can be produced, must give rise to similar results; and this has been strikingly confirmed by Mr. Barton, of the Royal Mint. This gentleman constructed an engine by which he can engrave on the surface of steel and other metals, lines so exquisitely minute that from 2,000 to 10,000 are included in a single inch. Such surfaces, when viewed on a cloudy day, present but few appearances of colour; but, when the light of the sun or of gas falls

upon them, an extremely brilliant display of colours is the result;—every gradation of tint is exhibited, and a change is produced by every motion either of the object, or the source of the illumination.

Aquafortis, nitric acid, and the cutting engines of the lapidary will respectively separate mother-of-pearl, which is of a scaly, laminated structure, into a number of thin films, each surface of which presents the same beautifully coloured appearance. These are applied to a large variety of ornamental purposes, in the same way as tortoiseshell or the veneers of fancy woods, among which are handles for penknives, combs, buttons, spoons, and the inlaying of workboxes and dressing-cases.

Devices or patterns are often drawn upon the films or plates with opaque turpentine varnish. The shell is then repeatedly brushed over with strong nitrous acid by which the parts, which have not been covered with the varnish, are eaten away. An oil of turpentine being employed to wash off the varnish, the device which had been traced appears in relief. When it is intended that this should be cut out, this can be done with a fine frame-saw, or a knife-edged tool. Should several devices be required of the same shape and size, a number of films of shell are glued together into a compact mass. The ornament is then drawn on one of the two exterior films, and the saw is employed to cut through the whole at one time. The mass is then

put into warm water, which softens the glue, and the various pieces are separated one from another.

But the enlargement and decoration of its dwelling was not the limit of Silver-shell's curious power. The shell became gradually much thicker, and on the agency that produces this change we are happily left in no doubt. Professor R. Jones observes :—"While the margin of the mantle is the sole agent in enlarging the *circumference* of the shell, its growth in *thickness* is accomplished by a secretion of a kind of calcareous varnish, derived from the external surface of the mantle generally; which, being deposited layer by layer over the whole interior of the previously existing shell, progressively adds to its weight and solidity." The fact is equally deserving of notice that, as glands are situated only in the circumference of the mantle, no colouring matter is ever mixed with the layers that increase the thickness of the shell. And why? Because, were it otherwise, there would be a loss of the secreted substance; and economy is one of the laws of creation. As it is, the substance always continues of a delicate white hue, and forms what is called nacre, or mother-of-pearl.

Even now we have not exhausted the wonders of the oyster's shell; for its two valves are not loose, like the plate that holds the bachelor's solitary muffin and the one that is placed upon it to preserve its warmth; nor are they like the paper covers of a book,

either of which gives way on a slight wrench. On the contrary, they are united at the back by a hinge-joint, artificially constructed, and secured by a substance of great strength.

According to Silver-shell's ordinary state, its abode was kept open for a little distance, so as to allow the ingress and egress of the water indispensable for respiration and nourishment; but as a security against danger, the in-dweller was able to close its shell, and firmly to hold the valves together. Of this power many an opener of oysters has had full evidence; for there was no little difficulty in working in the point of the knife, and when the two valves were separated, it required a considerable wrench to tear them asunder. This is the effect of two strong muscles placed between the valves, their fibres passing directly across from the inner surface of the one to that of the other, and firmly attached to both. In a pair of fresh oyster-shells, weighing 3,488 grains, the entire spring of the hinge weighed three grains and a half; and its elastic power was equal to the pressure of three pounds fifteen ounces avoirdupois, when placed upon the centre of the flat valve, and confined to the insertion of the valvular muscle.

How, then, is our admiration demanded by the structure of a shell! Utterly destitute of vitality, with no vessels permeating its substance, and as incapable of expansion by any internal power as the rock on which

it grows, what astounding marvels does it exhibit! We ask, By what agency are they wrought? And the only answer that can be given leaves us involved in mystery: It is the agency of *life*.

The simplest indication of life, it will be well to remember, is traceable to a primal cell. This, however, is, in an immense multitude of instances, only the germ from which arises a highly complicated structure; and here we have another prodigy of vital energy. Let the cell but have a due supply of nourishment and a proper temperature, and it will attach to itself, assimilate, and organise all the nutritious particles in its neighbourhood, and render them subservient to its purposes. It will also throw off the particles which, having been integral parts of itself, have become useless; thus growth takes place, and every loss is repaired at the expense of the spring-head of life. In the course of time every atom of the animal, whether consisting of but one cell or a combination of cells, may become changed, and yet its identity remain unaffected. But, in order to the growth of an organic body, the accession of particles must preponderate over the loss; and hence, from birth to maturity, there is not only a rapid circulation of the vital fluid through the system, depositing everywhere its atoms of support, but a rapid reception and assimilation of extraneous matter, and accordingly, the unceasing cry, "Give! Give!"

Absolutely indescribable is the range of vital

phenomena, and intense is the curiosity which they frequently awaken.

When the flowers were arrayed in their loveliest bloom,
And breathed through the gardens their sweetest perfume;
When the trees of the forest in verdure were clad,
And with sheaves bright and golden the valley looked glad;
When the orchard was studded with fruit rich and fair,
Blending Nature's profusion with Art's choicest care,
I asked—"*Why* are beauty and vigour so rife?"
And a voice gently answered—"It is life—it is life!"

I looked at the sheep as they grazed in the field,
The herds cropping herbage the meadows now yield;
The birds as they sped with their songs through the sky,
Or glanced at the earth, hoping prey to espy;
Gay insects that danced o'er the face of the stream,
And the fish leaping forth with a varying gleam;
"What is this?" I inquired, "that bids ye rejoice?"
"It is life—it is life," again answered the voice.

Then man I regarded, of loftiest mien,
The bright tints of health on his face might be seen;
Knowledge flashed from his eye—truth dropped from his tongue,
With jewels of wisdom his language was strung,
It melted in pathos—it roused with its power—
Its music enraptured:—so precious a dower
Could only be that of a SPIRIT—so veiled
That all who have probed for its essence have failed.

Once more I inquired, "Where—*where* is the mine
That yields such rich treasures for man to combine?"
Once more, "It is life!" softly fell on my ear;
But when all entranced by possessions so dear,
I asked—*What* is life?—of the land and the sea,
Of the sky—of mankind, and of all things that be;
Not a word of reply to my question has come—
The instant it passed all creation was dumb.

It is a fact that may well teach man humility, that while the atoms of the soil on which we tread, or of the metals and gems which are brought forth from its deep recesses, are *inanimate*, the atoms of the leaf which adorns the tree, and those of the thrilling nerve and flowing blood, are *alive;* and yet his oft-vaunted philosophy fails to indicate *what* constitutes the difference. Even when he plumes himself on the elevations he can scale or the abysses he can fathom, here is an enigma which, though he has sought to solve it, has hitherto baffled his most ardent efforts.

The chemist exercises, in his own sphere, a truly marvellous power. He tells us that the elements of all organic bodies are carbon, oxygen, hydrogen, azote, and alkaline and earthy salts; but the question is left unanswered, "*What* is life?" These are only the instruments with which life acts, as the timber and the stone with which the builder rears his edifice, or the indigo and the carmine which the artist mixes on his palette to throw on his canvas. The physiologist encounters at the outset a signal disadvantage. To separate any one organ from a living creature, for the sake of experiment, is to destroy the very conditions under which alone its proper functions can be performed. Sensation is gone from the nerve, elasticity from the muscle, sight from the eye, audience from the ear, action from the hand, and taste from the tongue. However skilful or earnest

the physiologist may be, vitality has departed before he can fairly enter on its pursuit. It were vain to seek for life in the sepulchres of the dead.

The chemist can effect wondrous combinations. Having resolved substances into their original gases, he can re-combine them; he is even able to tell the necessary proportions in which two or more bodies shall unite, so that from thence a third shall arise totally different in properties and character from each component; but he can no more re-compose a single fluid or a single solid of an organic body than the comparative anatomist, who having, with Cuvier-like tact, selected, arranged, and articulated all the bones of an eagle, an antelope, or a man, can endow the skeleton with life.

A failure not less complete attends a theory very recently announced. It affirms that all the phenomena of life are "voltaic effects, and solely obedient to physical laws." But where is the proof that electricity is an exciting power? Of this there is, in fact, no evidence. The discovery that if amber or sealing-wax were rubbed with a dry cloth it acquired the power of attracting feathers, dust, or bits of paper, was, indeed, the germ from which sprang, like an oak from an acorn, a giant from a babe, the splendid science of electricity. Electrical excitation is, therefore, a new and peculiar condition of the body thus rubbed. But, apart from this action, the amber or the sealing-wax will exert no

more force than a grain of sand or a particle of thistle down; and the same condition is essential to develop the power of the most stupendous mechanism.

The question still arises: *What* is life? and the last of our modern theorists has no more right to shout, "I have found it! I have found it!" than Plato, Pythagoras, or Aristotle of old, or Cudworth, Berkeley, and other speculatists of later date. It is high time for men who aim to acquire and to be celebrated for wisdom, to renounce the fabrication of cobweb-spun theories, which crumble when touched, and of pompous names as a substitute for things. Let them engage in pursuits worthy of their powers, for which, sooner or later, there will be a certain reward. The world, which is too old for the dreams of the "plastic principle," the "*vis vitæ*," and the "spiritual fire," all of which beguiled it in the past, cannot go back to adopt the phantasies of electro-biology, to gratify any one intent on the high honours of discovery. A step is taken to advancement when we have learned that there is a boundary to human knowledge. As there are subjects which we may examine to a certain extent, and then hear a voice saying, "Hitherto shalt thou come, but no further;" so there are others which stop us at the very threshold. To advance a single hair's-breadth defies the noblest powers of man. Who can tell what electricity *is?* And similar questions, bringing back to us

only the empty echo, should teach us the proper range of our intellectual faculties. We have to do, not with *causes*, but with *facts*. Of the latter we have abundance; of the former there has been granted to us no revelation. It ought to be enough for us, that "secret things belong unto the Lord our God;" and with him is "the fountain of life." It may be for the Infinite and Eternal *alone* to declare what it is.

To adopt the words of an eminent naturalist, Dr. W. Harvey: "Every plant and every animal is, while its life endures, a personal fellow-worker with the Deity, —not creating, as he creates, absolutely, but an author of relative creations—an agent in his hand of changes which force merely physical could never compass. The growth of cellular or vascular tissue, whereby the body, once but a living speck, becomes what God has destined it to become: the internal action of organised bodies, —animal will,—the reproduction of the species, all these are utterly antagonistic to the physical laws of matter. They are manifestations of that other agency—life, an attribute of the personal God; and while the portion of the life committed to each lasts, the body performs its wondrous functions."

The sketch now given of the wonders of an oyster-shell, would be wanting in one interesting particular, if no notice were taken of the fact that this house of a living creature commonly becomes the residence of a

multitude of others. There, for instance, grow coral-lines, which certainly have nothing in their appearance, when collapsed and removed from their native element, to attract attention. But only let one of the finest fronds of one called the "sickle beard" be taken and dipped in water, and it will spread out into a beautiful white plume, with rows of cups on the edges of its fibrils, and others about its stem, each cup containing a flower-like head of the animal, whose tentacles collect the food for its support.

There, too, may be observed little shelly rugged tubes, the dwellings of very different creatures, clustering on oyster as well as other shells, and whatever else may have lain at the bottom of the sea. Beautiful and graceful is the serpula as it issues from its tube, waving its breathing organs, of exquisite structure, adorned with the richest tints of yellow, violet, azure, or crimson, before the unassisted eye. Nor less admirable in structure is that little inverted cone-like body, to open and close the tube, which is pushed out of the way of the organs of respiration.

But to give only another instance of this kind, it may be stated that Professor Allman, a very vigilant and careful observer, found, at a supper-table, an oyster-shell infested by various creatures. On looking more intently, he discovered, what eyes less acute would have failed to perceive, some small white dots, ir-

regularly placed on the surface of the fronds of some of these parasites. Laying, therefore, the oyster-shell aside for further examination, and submitting a fragment to the microscope on the following day, he was soon rewarded with a sight of a delicate, glossy fan, and, in fact, with the discovery of a new plant. Each of the minute dots was now seen to consist of one or more, frequently of a cluster, of transparent fan-shaped bodies. Each dot, or cluster, crumbles under the touch, being composed of carbonate of lime; not as an incrustation, but as intimately incorporated with the tissues of the plant.

CHAPTER V.

RELATIVES OF SILVER-SHELL.

STRANGE CIRCUMSTANCES IN THE EARLY HISTORY OF OYSTERS—GROWTH ON BOTTLES—STRUCTURE OF THE GLOBE—FOSSIL OYSTERS—OYSTER BANKS OF GEORGIA.

IT is important to remember that Silver-shell was not a solitary being, but a member of a widely-extended family, even were we to regard only the contemporaneous progeny of the parent oyster. The breeding season continues from May, or the beginning of June, to the close of July, and during these months the oyster is not edible, and is said to be "*sick*," or "in milk." If, therefore, prior to this period, that is, in March or April, an oyster be examined, the organ which is the ovary, or egg reservoir, will be found filled with a milky fluid, teeming, as the microscope will show, with minute creatures. In June these embryos have attained to their proper size for exclusion, and are invested with a tiny and filmy shell. They now pass down a tube, and are carried to the gill chamber, situated between the folds of the outer covering of the oyster, called the mantle; and here the brood lodges for a time, sustained

by its viscid slime, as the young of the opossum and the kangaroo find a temporary dwelling-place in the pouch with which their parents are so remarkably provided. In due time the minute oysters are gradually extruded, and by the end of July all have been dispersed on the surrounding waters. How numerous they are is evident from the fact that one oyster was found to contain one million two hundred thousand eggs; a sufficient number to fill, in maturity, no fewer than twelve thousand barrels.

Nor should it be overlooked that the future circumstances of a single brood are marked by a great and often strange diversity. Mr. Busk mentions* the valve of an oyster-shell which resembles a combination between an oyster and a pholas, one of the rock-boring mollusks. He thought that the oyster had encased the pholas, or, at least, that the pholas is enveloped in its valve. Professor Henslow, however, has come to a different conclusion:—

"I suspect," he says, "that such is not the case, and that Mr. Busk has the genuine shell (one valve) of an oyster only. A specimen of a fossil oyster which I prepared for the Ipswich Museum a few weeks ago seems to explain Mr. Busk's puzzle. This shell (probably a detrital relic from the Suffolk drift) had attached itself by the lower convex valve to an ammonite,

* "Annals and Magazine of Natural History," March, 1855.

and, as it grew, had taken in a very complete manner the impression of its whorls. But the curious result has been that the upper valve, which was not in contact with the ammonite, has become partially modelled to represent it. Thus the two valves together have the double impression of the ammonite, in intaglio below, and in cameo above. I suspect from this that Mr. Busk's oyster had grown with the lower valve (which he does not possess) attached to the outer convex surface of a pholas, and that the upper valve (the one in question) has, in consequence, been partially modelled after it. We must suppose, in these cases, that the mollusk accommodates itself to whatever curvature is impressed on the lower valve, and then the materials secreted for the upper valve will necessarily follow the contour thus given to the animal."

An engraving * (8) shows an old-fashioned champagne bottle, taken from the wreck of the Royal George, having on it four oyster-shells or lower valves, all of which are modified in form by the figure of the bottle. The two more immediately in front, instead of being concave internally, are convex, moulded, in fact, by the globose body to which they adhere, so that the oyster, instead of sinking into a bed, must have been elevated or perched up, and consequently covered by an arched or vaulted valve instead of a flat valve, the order of

* "Illustrated News," Aug. 11, 1855.

things being reversed. The two other shells show rather how, by the disposition of layer after layer, the oyster makes the best of an unfortunate attachment, than display any decided alteration of the normal character of form. That lying on the base of the neck of the bottle, though somewhat irregular, is fairly concave,

Fig. 8.

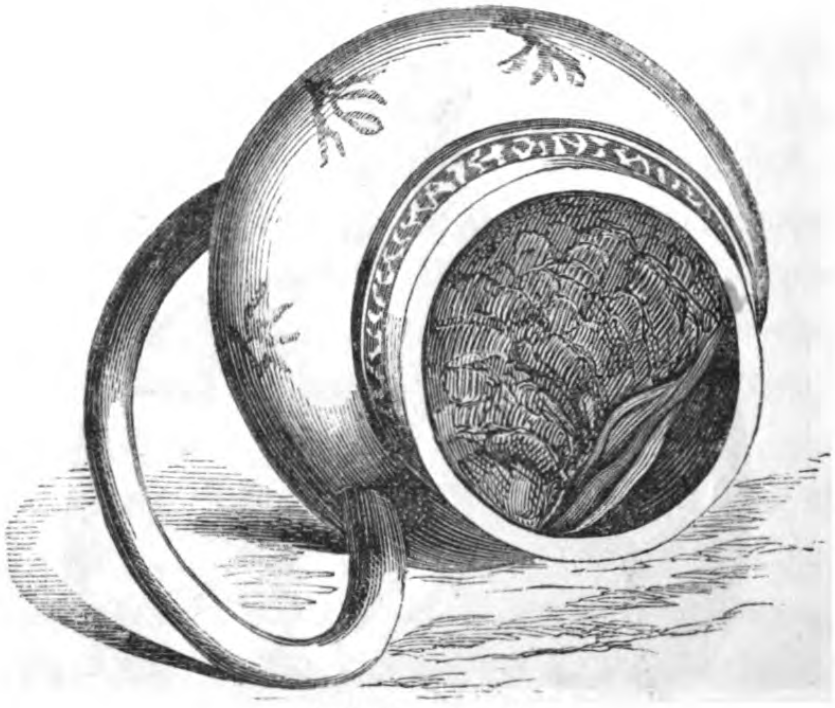
Oysters incrusted on a Bottle.

and is raised up by numerous rough external layers, acting as a sort of buttress. These shells bear marks of great age, the oysters having lived and died in their

present condition. Other shells, of different ages, some small, some mere *spat*, are attached to the bottom and opposite side of the bottle.

Another engraving represents an ancient Chinese teapot without a spout, but perforated at the spot from which it once projected by three small orifices, like those

Fig. 9.



Oyster in a teapot.

of a crow-quill, which, being at some time at the bottom of the sea, became the abode of an oyster, either washed into it in the state of *spat*, or at some subsequent stage of its progress. In this strange abode the oyster lived and grew, deriving its subsistence from the water that flowed in through the orifices.

Its dwelling, too, became a prison; for the mouth of the teapot was tightly and closely plugged up by the lower valve of the shell. This part rose abruptly from a lower flat margin, extending disc-like, or ring-like, within the vessel, to its swollen circumference, or nearly so; hence the escape of the oyster was impossible, as this substance fitted the mouth of the teapot like a bung. Its surface is transversely marked with lines, the results of growth, and with longitudinal ridges and furrows. It consists of many layers of lime, placed one upon another, to the thickness of half an inch; the whole appearing as if the oyster, clothed in a shell of thick putty or liquid plaster of Paris, had tried to break through its prison-house by pressing upwards, and had thereby converted its shell into a plug, so as to block itself in, the putty or plaster becoming hardened. Such is, at least, the appearance, though not the fact, for the growth and adaptation of form kept pace with each other. This singular dwelling was dredged up in Falmouth River, and is in the possession of Mr. Payne, of Blackheath.*

The naturalist by whom this specimen was described mentions an instance in which three oysters, at an early stage of their existence, became agglutinated together by the union of their convex valves. Thus they grew, accommodating themselves to each other, with a certain

* "Illustrated News," Aug. 11, 1855.

degree of distortion, which, with the ruggedness of the surface of each, and with a crop of acorn-shells affixed thereon, produced a singular and not unpicturesque effect. At the time when this specimen came into his hands the oysters were living, and the valves were opened by the knife for the ordinary purpose.

Though the Heralds' College contains immense and diversified records of the past, it has no vellum or parchment-roll relating to the Silver-shell family. And yet it is to be traced to a period so remote as to eclipse the ancestry of Britain's proudest peer. It may be well to take a rapid glance at its high descent.

Some of the theorists of the last century considered the earth to have been primarily a perfect mathematical sphere, without seas or islands, without valley, rock, or mountain, and, therefore, as having neither "wrinkle, scar, nor fracture." They did not perceive that what they deemed deformity was actually beauty, and no less conducive to the greatest utility. We owe our springs of water, our rivers, the stone and lime of our buildings, the metals so essential to arts and manufactures, the purity and salubriousness of our atmosphere, and the abundance of vegetable and animal life to the condition in which we find the earth. Its crust, so to speak, consists of some thirty or forty strata of various thickness, spread out one over the other, resembling as many volumes piled on their flat sides, and yet

arranging themselves into a very few grand groups. The whole set, indeed, is nowhere displayed lying each on the other; yet their order of succession is sure and known, so that, while some are wanting in every locality, the order of position is never violated. Still further: the strata do not lie over each other like the coats of an onion or of a bulbous root, but have been correctly compared to a vast number of wafers, irregularly formed, laid on a globe, patched upon each other in different sets as to thickness, and variously under-passing, out-cropping, and over-lapping.

Were, then, a mighty force below this surface to act on certain points, and along certain lines, the wafer-patches would be bent, broken, and have their edges often turned up, so that those of the lower ones would stand in some places over the higher ones that had been thus shattered. And, now, were a mass of melted matter, which had lain quietly beneath the lowest of the patches, to boil up, burst forth in many places, to raise the wafers, piercing them, finally hardening in fantastic shapes, and traversing over the upheaved and fractured outside, there would be another illustration of the state of the earth's surface.

Such is the origin of granitic and similar rocks. Boiling up, they gave rise to mountain ranges when they could not pierce through the resistance; but, when they could, cooling, and remaining as magnificent crags

and summits. It is by following the broken edges or "out-croppings" of the strata, carefully and intelligently, through extensive tracts of country, that the series is disclosed, from the crystalline rocks, on which the first or lower stratum rests, up to the last, lying immediately under the soil on which we live, rear our edifices, and gather the produce of our gardens and fields. With respect to the actual surface of the earth, the greatest height from the bottom of the lowest valley to the top of the highest mountain is ordinarily estimated at five miles. It may be represented to the eye, if a fine thread be laid on the surface of a twelve-inch globe.

The term *rocks* does not necessarily denote a hard, stony mass. Consolidation appears in all degrees, from the loose sand or gravel on which we tread, and the dark-coloured clay which is just beneath, up to the most close-grained marble. The lower we descend the greater degree of hardness is discoverable. Two forces operate to produce this result: one is the mere weight of the materials, which presses more heavily as the depth is increased; and the other, principally acting on the lowest beds, is interior heat. Chemical and electrical action have also, doubtless, no little influence.

If we were to imagine a descent to some depth into the crust or shell of the earth, no sooner should we have quitted the grass of the field than we should pass beyond all the records of humanity. Not a trace of man

is found in the *tertiary* beds, formed of clays, sands, and limes variously intermixed, occupying an immense thickness of many hundred feet, and reaching up to the ground on which we tread in our London basin. To adopt the words of Dr. Harris: "Let our grave be as shallow as it may, in even the latest stratified bed, we have to make it in the dust of a departed world. Formation now follows formation, composed chiefly of sand, and clay, and lime, and presenting a thickness of more than a thousand feet each. As we descend through these, one of the most sublime fictions of mythology becomes sober truth, for at our every step an age flies past. We find ourselves on a road where the lapse of duration is marked—not by the succession of seasons and of years—but by the slow excavation, by water, of deep valleys in rock marble; by the return of a continent to the bosom of an ocean in which ages before it had been slowly formed; or by the departure of one world and the formation of another." Truly and emphatically has it been said: "Time! Time! Geology compels us to make unlimited drafts on antiquity!"

That it must be so will be rendered evident by a few obvious facts. Pebbles, small as coriander seeds, and increasing in size beyond that of birds' eggs, may be readily discovered in those stratified rocks which are of a sandy structure. These show that they are fragments of more ancient rocks, long rolling on a hard

bottom under water, dispersed through the loose sand of a deposit, subsiding to the lower part if a tolerably free motion were allowed, and then consolidated. Thus we have the substance called *conglomerate.*

In many places the upper part of the vast formation of the old red sandstone is of a closer grain, showing it was produced by the last and finest deposits of clayey and sandy mud, tinged as the whole is with oxides and carbonates of iron, of red and other hues. But frequently the lower portions, sometimes dispersed heaps, and sometimes the entire formation, consist of vast masses of conglomerate, the pebbles being composed of some other of the earliest kinds, as granite. If we take this substance under consideration, we are thrown back into periods still more remote. Three of the sciences aid our contemplation. First comes mineralogy, and points out the quartz, felspar, and mica, of which the granite pebble is composed. Then crystallography shows, by cleavage or mechanical division, that each of these three substances is composed of atoms indescribably minute, and each of these of others still more so, and so on to an indefinite extent; yet each one possessing a determinate geometrical figure, and combining in fixed and definite proportions. And now chemistry advances to resolve the atoms into one or more of the substances, which, too, are indivisible and ultimate; deserving to be regarded, as Daubeny has

beautifully expressed it, as the alphabet, composing the great volume which records the wisdom and goodness of the Creator. What, then, is the aggregate of ages that have passed in these successive formations?

It was, however, while certain mineral masses were in progress of formation, and yet soft, that they were replenished with the remains of animals which had lived in the waters. Vestiges of their skeletons, coverings, and shelly dwellings are still discoverable. In the various strata, excepting the earliest two or three, such remains occur of organised creatures, in some instances vegetable, but principally animal. Even in the lowest beds they may have appeared; but they would doubtless have been destroyed by the heat communicated from below.

Each system of strata has species which belong to itself;—a fact which stands among the most remarkable discoveries of modern times. Nearly seventy years ago a very young man had it gradually disclosed to his mind, as he quietly but laboriously examined the stratified formations of the southern and midland counties of England; nor did he announce it till it was fully established by the patient and persevering studies of many years. Shrinking, meanwhile, from all personal aggrandisement, he most generously offered it to the world at large; a course which reflects the honours of the philanthropist

on the name of Dr. William Smith, "The Father of English Geology."

How entirely his views of the regular succession and continuity of strata, and the definite distribution of animal and vegetable forms in the earth, were his own, will appear from the following incident:—The Rev. J. Townsend, of Pewsey, and the Rev. B. Richardson, of Farley, had an extensive and accurate knowledge of the counties of Somerset and Wilts, where the young geologist had specially pursued his researches; and both possessed large collections of organic remains. What, then, was their astonishment, blended with incredulity, when, taking up one fossil after another, he instantly described the particular rock, or the bed of stone or clay, from whence it was taken. Nor were they less surprised when Strata Smith, as he was called, traced, with the greatest ease and accuracy, the ranges of the rocks, by following the courses of springs and other indications of a change of the substrata. On what has been designated "the Master-Principle of Geology," the characterism of fossils, a number of other truths are dependent, of the greatest value, theoretically and practically.

Now, it is an interesting fact, that with the substance of our globe shells have much to do. "Of all classes," says Lyell, "the testacea are the most generally diffused in a fossil state, and may be called the medals princi-

pally employed by nature in recording the chronology of past events." Lying upon and filling up depressions or basins of the chalk, is our great tertiary formation, including many tertiary shells, all apparently extinct. The most common shell is a massive gigantic oyster, sometimes over a foot in diameter. The beds comprising this formation are covered by others of a peculiar soft white stone, including much gypsum, and resembling chalk, but really of the nature of pumice-stone. This substance is very remarkable, from its being formed, to at least one-tenth of its bulk, of animalcules; and Professor Ehrenberg has recognised in it no fewer than thirty marine creatures.

Darwin describes the geology of Patagonia as worthy attention. It differs from Europe, where the tertiary formation appears to have accumulated in the bays; for here, along hundreds of miles of coast, there is one great deposit, including many tertiary shells, all apparently extinct. Here, too, the most common shell is an oyster of gigantic size.

At Castle Hill, near Newhaven, about eight miles from Brighton, immediately beneath the turf, is a regular sea-beach of oyster-shells, many feet in thickness, forming the summit of the chalk cliffs, one hundred and fifty feet above the level of the sea. Near Bromley in Kent, and Reading in Berkshire, similar accumulations of pebbles and oyster-shells are to be found. A

layer of oyster-shells, with the valves separated, and exhibiting other marks of water transport, is found, moreover, in the Whitby lias, extending for many miles along the coast, and ten or twelve into the interior.

During ancient epochs, as we learn from the fossils of both tertiary and secondary strata, many more kinds of oysters lived within our area, and multiplied so as to rival the contents of any modern oyster-beds. In the tertiary system we have a subdivision that is worthy of notice: *eocene* implies that there will be found the dawn of species still existing; the *miocene* subdivision above contains more of the species now living, though extinct species still predominate; while in the *pliocene*, or upper division, extinct species decline, and species now living predominate. And it has been amusingly remarked that, "The discoveries of geologists open scenes of regret to the enthusiastic oyster-eater, who can hardly gaze on abundantly entombed remains of the elegantly-shaped and apparently well-fed oysters of our eocene formation without chasing 'a pearly tear away,' whilst he calls to mind how all these delicate beings came into the world and vanished to so little purpose." *

The oysters of ancient times, like those of our own climate, formed by their accumulation banks, more

* Forbes and Hanley's "Mollusca."

or less extended, of strata, more or less thick and horizontal, in which the shells are still in the position they originally occupied, and almost without any admixture of foreign bodies. Even the bivalves, which live vertically sunk in sand or mud, must also form sorts of strata, because the individuals newly born are deposited by the parents above themselves, so that, sinking in the mud in proportion as they enlarge in bulk, they depress their parents and the oysters below them in succession, so as to remove them sufficiently from the surface of the soil to prevent their receiving any water, the consequence of which is death. Then their shells, vertical while the animal was living, begin to incline by degrees, become horizontal, are filled with the substance in which they are sunk, resist the pressure of the accumulated strata, so as sometimes to remain perfectly entire, or, if not so, they are broken and crushed, and disposed in beds more or less free from every other shell, or even from any other foreign body.

Mr. Jesse states that a friend of his, an observant and veracious person, informed him that, of all the natural phenomena on an extensive scale, which, during a visit to America, arrested his attention, and excited his admiration of the ways of Providence, was the formation of oyster-banks on the sea-bord of Georgia, the most southern of the United States of

North America, situated on the shores of the Atlantic Ocean, which bounds it on the east. On the south it is bounded by Florida; on the west lies Alabama; and on the north are the states of the Carolinas and Tenessee.

The land from the sea, for about the space of from twelve to eighteen miles, is completely alluvial, and in general consists of uncultivated marsh lands, through which an iron rod might be thrust to the distance of eighteen or twenty feet. A great number of large creeks and rivers are found meandering through these marshes, and, owing to the sinuosities invariably resulting from running water, the bends of these rivers would, in a short time, cut away the adjoining land to such an extent, as would make the whole sea-bord a quagmire.

But, it is a remarkable fact, that, wherever the tide bends its force, its effects are counteracted by walls of living oysters, which grow upon each other from the beds of the rivers to the very verge of the banks. These animals are often found in bunches among the long grass, growing upon the surface of the soil. They are in such abundance, that a vessel of a hundred tons might load herself, in three times, her own length. These banks are the favourite resort of fish and birds, as well as of the raccoon and some other animals, who feed on the oysters both by day and night. Bunches

of them, sufficient to fill a bushel, are found matted, as it were, together; and the neighbouring inhabitants and labourers often light a fire on the marsh grass, roll a bunch of oysters upon it, and there enjoy these luxuries.

Marvellous is the difference between death and life. It is a fact open to general observation, that all the coasts of the land composed of mineral substances, dead shells, or other animal or vegetable productions in which life is extinct, are habitually wetted by the ocean waters. But it is not so palpable, except to the student of nature, that no production of the sea, or of any other water, is thus wetted while it continues in the living state. Vitality, and vitality alone, produces this difference.

It occurs in all waters, indeed, however soft and limpid they may be, or however mixed with saline and other active substances; and the more such substances exist in the composition of any water, whether of the sea, or of any other collection, the more completely are the living inhabitants of that water, whether vegetable or animal, protected against its action.

How then is this? A mucous, or slimy substance, not easily described, has been provided, in which the surface of a living being is constantly bathed, so that it may suffer no injury from the macerating or decomposing influence which the water, whether salt or fresh,

would otherwise exert. As water very speedily decomposes the greater number of organised substances after they are dead, so, apart from this defence, destruction would await the living. Even the most compact of the porcelain shells are invested during life with a kind of membrane, often of extreme tenuity, which possesses the same quality. Most curious, then, is the relation of the sea to a substance which can be wetted by its waters, and to one which cannot be wetted. The wetable substance finds its way to the shore by an obscure but very certain and constant kind of attraction; while the substance which the water of the sea cannot wet, has no such tendency to come on shore, but remains to perform its function in the water.

Of no consequence is it whether it is a marine plant or animal or aquatic bird which frequents the waters without habitually living in them; for, if it is fitted by the Creator to live in the sea, there is no surface-action so long as it thus exists, and it has consequently no tendency towards the shore.

But when either the plant or the animal dies, and ceases to employ its powers, including among the rest the production of the water-repelling mucus, it is immediately subjected to the action of the waters as a dead thing; the action of the sea casting it on the shore, as having no longer any connection with that economy of life which has there its range. Such is the

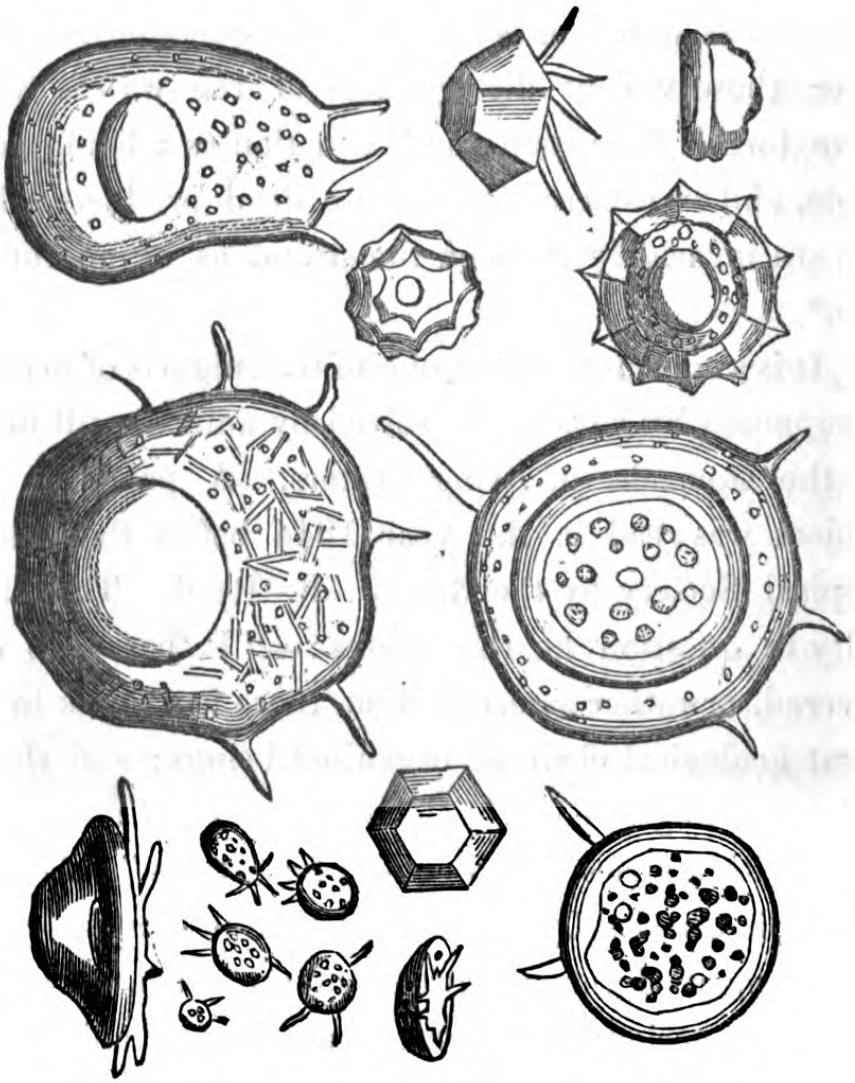
cause of the vast accumulation of shells with which we meet on various spots, and on some of the shores of the Channel Islands among the rest. This is also the reason why that sea-weed, which is so valuable in the Channel Islands, comes ashore in considerable quantities after those violent disturbances of the waters which have torn it from its natural situation as a living vegetable, and transferred it to those dead products which the sea invariably casts on the strand as of no further use.*

It is a curious fact that one of the enigmas of geology is supposed by some to be solved by animals still found in the stomachs of living oysters. A paper on this subject was read in the year 1844 before the Microscopical Society by the Rev. J. B. Read. The difficulty in question he thus states:—"It has been discovered, or rather asserted, that there is a break in the great geological chain of organised beings; and that a link is wanting to connect the cretaceous and antecedent series with a series of subsequent formations." Accordingly Sir Charles Lyell founded on this supposition his arrangement of the subdivision of the tertiary system; his eocene period, or dawn of our present animal and vegetable kingdoms, being coincident with the third geological era. Dr. Mantell, however, had doubts on this subject, and, adopting Sir Charles's arrangement

* Mudie.

as useful in the present state of knowledge, he thought it might require to be modified or even abandoned with

Fig. 10.



Shield-bearing animalcules.

the progress of research, as he remarks:—"It cannot be doubted that strata in which no recent species have

been found, may yield them to more accurate and extended observation."

"It is remarkable," says Mr. Read, "that the converse of this supposition has actually obtained, and our modern seas have yielded living forms hitherto characteristic of the chalk formation, and regarded as antediluvial. The merit of this discovery rests with Professor Ehrenberg.

"My own observations confirm all the important conclusions arrived at by Ehrenberg, and are, fortunately, capable of easy verification. It will not be necessary to send for sea mud from Norway, or for Peruvian or Mexican sea water; half a dozen native oysters, or, in truth, I may say, the stomach of a single oyster, will often afford us ample proof of the uniformity and identity of organic life in distant ages of the earth, and leave us in no doubt that the dawn of the organic creation, co-existent with ourselves, reaches further back into the history of the earth than has hitherto appeared."

Mr. Read then proceeds to state that the ciliary currents in the fringes of the oyster induced him to examine the stomach, under the expectation of finding some minute forms of infusoria, as it seemed but reasonable that the absence of locomotive power, and the consequent inability of seeking for food, might be compensated by so beautiful a contrivance for ensuring constant

nourishment. His expectations were fulfilled and surpassed. In the stomach of every living oyster he examined, and in the intestinal canal, he found myriads of living animalcules. Not only were some of these of the naked kind, but others which have the silicious loricæ (the flinty shields), and some of those which, in their fossil state, constitute the chief bulk of the chalk.

"Beyond all doubt," adds Mr. Read, "the bulk of the cretaceous series is composed of organisms still living, as I have now shown, in our British seas, and, as Ehrenberg observes, still capable, under the occurrence of favourable circumstances, of giving rise to the greatest changes in the distribution of the solid crust of the earth. The material, and not the magnitude of the infusoria, is the proper element in these calculations. We must shut our eyes to the minuteness of each individual atom of life, and look rather at the marvellous activity of its law of increase, and at its indestructible shield (10), which sets at defiance the two great reducers of organic structures, death and fire. A very few nutshells would hold all we should leave of an elephant, if reduced to its ultimate elements by fire, but no known intensity of heat would reduce the silicious mass of infusoria. Fusion, under certain conditions, would be the utmost result, and thence would originate other mountain masses which, to say the least, would be very nearly allied to those which we term granitic."

Surprising as it may be to many to find the shells of oysters largely contributing to the crust of the globe, it is still more so that creatures of extreme minuteness should be associated with them. The Egyptian pyramids are actually built of a limestone entirely composed of chambered shells, exquisitely constructed, and of very small size. Other rocks there are whose very substance consists of microscopic shells of extraordinary beauty, once the habitations of minute animals. No one who visits the county of Kent, for instance, can fail to observe the extension of the great chalk range, which again shows itself on the opposite coast of Boulogne. Above the chalk lies a deep bed of plastic clay, and above this the London clay, of which the hills of the Isle of Sheppey consist, and also Shooter's Hill, which is about four hundred and forty feet in height. Near Pegwell Bay, which is a pleasant walk from Ramsgate, this London clay immediately covers the chalk, spreading over a tract of no great extent. In some parts, as, for example, a strip from the valley of the Darent to below Gravesend, the overlying clays have been more or less completely washed away, the chalk being covered with a mixture of sand and vegetable soil.

Of the thickness of the chalk some idea may be formed from the cliffs which abruptly crop out and overhang the sea, or the estuary of the Thames. Let those who gaze with interest on the ocean dashing

against the sea-wall of Dover, attentively observe its range of cliffs. The hill on which its castle stands and other relics of high antiquity, as the first pharos built here by the Romans, is four hundred and sixty-nine feet in height. Such is the measurement of the outcropping cliff; but the actual thickness of the stratum of chalk is considerably more. The late Sir W. De la Beche estimated its average thickness at seven hundred feet. Dr. Conybeare considers it to range between six hundred and one thousand feet.

Original local causes influencing the deposition of the chalk, and others which have since operated producing the abrasion or removal of its upper surface, have led to the varying of it in thickness in different places. The height of the cliff at Beachy Head, Sussex, which at the summit includes a portion of the flinty chalk, and goes down very nearly to the next stratum, the upper green sand, is only five hundred and thirty-five feet; this flinty section averages at Dover three hundred and fifty feet. Taking this as an average standard, the total thickness of the chalk on the Sussex coast may be estimated at about eight hundred feet. At Diss, in Norfolk, on the other hand, the thickness of the chalk, as ascertained by boring, is but five hundred and ten feet.

The extreme minuteness of the chalk animalcules is strikingly proved by the fact, that even in the finest

levigated whiting multitudes of them are still present, and may be applied, without suffering change, to the most varied purposes. Thus, in the chalk coating given to painted chambers, paper, or even glazed visiting cards, may be seen a pretty mosaic of well-preserved moss-coral animalcules, invisible to the naked eye. Our natural vision receives from such a surface the impression of the purest white; it is only the microscope that can disclose the fact, that it contains the bodies of millions of beings of exceedingly varied and beautiful forms that once enjoyed life.

Similar relics are found in the series of the oolite and lias rocks, which come under the chalk, and, in England and many other countries, overlie the new red sandstone.

Another instance, too remarkable to be omitted, is that of the polishing slate of Bilin, in Bohemia, occupying a surface of great extent, probably the site of an ancient lake. Its slaty stratum, fourteen feet in thickness, consists almost entirely of an aggregation of the silicious shields of one species of animalcule, *Gaillonella distans.* These shields, or cuirasses, as they have been called, are most beautiful coverings, sometimes of a single plate, sometimes double, formed of the purest quartz or rock crystal, and therefore perfectly transparent.

The size of one of these animalcules amounts, on an average, and in the greater part, to one two-hundred-

and-eighty-eighth of a line, which equals one-sixth of the thickness of a human hair. The globule of the human blood is not much smaller. Those of a frog are twice as large as one of these creatures. As the polishing slate has no cavities, these animalcules lie closely compressed. A cubic inch would contain, on an average, about forty-one thousand millions of these animals. Of the forty-one thousand millions of them, one hundred and eighty-seven millions go to a grain. A single shield of the *gaillonella* weighs about one one-hundred-and-eighty-seven-millionth part of a grain.

An ingenious device has been adopted by a modern writer to cast light on immense numbers, of which it is ordinarily so difficult to conceive. He says, if a million of peas were placed on the floor of a room, it would require to be sixteen feet square. Accordingly, it would require one hundred and eighty-seven rooms, proportionately smaller, to contain the animalcules that would amount in weight to a single grain!

CHAPTER VI.

THE PEARL OYSTER.

THE PASSION FOR PEARLS—THE PEARL FISHERY—THE COULTOS—SEED PEARLS.

TURNING now from the consideration of those relatives of Silver-shell which have been rapidly contemplated, there is one from which it would be unjust to withhold our attention. The Pearl Oyster is the same size as our own, but oval in shape, and quite flat on one side. A few words will be desirable on its rare and costly produce.

The passion for pearls was at its height about the period when Roman freedom was extinguished, and in the imperial city pearls were valued as highly as precious stones. A pearl, celebrated in Pliny's time, was bought by Tavernier for £10,000. In Asia this taste was of more ancient date, nor has it ever declined. A string of pearls of the largest size is an indispensable part of an Eastern monarch's decorations. It was thus that Tippoo was adorned when he fell before the gates of his capital; and the rulers of Persia have for ages been similarly decorated.

Shakespeare gives us the following colloquy:—

Cleopatra.—How goes it with my brave Antony?
Alexas.—Last thing he did, dear queen,
He kiss'd—the last of many doubled kisses—
This orient pearl;—his speech sticks in my heart.
Cleo.—Mine ear must pluck it thence.
Alex.— "Good friend," quoth he,
"Say, The firm Roman, to great Egypt sends
This treasure of an oyster."

Again: the poet says:—

"Honesty dwells like a miser in a poor-house, as your pearl in your foul oyster."

The pearl oysters, like those with which we are familiar, lie in banks, at greater or less depths in the sea. Such banks, for example, occur on the western side of the island of Ceylon, about fifteen miles from the shore, where their average depth is about twelve fathoms. Here the greatest of all pearl fisheries has been carried on for many centuries. They seem always to have been considered the property of the king or kings of Ceylon; but, since the occupation of the island by the British, the privilege of fishing on them has been sold sometimes by auction, the sales being only made for one season.

The pearl fishery always begins in the month of April, because the sea has then a beautiful tranquillity; and it is generally continued to the middle or end of May. It attracts to the coast not only a multitude of the Cingalese, but crowds of speculators from all parts

of the vast Indian peninsula, whose variety of language, costume, and manners is described as very striking and pleasing. On the eve of the fishery there is a curious and picturesque spectacle.

A mass of huts, composed of a few poles stuck in the ground, interwoven with light bamboos, and covered with the leaves of the cocoa-nut tree, is at once seen to arise on the solitary sea-shore. Bazaars, too, appear in long rows, gaily decorated, and packed with all varieties of merchandise; while there are booths for the sale of strong liquors, as well as of sweetmeats and native drinks. Amidst the trading assemblage a temple, with its cloths, flags, and flowers, has been observed, attended by its priests, who are no less eagerly seeking for profit by selling charms to the divers, and which are deemed lucky for those who intend to make purchases. They even put forth a claim to temple oysters, which is yielded to by the divers, most probably from the fear of refusal involving some malignant influence.

Conspicuous among the assembled crowd, when the fishing is about to commence, is the shark charmer, who is supposed to exert some magic power over the monsters of the deep, and without whose presence no diver will undertake his task. He is usually a tall, dark, and long-haired man, bearing on his skin mysterious characters, and with his neck and arms adorned with strings of heavy beads. He strongly resembles the "medicine

man" of the American Indians and the sorcerers of every age, who find a prey in the ignorant and superstitious. Striking as his appearance is to such persons, he does not rely upon it for his influence, but often harangues them on the greatness of his power and on his marvellous exploits.

The signal for beginning the fishing is given at daybreak by the discharge of a cannon; on which a countless fleet of boats, that have started for the shore at midnight, and, favoured by a land breeze, have reached the oyster-banks before dawn, cast anchor in the respective parts for which their owners have contracted, or at which they are appointed to work. Inspectors are in attendance to prevent any irregularity in these respects.

The boats generally carry a captain, a pilot, and twenty men, ten of whom are experienced divers. The ten divers are divided into two companies of five each, and these companies plunge and relieve each other by turns.

That they may descend through the water with greater rapidity to the bank round which the oysters are clustered, the divers place their feet on a stone attached to the end of a rope, the other end of which is made fast to the boat; they carry with them another rope, the extremity of which is held by two men in the boat, whilst to the lower part, that descends with the diver, there is fastened a net or basket. Every diver is

also provided with a strong knife to detach the oysters, or to serve him as a defensive weapon if he should be attacked by a shark. On touching the ground they gather the oysters with all possible speed, and, having filled their net or basket, they quit their hold of the rope with the stone, pull that which is held by the sailors in the boat, and rapidly ascend to the surface of the sea.

Well has Mrs. Hemans said :—

"Thou hast been where the rocks of coral grow,
Thou hast fought with the eddying waves ;—
Thy cheek is pale, and thy heart beats low,
Thou searcher of ocean's caves !

"Thou hast look'd on the gleaming wealth of old,
And wrecks where the brave have striven :
The deep is a strong and a fearful hold,
But thou its bar hast riven.

"A wild and weary life is thine—
A wasting task and lone,
Though treasure-grots for thee may shine,
To all besides unknown !

"A weary life! but a swift decay
Soon, soon shall set thee free ;
Thou'rt passing fast from thy toils away,
Thou wrestler with the sea!

"In thy dim eye, on thy hollow cheek,
Well are the death-signs read—
Go! for the pearl in its cavern seek,
Ere hope and power be fled!

"And bright in beauty's coronal
That glistening gem shall be;
A star to all in the festive hall—
But who will think on *thee?*

"None!—as it gleams from the queen-like head,
Not one 'midst throngs will say,
'A life hath been, like a raindrop, shed
For that pale quivering ray!'

"Woe for the wealth thus dearly bought!—
And are not those like thee,
Who win for earth the gems of thought?
O wrestler with the sea!"

Mr. Marshall, for many years surgeon to the forces at Ceylon, states that he rarely knew the submersion of a diver last longer than fifty seconds. This is about the time that the men in the Bay of Naples, who dive for small mollusks, and the Greek islanders of the Archipelago, who dive for sponges, remain under water. These are the most famous divers in Europe, and are likely, from their physical structure, sobriety of life, and constant practice, to carry their art as far as possible.

But a recent visitor says: "There was a move on deck, the signal flag rose slowly upwards, the union-jack fluttered in the morning breeze, and just as it touched the masthead a thousand divers, with their stones and nets, plunged silently in the sea. I shall not easily forget the sensation I experienced when I saw the crowd of human beings sink, as by magic, in

the depths below, leaving but a few bubbles to mark their downward path. I pulled out my watch; a minute elapsed, and not one of all the thousand appeared; a minute and a quarter,—a minute and a half,—three-quarters,—two minutes,—still not a soul rose to the surface. I dreaded some fearful calamity. Two minutes and a quarter had flown; the drops of perspiration gathered thickly on my forehead; my hands trembled so that I could scarce hold my watch. I turned to the Adapanaar—the head-man of the district, in his ten-oared cutter, in which I stood—in an agony of anxiety, but he was sitting calm and quiet as an oyster. How gladly my heart beat when I saw, first a dozen heads and shoulders, then fifty, then five hundred and more, ascend to the surface, bubbling and spluttering, as they well might, after such a submarine excursion."

The old shark charmer had stationed himself from the commencement of the diving on the stern of his boat, which was in the centre of the fleet; occasionally he muttered a charm, flourishing his long arms about in his accustomed manner; but at intervals he descended to sip something from a cocoa-nut shell bottle. At one of these times loud cries arose of "The shark! the shark!" A poor diver, lacerated grievously by the monster, was dragged into a boat, and the fishing was stopped for that day. The inspector sent for the shark charmer, who stated with the greatest effrontery that

there were some spirits adverse to the powers he possessed; and that during the brief time of his taking a little refreshment one of them had broken his charm and unclosed the jaws of the shark.

In spaces of ground called coultôs, enclosed with poles and transverse pieces of bamboo, but open to the air, the oysters are deposited on being landed. They are here left to putrefy, which they soon do under a burning sun; and it is a curious fact that, though these numerous coultôs, each one containing an enormous mass of oysters, all putrefy together, emitting the most detestable odours, yet the health of the precarious but crowded population gathered there is in noways affected. "During two years that I did duty at the fishery," says M. de Noé, now a peer of France, but formerly one of the French emigrants, and an officer in the British army, "I never saw a soldier of my regiment sick; Europeans and sepoys all enjoyed good health;" and it has been remarked, on other authority, that in this climate, where the effects of vegetable decomposition are so fatal and so rapid, those of animal decomposition are almost innocuous.

As soon as the putrefaction is sufficiently advanced, the oysters are taken from the coultô, and placed in troughs made of the trunks of trees hollowed; sea-water is then thrown over them. The pearls are now readily shaken out and washed, by men who stand on

one side of each of the troughs. The largest are carefully picked up, and washed repeatedly with clean water; the next in size and quality are merely taken from the trough, and spread out on white napkins to dry in the sun; and it is not till this is done that any attention is paid to the smallest pearls, which are generally left to the care of the women, who pick them up and dry them.

To assort the pearls afterwards they make use of three sieves, placed one above the other. The apertures in the uppermost sieve are the largest, and the apertures of the second sieve larger than those of the third; and by this means the class of the pearls is determined. It remains, however, for an after examination to decide on other qualities which give value to the pearls, as their regularity of form and their colour. Little as it might be supposed, great importance is attached to the colour; for while Europeans most esteem the pearls that are of a pure white, the Cingalese prefer those which are rose-coloured; and the Indians, and some other orientals, the yellow pearls. Besides pearls of these three colours, others are found of a delicate blue tint, while some have a golden and others a silvery hue.

"The pearl," says M. de Noé, "is a malady of the oyster, which requires seven years to develop itself completely. If the shell is not fished at that time, the

animal dies, or the pearl is lost. When the season happens to be stormy the oysters often suffer, and their produce is consequently diminished. Perhaps on such occasions they open and disgorge their pearls."

Moore speaks of—

> "That rain from the sky
> That turns into pearls as it falls in the sea;"

and the Hindoos also have a poetical notion of the origin of pearls. To them they are congealed dew-drops, showered during certain months of the year on the earth by Buddha, and caught by the oysters as they float on the waters to breathe. The Brahmins avail themselves of the imagination to practise on the credulity of the people. They require of them what are called "charity oysters;" these they pretend are offerings to Buddha, who will repay his worshippers by showers of pearls in proportion to the liberality of their contributions.

In addition to the variety of persons attracted, as has been seen, to the pearl fishery, there annually arrive troops of Indian artisans, who are very expert in piercing or drilling the pearls, and who practise their art on the spot at a very moderate charge. They sit in the open air before the tent of any person who employs them. Nothing can be more simple than the implements they use. These are merely a block of wood in the form of an inverted cone, which rests on

three legs, and whose upper surface is pierced with circular holes of various diameter, fitted to receive the pearls according to their size, with a few drills. Their drill is merely a short, sharp needle, inserted in a stick, which is made circular at the top, and is set in motion by a bow, like those used by our watch-makers. Sitting on the ground cross-legged, they keep the block of wood between their knees, and apply the drill perpendicularly to the pearl, which they are said to pierce with extraordinary rapidity and accuracy.

Pearls of an inferior description are formed in a fresh-water bivalve.* Some of these were exhibited in the Great Exhibition of 1851, which were obtained from the deepest parts of the River Strule,near Omagh. Similar pearls were also shown from the River Ythan, Aberdeenshire. It is probable that pearls from this source, collected by the ancient Britons, may have given rise to the statement by Tacitus in his "Life of Agricola," of pearls, "not very orient, but pale and wan," being among the indigenous products of Great Britain. Pearls of the same kind have also been procured from Conway, in Wales, as well as from Sweden and Norway.

The smaller kind of pearl called "seed-pearl," is procured at Kurrachee, on the Bombay coast. They are of little value, except to the Persians and some of the Hakeems of India, who esteem them as medicine. The oysters producing "seed-pearls" are washed up

* Unio margaritifera.

by the surf-waves to high-water mark, and are left there as the tide falls. They are gathered by Coolies employed for the occasion, put into boats, and landed at Keamaree point. There the shells are broken and the pearls extracted, under the superintendence of the contractors, who pay the Julpore government forty thousand rupees per annum for the pearl contract. Even the gleaners who come after them pay for the right of sifting the broken shells in search of any pearls that may remain.

A little orphan boy about twelve years of age, while fishing on the banks of the Tenessee, in the United States, picked up a large pearl which he found lying among the shells. Returning home, he accidentally exhibited it while rummaging his pockets, filled with fish-lines, bait, corks, shells, and coppers, when a gentleman standing by, observing the costly treasure, asked him how much he should give him for it? The boy, unconscious of its value, asked in return only one or two small coins. "No!" replied the gentleman, "you must not sell it for a trifle; it is worth a large sum. I will send it to Nashville to be sold, and the proceeds of it shall be applied to your education." "The pearl," says Elihu Burritt, "was sent to a lapidary, who estimated its value at five hundred dollars! Let it glitter in the diadem of a crowned head, and that boy's mind be enriched with jewels whose lustre shall outlive and outshine the light of diamonds; and he will have parted with it for a pearl of greater price."

CHAPTER VII.

COMMERCIAL VALUE OF THE SILVER-SHELL FAMILY.

MANUFACTURE OF "PEARL BUTTONS"—OYSTERS A LUXURY OF THE ROMANS—OYSTER-WOMEN OF FORMER DAYS—OYSTER-BEDS OF NORMANDY—GREEN-TINTED OYSTERS.

LET us now transport ourselves to one of the large manufactories of Birmingham. Ascending the stairs, and entering a room, we see some shells washed in water, and we follow a basket of them to witness the operations of another department. A man stands here at a strongly-formed lathe, which, revolving, puts in motion a hollow spindle, having at one end some saw-like teeth; it is, in fact, a tubular saw, and while his foot keeps the lathe in motion his left hand presses a shell against the teeth, that they may work their way into the shell, and his right hand is employed in moving the tube along until the shell is cut through.

In this way flat circular pieces are cut out of the shell, the size being dependent on the tube; the diameter of which varies from a huge disc not *quite* so large as a soup-plate, to one which some persons can only see with a pair of spectacles. A slight rasping is all that these discs receive till they are successively placed in

the chuck—the revolving part of another lathe, that the turner may give the side that is before him the desired flatness, convexity, or indentation. Many of these discs now go to the engraver, that they may have impressed upon them some beautiful design. Others have shanks inserted in them by a very curious process, for glue cannot be used, nor any solder, and yet they are made to adhere with the greatest firmness.

Thus, then, it is that "pearl buttons" are made. They are polished with brushes, soap, and rottenstone by women, who, by means of a lathe, drill in them two, three, four, or as many more holes as may be required, and that with surprising dexterity. A button, for example, is seen fixed in a chuck, when the ear instantly catches the sounds *twit, twit twit, twit twit twit,* according to the number of holes, and the button drops infallibly pierced with those required, the distances being almost perfectly equal. In a similar manner some buttons are adorned with rings, stars, and other decorations, according to the fancy or taste of the manufacturer; and, finally, they have their edges corded or milled. Such engravings as racehorses, foxes, greyhounds, are always added by the ordinary process.

Of what substance, then, are "pearl buttons," made in millions absolutely confounding in a very limited period of manufacture? It is the hard, silvery, brilliant, internal layer of several kinds of shells, particu-

larly oysters'. The large oysters of the Indian seas alone secrete this rainbow-like material of sufficient thickness to render their shells available for such purposes. One genus of these mollusks is found in the greatest perfection round the coasts of Ceylon, near Ormus, in the Persian Gulf, and among some of the Australian seas. The shells used for buttons are bought of the merchants by the ton, which exceeds in value a hundred and twenty pounds sterling. They are taken just in the state in which they arrive in the docks to Birmingham; and lie in the store-rooms of its manufactories in vast heaps, as they would have done had a band of Titans left them there after regaling themselves with an oyster supper.

Not many years ago the dark-coloured portions of the shells were considered worthless, and were consequently thrown away. But the happy thought occurred to some one that purchasers might be found for dark-coloured buttons. The experiment was made, and with signal success. Not only did the dark-coloured buttons sell, but the black parts of the shells, and even the dark shells from the South Seas, became more valuable than the white ones.

Even the shell-dust—the sweepings and scrapings of the manufactories—has been employed beneficially for manure. Nature is full of astounding metamorphoses, and assuredly that may be classed among

them, when some particles of the little house of a mollusk on the shore of the Indian Ocean, after being sown in one of the fields of England, reappear in the loaf of the cottager or the confectionery of the noble.

But, if the oyster-shell be valuable, how can we properly estimate its inmate, far-famed during successive ages? "He was a very valiant man who first adventured on an oyster," is recorded as one of the sage observations, often made, of King James the First. A similar declaration has also reached us from former days:—

> "That man had sure a palate covered o'er
> With brass or steel that on a rocky shore
> First broke the oozy oyster's pearly coat,
> And risked the living morsel down his throat."

As the tale goes, an oyster gaping on the sea-shore, and disclosing the silvery surface of its shell, led some passer-by to put in his finger, when the two valves suddenly closing gave him so severe a pinch that he put the injured digital into his mouth for relief, and found, to his surprise and pleasure, a new and delicious taste.

"Most probably," says one of olden time, "mere hunger first put men on that trial. Thus necessity has often been the purveyor to provide diet for delicacy itself; famine maketh men to find out those things which afterwards proved not only wholesome, but delicious. Oysters are the only meat that men eat alive, and yet account it no cruelty."

The speculations of a human stomach, in reference to some of its adventures, would doubtless be amusing, and one with which we have been recently favoured will cast some light on the present subject.

"The day was over, the bell was sounded for 'all in,' and prayers were called, when, during the confusion of the boys rushing to their places, I found myself carried, as fast as legs could carry me, far beyond the precincts of the school grounds, so I felt certain that an ordeal of some sort was in store. Instead of finding myself as usual in a pastry-cook's shop, a certain marine odour of stale fish puzzled me extremely; and I waited the elucidation of the mystery with such feelings as only a stomach experiences when he is all uncertain as to what is going on and what is coming in, and when he is placed at the mercy of a hungry and unscrupulous schoolboy.

"I was not long held in suspense, and never shall I forget my sensations. Down there came, flopping—no other word is descriptive—into my astonished inside, a small mucilaginous mass of a saltish flavour, almost fluttering with life (good powers! I thought it has not had time to settle its affairs), accompanied by a fluid of extreme acidity, and by particles of black pepper, hot and pungent. I really was never so completely astounded in my life. Over and over I turned the wonderful compound, but could make nothing at all

of the shapeless little monster. Before I could give vent to a burst of invective, which I felt rising within me, another, and yet another, came unceremoniously slipping down, and then a torrent of a sort of licorish fluid, called porter, came gurgling and frothing after. At this a horrible suspicion flashed across me. For a moment the dreadful question rose in my mind, whether these peculiar substances, salt and flabby, which had so excited my awe and abhorrence, were the eyes of some of the poor brewers employed in the well-known firm of Nux, Vomica, and Co. This fearful idea seemed in a manner to be corroborated by the brackish taste I before alluded to, and which I naturally attributed to the flavour of the poor fellows' tears. The powder, it is true, cast a doubt as to the correctness of my surmises; but with exquisite imagination I looked upon *this* as some of that dust blown back into the faces of the men which their master had endeavoured to throw into the eyes of the public when they playfully affirmed that their beer is genuine. Another cataract of black liquor, however, distracted my attention; and when the money chinked upon the counter, the name of this extraordinary little stranger (which was *not* welcome) was pronounced for the first time in my hearing, and the word *Oyster* was indelibly impressed upon my memory for evermore."*

* "Memoirs of a Stomach."

The earliest accounts we have of oyster-eating are, however, associated with the details of luxury. The Greeks, and especially the Romans, levied contributions on land and sea throughout the then known world, to cover the tables of the opulent and luxurious. The oysters of the Dardanelles, of Venice, and even of the southern coast of England, were held in high estimation. Sergius Aratus is mentioned as the first Roman who constructed artificial beds.

Naples owes its fame, and probably its existence, to the superlative loveliness of its situation.

——— "Not a grove,
Citron, or pine, or cedar, not a grot,
Sea-worn and mantled with the gadding vine,
But breathes enchantment."

So says Rogers. But, assuredly, in no spot on earth are the skies brighter, or the waters more pellucid and serene.

In the wide and sunny expanse of blue waters that stands near this far-famed city, no part was calmer or more beautiful than the recess in the northern part of its bay, between Baiæ and Puteoli. Naturally sheltered by the surrounding coasts, it seemed of itself to invite the gratification of luxurious ease, and the formation of a mercantile harbour. Baiæ was resorted to by the Romans, as Brighton and Cheltenham have been in our times, by invalids and the restless in fashionable life;

while Puteoli, on the opposite side of this inner bay, was, on a small scale, what Liverpool is to England Between them was an inclosed reach of water, called the Lucrine Lake, over which coloured sails wafted the small yachts of fashionable visitors, and which contained the oyster-beds for the luxurious tables of Rome.

Martial says, in one of his epigrams,—

> "No praise, no price, a gilt head e'er will take,
> Unfed with oysters of the Lucrine Lake;"

for those were greatly preferred which, being brought from other places, were deposited in these waters, where they grew remarkably fat. The oysters were then most highly esteemed which had the edges of the mouth of a deep brown hue, and, indeed, almost black. To these they gave a special name—it is said to have been *Calli-blephara;* but the term is supposed to have become corrupted. That some Romans had a delicate perception of different qualities in oysters, is as probable as the fact is now certain as to many among ourselves; and hence it is not a mere satire of Nero:

> "He, whether Circe's rock his oysters bore,
> Or Lucrine Lake, or distant Richborough's shore,
> Knew at first taste."

The description will, doubtless, apply to many a Roman banquet:—"Around stood silver dishes containing asparagus, *lactuca,* radishes, and other productions of the garden, in addition to *lacerta,* flavoured

both with mint and rue, and with Byzantine *muria*, and dressed snails and oysters, while fresh ones in abundance were handed around. The company expressed their admiration of their host's fanciful invention, and then proceeded to help themselves to what each, according to his taste, considered the best incentive of an appetite. At the same time slaves carried round in golden goblets the *mulsum*, composed of Hymettian honey and Falernian wines." *

This description is strictly correct, as the Romans ate oysters not only raw, but cooked in various ways, and with seasonings, into which entered various substances, as wine, oil, vinegar, yolk of eggs, and pepper. Macrobius clearly distinguishes between two kinds of oysters which were handed to the guests, and of which they partook or not, at their pleasure. One he points out as *ostreæ crudæ*, obviously raw oysters; but the others he mentions in connection with the dish that held them, the *patina ostrearum*, which was a warm dish, prepared from oysters; for *patina* does not signify the dish only in which the meats were served, but a covered bowl in which they were cooked, as well as placed on the table.

Three Romans, each bearing the name of Apicius, owe all their celebrity—such as it is—to gluttony. Of one of them it is recorded that, when the Emperor Trajan

* Becker's "Gallus."

was in Parthia, he sent him fresh oysters preserved in full flavour, by a process which he had invented.

Pliny, Virgil, Cicero, Horace, and other ancient authors represent the Romans not only as fond of oysters, but especially so of those obtained from the British shores. Our oysters had a prominent place at the banquet tables of their emperors. They ate with them a peculiar kind of bread, which is called by Pliny *panis ostrearius*, and was probably something like the large rolls which are seen in our modern oyster shops.

Occasionally we catch a glimpse of the indulgences of our forefathers in these little delicacies, as we examine their ancient records. Thus, for example, Henry Machin, citizen and merchant taylor of London, keeps a diary, in which all the good things of which he partook seem to have secured a special record; of which the following, which we are inclined to refer to the time when oysters had just come in, is a curious instance:—"On the 30th July, 1557, himself, Master Dave Gyttons, Master Meynard, and Master Draper, and Master Smyth, Master Caldwella, and Master Asse and Gybes, and Master Fackington, and mony mo, did ett alff a bushell of owsters in Auchur-lane, at Master Smyth and Master Gyttons' seller, a-pone hoghedes, and candyll lyght, and onyons, and red alle, and clarett alle, and muskadylle fre cope, at viii. in the mornyng."

There is also a record extant of "the seruing in of

the feast of the East India Comp^{a}., at Merchañtailors Hall, 20 January, 1622 (23)." In this bill of fare of provision for "the upper table, 4 messe," we discover "Rost mutton with oysters," in the first course; and in the second course, "Boyled oysters," "dicto broiled," "oyster pie," and "pickled oysters." Then for "the 2 side tables, 14 messe, and 2 messe for the gallery:" "rost mutton with oysters," "rost capon 2," whereof 1 with oysters, appears in the first course; and in the second "oyster pie," and "oysters pickled." But, though the following arrangements are equally conspicuous, "The wayters, 7 messe," "For the clerke and the beadle of the hall, 2 messe between them," and "For the players, 3 messe," to none of these inferior classes, though they were far from being stinted, is there the *bonne bouche* of a single oyster.

In the scene in the Garter Inn Falstaff says,—

> "I will not lend thee a penny."

To which Pistol replies,

> "Why, then the world's mine oyster,
> Which I with sword will open."

And the opening of oysters was, at that period, doubtless of common occurrence. Women are now very rarely seen carrying oysters in tubs on their heads, or standing at their side, to supply their customers; yet, even half a century ago, they were numerous in the streets

of the metropolis. In earlier times they formed a well-known class of the people, to whom many allusions will be found in the works of the most eminent writers.

When, for example, Aumerle is describing to Richard II. the insinuating conduct of "high Hereford," he says that he, Bushy, Bagot, and Green,

> "Observ'd his courtship to the common people :—
> How he did seem to dive into their hearts,
> With humble and familiar courtesy;
> What reverence he did throw away on slaves,
> Wooing poor craftsmen with the craft of smiles,
> And patient under-bearing of his fortune,
> As 'twere to banish their affects with him.
> Off goes his bonnet to *an oyster wench;*
> A brace of draymen bid—God speed him well,
> And had the tribute of his supple knee." *

Bishop Hall, when satirising an old country squire, who starves himself to make his son a lawyer and a gentleman, says :—

> "Old drivelling Lolio drudges all he can
> To make his eldest son a gentleman.
> Who can despair to see another thrive
> By loan of twelve-pence to an *oyster wive ?*"

And, not to multiply instances, Butler describes the time when—

> "The *oyster women* locked their fish up,
> And trudged away to cry, 'No bishop!'"

* Richard II., act i., scene 4.

Numbers of persons, therefore, must have repaired to the tubs of these women—manifestly of a low class—from among the humbler ranks of the people, to refresh themselves with a few, if their pockets forbade the gratification derivable from scores of these delicacies, in the court, the alley, or the street.

Some times oysters were scarce. Thus Bishop Spratt remarks:—"The reason of the scarcity of oysters, and consequently of their dearness, is because they are of late years bought up by the Dutch. There are great penalties by the Admiralty Court laid upon those that fish out of those grounds which the court appoints, or that destroy the cultch (the *spat*), or that take any oysters that are not of size, or that do not tread under their feet, or throw upon the shore, a fish which they call a five-finger, resembling a spur-rowel, because that fish gets into the oysters when they gape, and sucks them out."

Slow conveyances were for a long period formidable impediments to the enjoyment of oysters in the best condition by the higher classes, and it was thought a feat when such difficulties were surmounted. This appears in the statement of Dr. Fuller:—"I have heard that oisters put up with care, and carried in the cool, were weekly brought fresh and good to Althrop, the seat of the Lord Spencer, which was eighty miles from the sea; and it is no wonder, for I myself have eaten,

in Warwickshire, above eighty miles from London, oisters sent from that city, fresh and good; and they must have been carried some miles before they came there."

There was a proverb, "The Mayor of Northampton opens oisters with his dagger;" a shorter instrument bringing them too near to his judicial nose. No less a person, however, than King George II. preferred oysters when they were stale and had a strong flavour. The Hon. Robert Boyle, in his well-known "Reflections," speaks in abhorrence of the practice of "eating raw oysters." Our renowned lexicographer could not agree with Boyle, and went so far in his dislike as to compare scalloped oysters to "children's ears in sawdust." The poet Cowper liked oysters in all ways; and in one of his letters to Mrs. Newton, in Mrs. Unwin's name and his own, he says, "We return you many thanks for a pot of scallops, excellently pickled." And the ingenious and eloquent "Stomach" already quoted says, after referring to its primary initiation:—"Since that time I have had occasion to receive these creatures with extreme courtesy under all forms and circumstances, scolloped, stewed, buttered, devilled, with beards and without beards; but to the young ingenuous stomach like myself at this moment, the raw oyster, with adjuncts of strong vinegar and black pepper, and washed down with a semi-opaque fluid, will ever present

features for recollection to linger over, and offers another proof of how slight is the partition which separates the sublime from the ridiculous."

Meanwhile the oyster trade has been carried on to a large extent on the coast of Normandy, to which we have already referred.

Dieppe was originally only a small bay, to which vessels resorted by favour of the tide; and the whole of the ground, in which the present port is excavated, exhibited nothing but a swamp, which was inundated twice every day. By degrees it raised its head, and fishing laid the foundation of its future prosperity. Its fishermen then went to Yarmouth, on the English coast, to Schonen, in Sweden, and even to more distant parts, to obtain such produce of the sea as the herring, the mackerel, the cod, the whiting, and the conger-eel. Afterwards they exported their fish to all parts of the Mediterranean, and for this purpose they made use of their own vessels, called "druggers," bringing home, in return, from the sea-ports of the Levant, drugs and spices. The men of Dieppe, to the present day, have been chiefly engaged in fishing and navigation; and thus employment is given to those engaged in boat-building, rope and sail making, and cooperage. Oysters are dredged on the banks opposite to Dieppe, and there are beds also in which oysters for other parts of the coast are deposited.

The beds first formed by the Romans have been found necessary, in the rearing of oysters, by all other people. The oyster, when taken fr om its primal bed, is often wanting in that delicacy of taste which renders it so attractive to many; and hence its removal, so commonly practised, in order to the improvement of its quality. The belt of the Bay of Cancale, for example, appears even, solid, and without current, all favourable circumstances for the reproduction of oysters. The bank, too, must be very extensive to allow of the continual fishing that has taken place there without any sensible diminution, or only such as has been speedily supplied. Although the French may be said to have the right of fishing in this bay, yet it was long, and is probably still, open to any who choose to visit it, at certain seasons, commencing at the end of September, and finishing in April.

But a drag, or sort of iron rake, behind which is attached a leathern pouch, is, at proper times, drawn along the surface of the bank by a boat in full sail; and not unfrequently eleven or twelve hundred oysters are taken at a single haul, the fishing being continued as long as it is desirable. The oysters thus obtained are shipped in the ports of Cancale and of Granville, and are then transferred to what are called "parks;" so that the oysters may lose any strong taste they may have acquired from the muddy bottom where they have

been found, and gain the flavour that is so generally agreeable.

Oyster-parks in France are simply reservoirs, more or less extensive, excavated in the soil, or even, as at Etretat, in the rock, and into which the sea-water may be allowed, at pleasure, both to enter at full tide and to run out. These excavations are generally in the form of parallelograms, only a few feet in depth, and having sloping walls. They communicate with the sea by a canal, of greater or less length, with a small flood-gate. When the water is to be changed the gate is opened at the end of a low tide, and the reservoir is filled at high water. The bottom and sides of these parks are covered with pebbles, or very coarse sand, for the mud must be carefully avoided, as injurious to the oyster; while the movement of the water should not be so considerable as to cause any grains of sand to enter the shells.

When thus arranged, the oysters are placed in their natural position on the part of the elevation of the slope, which is sufficiently deep to preserve them from robbers, and yet not so low that they may enter the mud. The walls of the parks are washed, and water is thrown on the oysters to hasten their progress towards an improved condition. Any that die—their death being known by their remaining half open—are immediately thrown away.

The water that is used should always be very clear and limpid. Fresh water, when considerable, from rains or inundations, is not good. Cold is injurious to oysters; and parks are therefore sheltered from the wind. If it be desirable that oysters should be large, and yet very white and clear, the water should be changed at every tide. If, on the contrary, they are wished to be small, and particularly tender, they must be left in the water for a longer or a shorter time, according to the season.

In France oysters having a green tint are the especial favourites of the epicure. Particular effort is therefore made to supply the delicacy. A small reservoir is chosen, into which sea-water is admitted, and where it remains a sufficient time to allow the stones with which it is paved to become green. The greenness is said to be owing to the presence of animalcules, which M. Gaillon thinks penetrate the tissue of the shell-covered creatures; and he terms the minute being chiefly concerned in the transformation that takes place—the *vibrio* of the oyster. The precariousness of the change, however, renders such oysters very dear.

The art of greening oysters is carried to the highest perfection on the coasts of Aunis, whence come the celebrated green oysters of Marennes. The men who employ themselves in this way take no oysters indiscriminately. They choose those which are only a year old,

and especially the progeny of oysters already greened. They catch them with the hand on the rocks, or they detach some large ones taken by the drag and more deeply; they also choose those of the best form. After being placed in parks very carefully kept, for more than two years, green oysters are obtained of a very superior quality.

The oyster beds of Granville have obtained some celebrity. Some years ago no fewer than seventy-two boats were employed in this fishery, and thus much employment was found not only for men, but for women and children. Still more may be said of a place which is passed on the way from Cherbourg to St. Malo. Leaving a granite rock, surmounted by a telegraph, rising out of the flat land, and most probably once an island in the bay of Mont St. Michel, and just where the road reaches the present margin of the bay, the shore is lined by a long scattered village, in which the windmills are almost as numerous as the cottages. Though the sea comes up to the doors twice every day, no boat can approach them because of the shallowness of the water.

On the western shore of this bay is the small fort of Cancale, which may be observed on the right, backed by high cliffs, famed for its oyster-beds, on the Rochers de Cancale. These rocks first grew into reputation about the year 1804, when M. Balaine founded an establishment for the disposal of oysters, and contrived

the means of sending them to Paris in the best possible state in all seasons of the year.

Corseulles, on the same coast, is a small bathing-place and fishing port, facing the terrible rocks of Calvados, and also famous for its oysters. No fewer than six million dozen are annually transported from hence to Paris, by means of light and fast carriages.

It is stated by Dr. Knapp that the number procured annually from the Norman coast for the use of the Channel Islands and English markets, cannot be less than eight hundred thousand tubs, each tub containing two English bushels; and in some years three times that quantity is believed to be procured from those banks during the season. As many as three hundred cutters have been employed in dredging. Milne Edwards and Audouin state that during the year 1828 the total number dredged on the French bank of this region was about fifty-two millions. These French oyster banks, they say, yield a produce valued at from eight hundred thousand to nine hundred thousand francs a year.

A bill has lately been passed by the British parliament for the more effectual security of a former fisheries convention between France and England, by authorising the seizure of oysters and dredges found on board fishing-boats from the 1st of May to the 31st of August, and the seizure of oysters that may be landed during

that interval. The master of each vessel is also made liable to a penalty of three pounds, or imprisonment for ten days, with or without hard labour.

Let us return for a moment to this interesting coast. Mark that line of fishing craft driving out of the embouchure into the sea. The men lie lazily along the beams, dressed in red caps, blue or brown jackets, and little petticoats resembling loose small-clothes; while their vessel is dragged along by the women, singing in chorus, and keeping time with head and foot as they perform a kind of running march to the end of the pier. Here they throw the rope off their shoulders with a shrill shout, and stand for an instant to gaze after their husbands, fathers, and brothers. These no sooner feel that they are launched, than they start up from their posture of lordly ease, for now their turn has come. At once they fling out their mainsail to the wind, and, as the trembling helm is seized, the little vessel, apparently empty, even of ballast, goes forth dancing among the waves.

Some fishermen, it may be observed, embark from the ports of French Flanders, Normandy, and, most of all, of Brittany, who are engaged during the earlier months of the year; and those who do not perish amidst the storms that assail them, return in September or October. Their earnings, some four or five hundred francs, assist them through the winter, and are increased

by fishing off the coast, or by making nets for those who send out the fishing vessels, working up the raw material with which the latter supply them; they are paid two or three hundred francs for their labour.

Those who fish along the coast—at some of whom we have just glanced—though exposed, perhaps, to fewer risks than those who go to the whale fishery off Cape Horn, or to the northern cod fishery,—are generally worse off in other respects. Landernau, Belle-isle, and some other ports on the coast of Brittany are the chief stations for the sardine fishery, which employs about fifteen hundred boats, each manned with a crew of four, the master, an experienced seaman, a novice, and a boy; but these have hardly enough to meet the first wants of nature, and on some parts of the coast their distress is extreme.

The men engaged in the oyster-fishery do not suffer, like many of their race, from actual want. These have the article they bring to market always within certain reach. The oyster is found along the whole north coast of France, but is nowhere so plentiful as at Cancale and Grandville. Upwards of one hundred millions are taken up every year, and yet they seem as inexhaustible as ever. The oyster-fishery produces about fifteen millions of francs (about £600,000) a year, and hence diffuses at these two ports the means of easy subsistence. The oyster-dredgers are, generally, better

clothed, lodged, and fed than any other class of seamen. The fishings are carried on with most activity during winter, and, despite the severity of the weather, it is not unusual for the men to spend several successive nights at sea.

The fishermen's wives, strongly made, with clear complexions and red-rose cheeks, having their caps closely fitted to the head, some of them with long lappets, and wearing thick coarse petticoats of scarlet or blue, are especially conspicuous wherever they appear, and no less worthy of the visitor's attention. If they regard the sea as the men's province, they feel that the land is their own. When the tide is ebbing, they may be seen in ranks, with bare feet and legs, pursuing steadily the retreating waves, and filling their baskets with oysters and other shell creatures.

To these, however, they do not restrict their labours. They are the sellers of all the fish that is brought to the shores. The sea-harvests gained by their own "kith and kin" are entirely at their service, for the fisher's wife in France is literally his "better-half," not only taking charge of his household, but of the money she makes by her sales, and giving *him* just what she thinks he *ought* to want. And then it is amusing to see her, standing in the group formed on the sea-shore of others of the same class, immediately after the arrival of the fishing-vessels. A heap of fish is lying on the sand, and the auctioneer is taking their biddings for a specified

lot. And eager and busy are they as he vociferates, "*Deux francs*"—"*deux francs et deux sous*"—"*deux francs et quatre sous*"—"*deux francs et demi,*" while there is the usual chuckling when a successful purchase is made, and the no less common disposition apparent in some malcontent, who murmurs on failure "*trop-cher—trop-cher!*"

The Faubourg de Pollet, on the west of Dieppe, is worthy of a visit by those who like to study humanity. There was formerly an old bridge across the harbour by which this quarter might be reached; but, as it has been pulled down, in order not to check the force of the waters discharged from the basin behind, the only course now to be taken is that of making the circuit of the harbour. Here are to be found a singular race of fishermen and their families, still attired in the finery of their grandfathers: a cap of black velvet adorned with an aigrette of spun glass, a surcoat of dark blue cloth, laced on the seams with a light blue tissue, a neckcloth with silver tassels, a waistcoat embroidered with flowers, laced small clothes, silk stockings, and cloth shoes with silver buckles. They accept the name of sea-wolves, and are proud of being reputed to live not only on, but in and under water. The Polletais pique themselves on marrying among their own people, wearing a wide blue petticoat in the Dutch fashion, and tying their surcoat with ribbons. But we must now resume the history of Silver-shell.

CHAPTER VIII.

THE PERILS OF SILVER-SHELL.

OYSTERS, THE PREY OF QUADRUPEDS—THE OYSTER-CATCHER—SEA-WORMS—THE CLIONA, A PARASITIC SPONGE—THE SEA-STAR.

SOME creatures are adapted to a direct and powerful antagonism. One instance of this could never be forgotten by Mr. Beale.* He was searching for shells upon the rocks of the Bonin Islands, a series of groups in the North Pacific, when he was greatly astonished on seeing at his feet a most extraordinary looking animal, crawling towards the surf, which it had only just left. It was creeping on its eight legs, which, being of a soft and flexible nature, bent considerably under the weight of its body, so that it only rose a small distance from the rocks. Mr. Beale endeavoured to stop it by pressing on one of its legs with his foot; but, although he used considerable force for that purpose, its strength was so great, that it several times liberated its member, in spite of all the efforts he could employ on the wet and slippery rocks. He then laid hold of one of its arms with his hand, and held it firmly, so that the limb appeared as if, by these united efforts, it would be torn

* "Natural History and Fishery of the Sperm Whale."

asunder. Mr. Beale then gave it a powerful jerk, wishing to disengage it from the rocks to which it clung so forcibly. This effort the creature effectually resisted; it lifted its head, with its large projecting eyes, and, loosing its hold of the rocks, suddenly sprang on Mr. Beale's arm, which he had previously bared to the shoulder for the purpose of thrusting it into the holes of rocks after shells, and clung to it with great power, endeavouring to get its beak, which Mr. Beale could now see between the roots of its arms, in a position to bite. Mr. Beale declares that a sensation of horror crept over his whole frame when he found that this monstrous animal had fixed itself so firmly on his arm. Its cold, slimy grasp became extremely sickening, and he loudly called to the captain of the vessel, who was also searching for shells at some distance, to come and release him from his disgusting assailant. The captain quickly came, and, taking Mr. Beale down to the boat, during which time the latter was employed in keeping the beak of the creature away from his hand, quickly released him; but only by destroying his tormentor with the boat-knife, when he disengaged it by portions at a time. This creature must have measured across its expanded arms about four feet, whilst its body did not exceed in size a large clenched hand.

Animals of this kind, classed among oysters as mollusca, from the softness of their bodies, and therefore

related to Silver-shell as the species to the genus, are sometimes found on the British shores. They are a kind of Octopus.* The common name for one of them is the "poulpe;" in ancient times it was called "many-feet."

Its feet, appended to the head, are not intended only to aid it in walking or in swimming, by the contractions of the connecting membrane; they are used also for the seizure of prey. So powerfully armed, the poulpe becomes one of the most destructive inhabitants of the sea; for neither superior strength, nor activity, nor even defensive armour, is sufficient to save its victims from the ruthless ferocity of such a foe. A hundred and twenty pairs of suckers, more perfect and efficacious than the cupping-glasses of art, crowd the lower surface of every one of the eight flexible arms. If the poulpe only reach its prey, it is enough; if once a few of these tenacious suckers get firm hold, the swiftness of the fish is unavailing, as it is soon trammelled on all sides by the firmly-holding arms, and dragged to the mouth of its destroyer. Even the shell of the lobster or crab is a vain defence; the hard and crooked beak, from which Mr. Beale felt in danger, easily breaks to pieces the frail armour.

How well fitted it is for escape as well as attack, the following fact will show:—A naturalist attempted with

* O. vulgaris.

a hand-net to catch an octopus that was floating within sight, with its long and flexible arms entwined round a fish, which it was tearing to pieces with its sharp hawk's bill. The animal allowed the net to approach within a short distance of it before it relinquished its prey, when, in an instant, it relaxed its thousand suckers, sent forth a flood of inky fluid, and, under cover of the cloud it had created, made a vigorous and rapid retreat. Strange as this power is, which it possesses with all cuttle fishes, it has another which is equally or still more remarkable. The chameleon has long been known to change its colour according to circumstances, thus harmonising with the substance on which it rests; and recent observations show that a similarity in structure prepares these creatures for similar metamorphoses.

The oyster, in common with many of the mollusca, is eaten with pleasure by rich and poor; but what would be said of a disposition to banquet on the poulpe? And yet Dr. Johnston gives us the story of a Greek who ate this creature:—

> "Of all fish-eaters,
> None, sure, excelled the lyric bard Philoxenus.
> 'T was a prodigious twist! At Syracuse
> Fate threw him on the fish call'd 'many-feet.'
> He purchased it and drest it; and the whole,
> Bate me the head, formed but a single swallow."

No wonder that "a crudity ensued," and that the visit of "the doctor" was deemed advisable.

That a creature so formidable as the poulpe should

have enemies might naturally be expected; violence produces violence, and antagonism antagonism, whether among animals or men; but it is equally true that, in the absence of such qualities, there may be the endurance of malignant assaults, and of repeated and grievous injuries. Silver-shell, for example, lying on its rocky bed, was free from all appearance of intruding on the comfort, much less the lives, of creatures in its neighbourhood; it might be taken, indeed, as the very symbol of harmlessness; but still there were many who endeavoured to make it a prey.

Nor was this any peculiar condition: wherever oysters are found they are beset by perils. Thus, in Africa and other parts of the world where monkeys abound, one of these animals has been seen to place a stone between the two valves of an oyster-shell, and then securely to drag forth the little victim. Dampier observed another device practised by some preacher monkeys: these creatures took up oysters from the beach, laid them on stones, and beat them with another until the shells were demolished. La Loubère states that the monkeys of the Cape of Good Hope amuse themselves by transporting shells from the shore to the mountain-tops, where they devour the contents at their leisure. Even the fox, pressed by hunger, will eat oysters, and the raccoon, when near the shore, eagerly devours them. Cunningham*

* "New South Wales."

says this creature watches for the opening of the shells, and then, putting in its paw, tears out the in-dwellers.

Carew * mentions an oyster that closed its shells on three mice. Some years ago a dish of oysters was laid in a cellar of the New Inn at Ashburton, when one of them, soon opening its shell, was instantly pounced on by two mice, only, however, to be as quickly crushed by the valves. The oyster, with the two mice dangling from its shell, was long exhibited there as a curiosity.

According to the "Inverness Courier," a still stranger capture was made by a molluscous animal. At Ardinisgain, on Loch Carron, mussels of an immense size are found, some of them nearly as large as a man's shoe. One of these mussels being left exposed by the retiring tide, naturally enough opened its yawning mouth when the sunbeams fell upon it, and in this attitude it was approached by a prowling fox, whose hunger was sharper than his discretion. The temptation was too strong for Reynard to withstand; but no sooner had he thrust in his tongue between the accommodating shells than they closed upon it, and he was thus held fast till drowned by the returning tide.

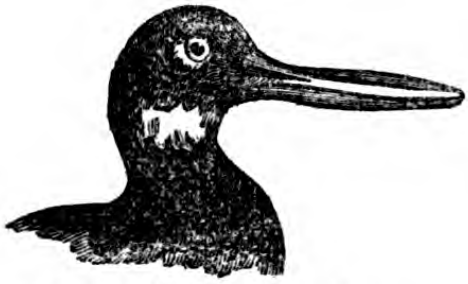
Barrow states in his account of the Cape, that there is scarcely a sheltered cavern in the sides of the Table Mountain, rising immediately from the sea, where living mollusks may not be found on any day of the year.

* "History of Cornwall."

Hither therefore crows, vultures, and aquatic birds come, detach oysters and similar creatures from the rocks, mount with them in the air, and, letting them fall, secure them as a prey. The story of the bald head of a philosopher being mistaken for a stone by one of these birds, who cracked the oyster by its fall, but killed the sage, is not, therefore, altogether a fable. "In a cavern at Muswell Bay," says Barrow, "I distinguished some thousands of birds, and found as many thousands of living shell-fish scattered on the surface of a heap of shells, that, for aught I know, might have filled many thousand waggons."

The shores of Normandy, like other coasts, are not

Fig. 11.



Head of the oyster-catcher.

free from the enemies of the oyster. One of its enemies is a bird, which delights in the rocks, and reefs, and naked strands. When the sea rises it retires before the ebb, and then follows the reflux, groping in the sand for various marine animals, among which are oysters, its special favourites. From this circumstance it is

called the oyster-catcher, and fully is it entitled to its name.

So well adapted is its bill not only to raise the limpet from the rock, but to force open the valves of the oyster, as to lead Derham long since to remark:—"The Author of Nature seems to have framed it peculiarly for that use." And it is not merely interesting, but instructive, to watch a bird of this kind detaching the oyster from its rocky bed; digging up cockles with its powerful bill; and separating mussels from the scarps. If the creatures are small, the oyster-catcher swallows them whole; but, if it finds one too large to be disposed of at once, the bird digs away at its valves till it opens them, and then, devouring the little animal, leaves its shell on the shore. Often did these birds visit the shore where Silver-shell found a home; often did they banquet on the soft-bodied creatures scattered over its surface; often did they approach the very spot where it was lying, and tear away some of its neighbours for a meal; but to none of their ravages did Silver-shell become a victim.

But there are other enemies of these creatures. Such are the sea-worms, some of which are of great beauty, which bore through the oyster-shell at all points. Here, then, is a very remarkable process, which may naturally give rise to the question—"How can a soft-bodied sea-worm bore through so hard a substance as an

oyster-shell?" and the mode adopted is well worthy of notice. There is reason to believe that sea-worms accomplish this task by means of flinty teeth, which stud their ribbon-shaped tongues. They must be actually beheld in order to excite due admiration. We cannot construct a model of them, even of a much larger size; for how can we imitate the life with which they are endowed, or the instinct that regulates their movements? These microscopic teeth are beautiful objects; withal constant in their shape, and arranged in transverse rows on the tongue. Now, one of these sea-worms made an aperture in Silver-shell's dwelling; and what did it do? It deposited some pearly matter between its tender body and the mouth of the invader, and thus compelled him to beat a retreat.

Some of its neighbours were not so fortunate; for in the holes drilled by the sea-worms a preparation is often made for the assaults of a parasitical sponge, which insinuates itself and eats further than its predecessor into the oyster, causing the softer parts of the shell to rot away, and spreading through the whole substance of the oyster like a dry rot in wood, until vitality is destroyed and its loosened shell becomes detached and empty on the waters.

Such is the Cliona (12), of which Mr. Hancock has determined upwards of fifty species, all inhabiting more or less diversified chambers in calcareous substances; three

or four of which are found in the common oyster. Of these twelve belong to the British seas; the rest exist in various parts of the world. They are most numerous in warm climates; none have been yet procured from the polar regions.

Fig. 12.

The Cliona.

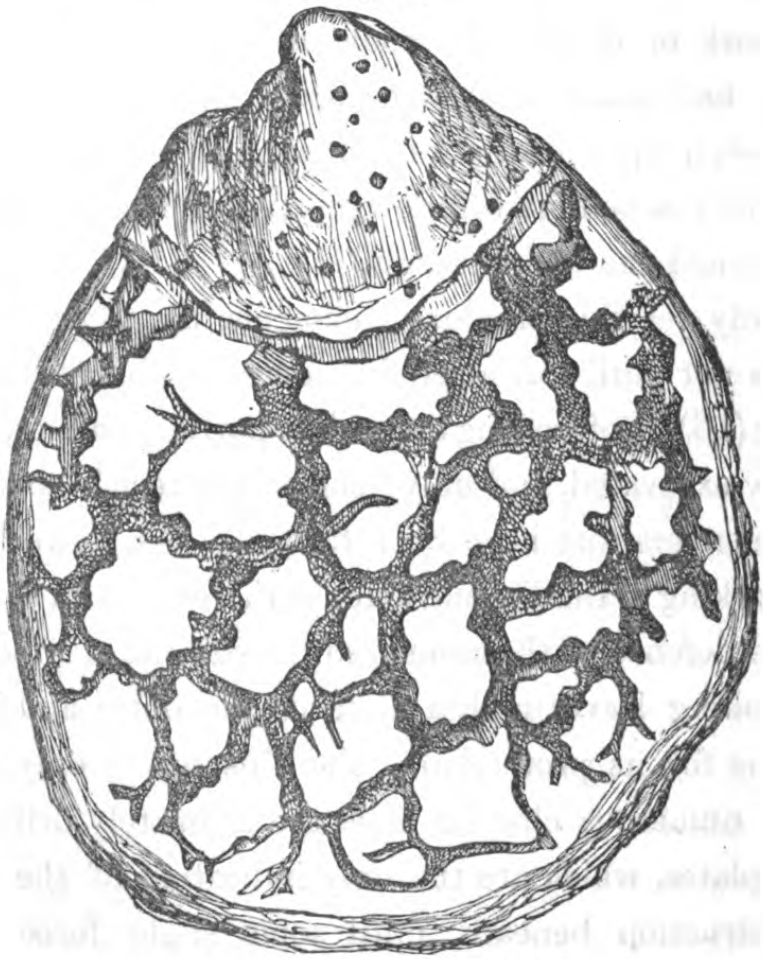
On the coast of Northumberland the surface of almost every piece of limestone near low-water mark is riddled by cliona; old shells, whether univalves or bivalves, are filled with it. "I have seen," says that intelligent observer,

"half-grown living oysters with cliona extending from the umbones almost to the ventral margin, and in one or two instances it even reaches that margin. In these cases it is evident that the growth of the sponge must have been more rapid than that of the shell, for the work of destruction could not commence until the oyster had attained to some size; and, had its growth been even equal to that of the sponge, the shell ought to have reached its full development before the sponge had gained the lower margin."

Only let this creature commence its attack, and it pauses not until it has acted throughout the entire substance (13). Before long the middle portion is almost completely excavated, and only small pieces remain to divide the chambers that have been formed. As, however, in the working of the Thames Tunnel, there was a "a shield" for the defence of the miners, so the parasite at which we are looking leaves a thin plate on the outer and inner surfaces for its protection. Yet this serves only for a time; numerous circular holes are ultimately drilled in these plates, which are the only indication of the work of destruction beneath, until some slight force from without ruptures the protecting walls, or the increasing growth of the tenant bursts them asunder. The whole system of elaborately wrought chambers, becoming exposed, soon gives way, and the cliona, Samson-like, perishes amidst the ruin produced by its own energy.

The question naturally arises, How can such cavities be produced? Evidently by some instrument with which it is provided, like the whelk, which with its proboscis can bore holes in shells, or by a solvent. On this

Fig. 13.



Cells formed by the Cliona.

point Mr. Hancock remarks :—" The extreme simplicity of the organic structure of these beings forbids a belief in the existence of a special secreting apparatus. If, therefore, a solvent fluid be the agent, it must be sup-

posed to exude from the entire surface of this humble animal. The character of the excavations would also lead to the same conclusion; for it is evident that the form of the sponge is influential in determining that of the chambers it inhabits. The test, then, can be easily applied, and, were the secretion of an acid nature, there could be little difficulty, one would think, in detecting it, particularly as cliona appears to work perpetually, at least so long as it continues to grow. I have completely failed, however, in detecting an acid." The calcareous particles, which may generally be observed strewed along the branched channels in the shell of the oyster, when inhabited by cliona, afford, as Mr. Hancock observes, a pretty strong proof of mechanical agency.

This, however, he proceeds, we think satisfactorily, to describe; for, if a portion of the superficial covering of the animal be carefully removed, and placed between plates of glass, with the external surface uppermost, and treated with strong nitric acid, large crystalline bodies of a peculiar character are scattered over it. These bodies are of a pale straw colour, and of the most brilliant lustre and gem-like beauty, the largest measuring one six-hundredth of an inch across. They are mostly irregularly six-sided, depressed, and scale-like, but stout, and frequently thickened in the centre, the upper surface being covered with numerous elevated, lozenge-shaped points, each generally having an expanded base,

of a squarish form, slightly raised above the common surface (14). These bodies are frequently congregated into groups, and are occasionally placed together side by side. Strong nitric acid does not in the least affect them after many days' immersion, the sharp angularity of the elevated points remaining unimpaired, and their

Fig. 14.

Spiculæ of the Cliona.

brilliancy undiminished. From these facts, and from the manner in which these bodies reflect light, there can be little doubt that they are composed of silex, or of some other substance equally dense.

Nor is this all: other crystalline bodies crowd the surface, which are as brilliant as the former, and, like them, resist strong nitric acid. These are mostly

minute, being generally one six-thousandth of an inch wide; they vary, however, considerably in size, and are occasionally very much larger; they are mostly angulated, have an expanded scale-like base, and much resemble the lozenge-shaped points of the larger bodies. These smaller ones are crowded together into dense masses; occasionally they become united by their expanded bases, and then the mass has a considerable resemblance to the larger forms.

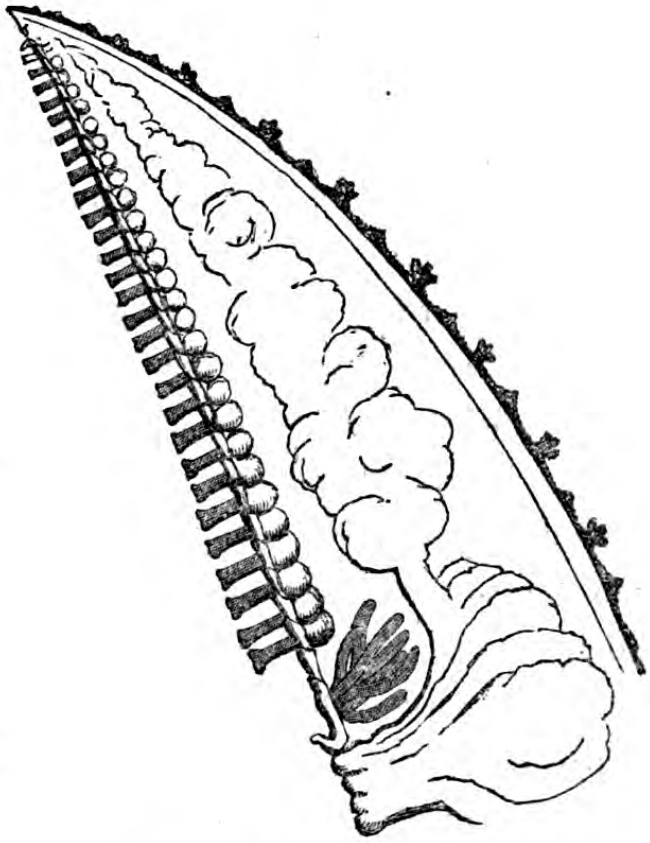
All, then, that is required is that each granule, or cluster of granules, should be set in motion; nor would anything more than limited action be necessary. The motion of cilia, according to Ehrenberg, is produced by the contractile tissue on which they are based; and if the silicious bodies now described are connected with a similar tissue, the whole surface of the sponge would be composed of thousands of minute drills, quite able to cut into the hardest calcareous substances.* Their power, however, Silver-shell did not experience.

There were, however, multitudes of other creatures intent on its destruction. Such are the sea-stars, often, but erroneously, called star-fishes, which attracted attention from the earliest times. Aristotle and Pliny named them *stellæ marinæ*, from their resemblance to the pictured form of the stars of heaven. Their ordinary figure excited the inquiry of Sir Thomas Brown:

* "Annals of Nat. Hist.," second series, vol. iii., pp. 321-348.

"Why, among sea-stars, delighteth nature chiefly in five points?" And again: "By the same number five doth nature divide the circle of the sea-star, and in that number and order disposeth those elegant semicircles or dental sockets and eggs in the sea-hog."

Fig. 15.



Section of the Ray of a Sea-Star.

Without indulging in such curious speculations, we shall find abundant materials of interest in the careful examination of one of the sea-stars. Let no one, walking

on the shore, be afraid to take up the first of them that comes within reach. The ancient naturalists, indeed, asserted that sea-stars were so hot that they could consume all they touched; and Aldrovandus and Albertus declared that whatever they were brought into contact with they *cooked;* but, as usual, they advanced no proof.

Others have affirmed that the sea-stars sting and blister the fingers when touched: a notion which probably led to their receiving the strange name of "Devil's-fingers." As Dr. Drummond was drying some in his garden, at Bangor, in the county of Down, he heard some children on the other side of the hedge exclaim, "What is the gentleman ganging to do with the bad man's hands? Is he ganging to eat the bad man's hands, do you think?"

Now, such a superstition is not surprising, when no less a person than Hippocrates, and some of his successors, considered sea-stars to be a cure for hysteria and epilepsy, when taken in a decoction of brassica and sweet wine. But it would be difficult, if not impossible, to establish the stinging power of these creatures. Certain it is, that Professor E. Forbes declares that he has handled thousands of them without suffering the slightest irritation of the skin; and in this experience that of every naturalist we have known or heard of fully coincides.

On taking up a sea-star, a glance at its structure is

desirable. Like many other creatures, it possesses no brain or nervous centre, but merely a nervous cord, which encircles the mouth, and thence radiates into the five points or rays ; each of these, too, even in its simplicity, is exquisitely complex. The skeleton, which is of a calcareous nature, is composed not merely of scores, but hundreds of minute portions, exactly fitted to each other in a symmetrical pattern. Harvey says it resembles an elaborate piece of crochet-work ; but there is no comparison between the products of finite and of infinite power. If a sea-star be dropped into fresh water it will act as a poison, and the creature will instantly die ; it may then lie there for a little time, be dipped for a moment in boiling water, and afterwards dried—as it may be speedily in the sunshine, or in a current of air. If it be placed in an ant-hill, its busy inmates will soon expose to view, for the cabinet of the possessor, a perfect skeleton.

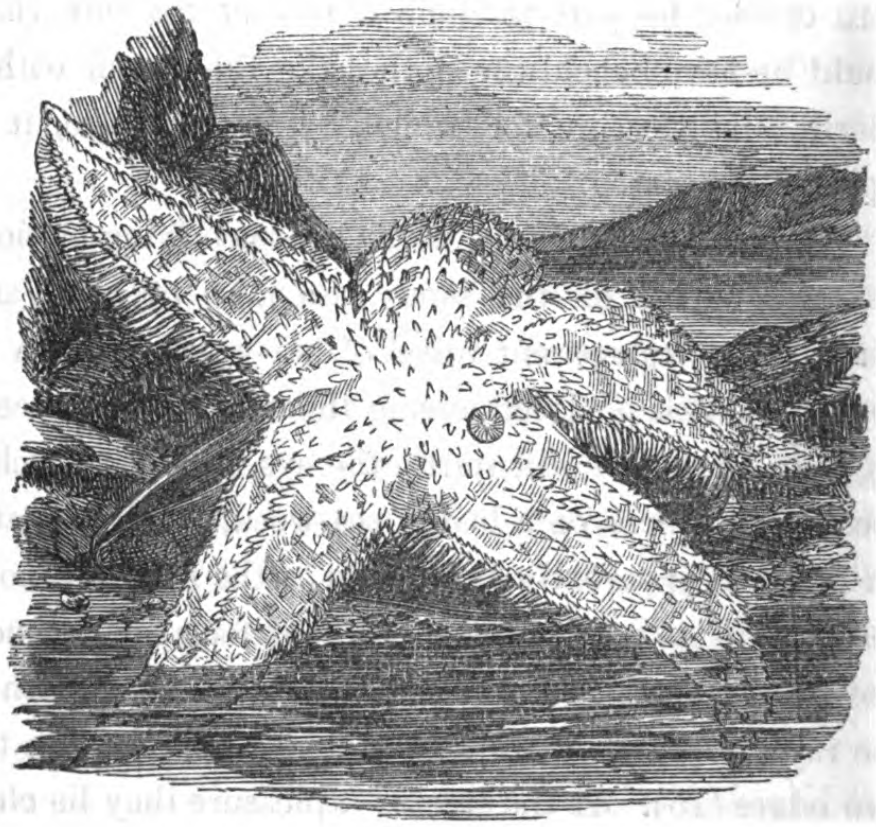
The sea-star appears to be a helpless animal. No power would seem less likely for it to have than that of motion. One might think it doomed to live and die in abject solitude. But let us guard against premature judgments. Buffon looked on a sloth, as it lay on the ground, pronounced it to be an ill-shapen creature, passing its days in misery, and even affirmed that it was "a blot on the fair face of creation." He saw the animal, however, in circumstances where it was not

designed to be, like a fish out of water, with no opportunity for the play of its powers, and therefore in a state of discomfort and restlessness. Had the naturalist been wandering amidst the wilds of Guiana, and had a sloth crossed his path to climb a tree at his side, then would he have beheld the sloth make the ascent with a celerity and pleasure for which, by its structure, it is especially prepared.

And so, if the sea-star, which has been lying motionless and supine on the sandy beach, be taken up and placed in a transparent vessel of sea-water, or even in one of the little pools left among the rocks by the receding tide, the result will startle the eye unused to such a spectacle. There, on a bed of sea-weed, lies the sea-star on its back, apparently as helpless as the little anemone that may be its companion. But, look for a few seconds, and little tubercles issue from the under sides of each of the rays, where they are longitudinally arranged on the two edges (15). At the creature's pleasure they lie close to the ray, and equally so are they filled with a fluid with which it is provided, causing the tubercles to lengthen themselves into sucker-like feet, which wave backwards and forwards as if the creature were determining the course it would take. And, now, bending down in the direction nearest the rock, it fastens the first suckers that reach it, that by contraction it may bring down a portion of the body; this allows, of course, other feet

to touch the bottom, to which they adhere; and so the sea-star proceeds, until, by the united action of its suckers, it is restored to its rightful position.

Fig 16.



The Sea-Star and the Oyster.

It is a pleasant sight when one of these creatures is placed in a glass vessel containing sea-water, and its various movements are attentively watched. Then it will be seen that it has, in fact, several hundreds of these sucker-like legs, each one a perfect tube, which, when the animal wishes, becomes filled and extended, while

the fluid is as readily withdrawn into the vesicles of the body. We have heard of Argus with his hundred eyes, and of Briareus with his hundred hands, but we are not told that each eye could find a separate object to contemplate, or that each hand could be employed in some distinct manipulation. But it seems as if each leg had an independent action, being capable of darting out in various directions, as if, like a living lever, it were seeking the best fulcrum, in order to render its highest service to the movement that is now taking place.

In the possession of a sea-star, it is very easy to witness its voracity; for only let a morsel of fish, or of a mollusk, be placed within reach, and thither it will go, clasping the prey as soon as it is gained with its rays, and absorbing it into the stomach, to which there is an opening on the under side. In the eagerness it thus manifests it fulfils its appointed destiny. It is one of the scavengers of nature, ordinarily working silently in the deep waters, devouring, from tide to tide, the ever-accumulating matter which, left undisturbed, would destroy every species of life. So strong is the predilection of these creatures for garbage, that the angler has frequently wished they would suspend their vocation, since scarcely has the baited hook sank to the bottom of the water than he has felt "a bite," only to find that he has caught a sea-star—a luckless beginning, perhaps, of a series of disappointments the same in kind.

Might we suggest a banquet for a party of sea-stars, it should be the contents of an oyster barrel, without any specification of the spot where it was filled. The large and coarse oysters of Liverpool and Bristol would doubtless be as much enjoyed as the most sleek and delicate "Miltons" or "Colchesters." "But how," it may be asked, "can their shells be opened? In what way can the resistance of the adductor muscles be overcome? Where is the oyster-knife of the sea-star for the banquet you propose?"

And assuredly it is not, as Appian imagined, in one of its rays. The supposition of the ancients that the sea-star, like a besieging force, took up a position that would secure the best point of attack, and, seizing the moment in which the oyster unwarily opened, however slightly, the valves of his shell, thrust in a ray, gradually insinuated its whole body, and so devoured the assailed—a notion which we have seen to have been also entertained by Bishop Spratt—has proved to be utterly fabulous. For, having reached an oyster by its locomotive power, and placed itself, as represented in the engraving (16), on its prey, it pours out a paralysing fluid, and instils it between the shells; as soon as they are open the stomach is thrust in, and the captive is devoured, however long his house may have been his castle. Such is the fact established by the actual observations of M. Deslongchamps.

A sea-star was found clinging round a *mactra*, which

was pierced with a hole, through which the creature had inserted a sucker, and this aperture was attributed to the invader. But we have no proof that this animal possesses any boring power. The probability is, therefore, as Professor Forbes suggests, that the hole was pierced by one of those marine worms we have already contemplated, and that the sea-star, in this instance, was merely " sounding with its sucker the prospect of a meal."

No such experiment was made on Silver-shell: escaping the ravages of birds and of other assailants of its race, it remained secure from the attacks of sea-stars, and thus allowed us to trace its subsequent history.

CHAPTER IX.

SILVER-SHELL, THE NORMAN, BECOMES "A NATIVE."

OYSTER-BEDS OF GREAT BRITAIN—TRANSFERENCE OF SILVER-SHELL TO THE ESSEX COAST—THE FOOD OF THE OYSTER—THE CHANGES OF SILVER-SHELL.

WHEN the Romans taught the Britons the construction of oyster-beds, they made a return in kind for some of the luxuries they had derived from our shores. Oyster-beds have long been, and are still, discoverable in various parts of Great Britain.

The oyster-fishery of most consequence in Scotland is that of the Frith of Forth. The oyster-beds extend there about twenty miles, from the island of Mecera to Cockenzie. The best are procured near Burntisland, on a bed belonging to the Earl of Morton, on the rocky ground opposite Porto Bello, and at Preston Pans. Capital oysters may sometimes be bought in Edinburgh at a shilling a hundred.

In some parts of Ireland oysters are plentiful. Malahide, Carlingford, Lissadell, and Burren furnish respectively their quota of oysters for the Dublin market, while there are few places around the coast of Ireland destitute of the rock oyster, whose qualities

deserve no particular mention. The Carlingford oyster is highly esteemed; it is said "to want nothing that it should have, and to have nothing it should want." It is round and rough as a walnut; opens white, fat, and juicy; it is neither too large nor too small, and blends with extreme delicacy the racy sharpness of the sea with the milder flavour of the fish. But there can be no dispute concerning tastes, and the Malahide, the Burren, and the Lissadell have all their respective admirers.

Arklow has become famous as the nursery of Irish oysters. From hence, as well as from Wexford, the artificial oyster-beds are abundantly supplied with stock, which, being furnished by the fishermen at so much a bushel, and laid upon the beds for two or three years, become well-conditioned and full-flavoured.

Artificial beds are said to have been commenced about the year 1700, by the Kent and Essex Company of Dredgers, for keeping up a supply for the London markets. These have been continued to the present day, and are likely to be perpetuated, since oysters from hence are in incessant demand. The beds in the channel of the river Colne alone extend over a space of two or three miles in extent, between the villages of Wivenhoe and Brightlingsea. They are the property of the Corporation of Colchester, yielding to it a valuable revenue by grants of licenses for the privilege of dredging upon them. The dredgermen are presided over by a jury,

formed from among their own members, for the enacting and sustaining of the general and bye-laws of the fishery.

As the number of oysters in these beds is constantly suffering diminution to supply the market, it is necessary that a communication should be kept up with Corseulles, Granville, and Cancale, on the Norman coast, from whence they can be readily obtained. Silver-shell had long been reclining on its native bed, in peril from the ordinary assailants of its race, yet happily secure, when, a demand being made for the Essex coast, it was, with a multitude of others, dredged up and put on board a French vessel. Fixed to one spot, as it had been, from its first descent from the surface of the waves, and its alighting on the rock beneath, it was now, with its companions, wafted across the Channel, with none of the discomfort so commonly experienced in the transit by those who regard it as a delicacy, but to whom even the choicest oyster would then be disgusting.

Equally free was Silver-shell from all the emotions of human kind on a first visit to England. As there were no regrets on separation from its native land, so no joy arose as the vessel neared our far-famed shores. It was as calm when borne away from the vessel as when carried into it, and as indifferent to all the events of the future as it had been to all the adventures of the past.

No time was lost in placing it in its second bed, a

few feet deep in water, where it was destined to pass an important portion of its life. The great object of those who had it, with numbers more, in charge, was that of the grazier when he puts his sheep or oxen into a rich meadow ;—that Silver-shell should *feed;* and that it did with an eager but satiable appetite.

It is difficult to conceive of the abundance of animal life without taking a drop of water, not merely from the stagnant pool, but from the river, the lake, or the vast ocean itself, and placing it on the field of the microscope. Then countless living beings will be seen moving rapidly in all directions, yet without jostling one another in their little world, but displaying sagacity in their diversified gambols. That such a multitude should here find a home may well awaken profound astonishment.

But the lens of the microscope may be exchanged for one of higher power, and now another population of that drop of water is discoverable which was previously unseen. These are of a smaller race ; sparrows to eagles, lambs to elephants, yet not less active in their movements, nor at all inferior in instinctive endowment.

Again let the power of the lens be increased, and, though another world is discoverable, let it not be supposed that the final aggregate of animal life in that drop of water has even now been disclosed. The sense may ache under the pressure of its task, but it has not per-

ceived all the life that is there; nor is success to be confidently expected, even were the microscopes of the future to be made as superior to the present as they are to the optical instruments of the past, and plied with the utmost zeal and perseverance. Cavanilles, the celebrated Spanish botanist, thought of being able to *see* grass grow, but neither his instruments nor his eyes ever attained this power. Could it be possessed, its discoveries would doubtless be utterly incalculable.

The abundance of animal life is manifest by Dr. Scoresby's account of his sailing in the Greenland Seas, where he sometimes passed through stripes of blue, green, olive-green, and transparent blue, in the short space of ten minutes. During a run of fifty leagues the sea was constantly of an olive-green colour, remarkably tinted, but on one afternoon it changed to transparent blue. The inhabitants of these waters proved to be well deserving examination.

The green appearance of the sea in these latitudes was then demonstrated to be caused by millions of small marine creatures. A calculation of their number in the space of two miles square, and two hundred and fifty fathoms deep, gave an amount of 23,888,000,000,000. On one occasion the sea was observed to be coloured in veins and patches of a brown colour, and sometimes with a yellowish-green; and this water, on being examined by the microscope, appeared swarming with minute

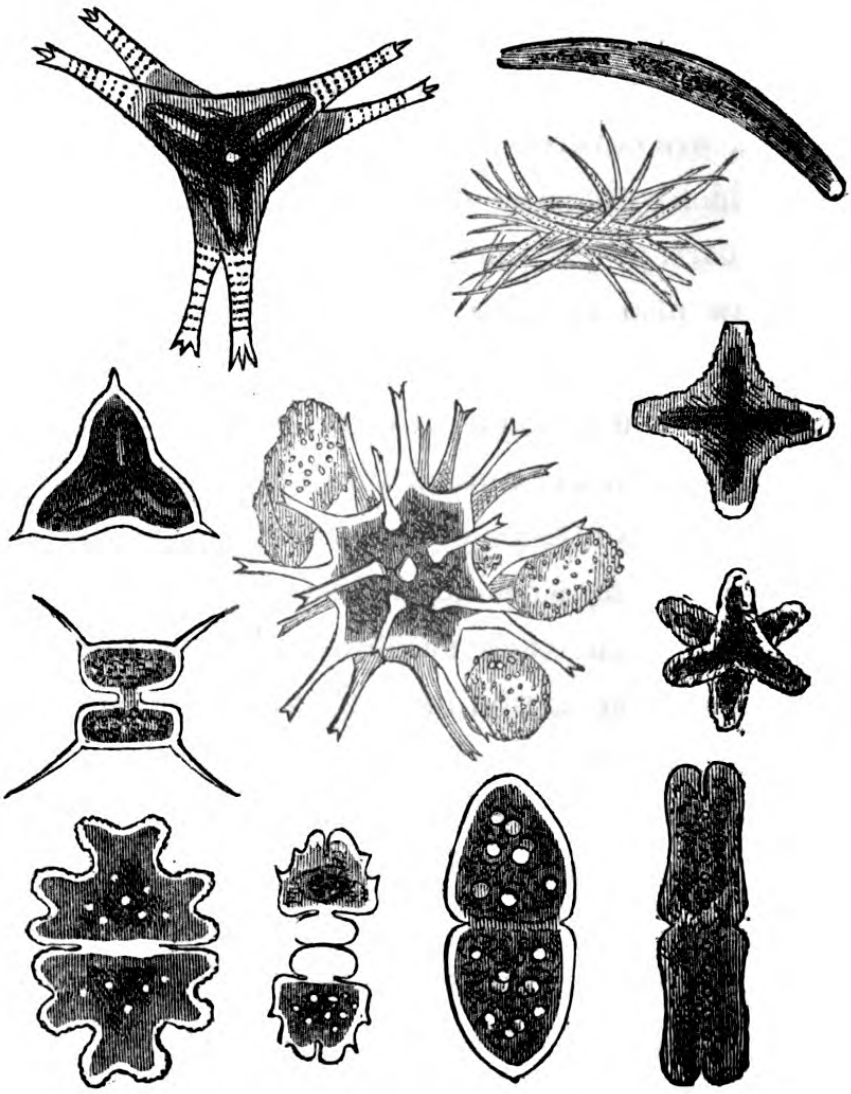
marine creatures. A drop of this water contained 26,500 animalcules. Hence, reckoning sixty drops to a dram, there would be a number in a gallon of water exceeding, by one-half, the population of the globe on which we live.

Animalcules of the simplest class and most primitive structure, are covered with cilia—the extremely minute hairs of which we have spoken—which, acting like so many dwarfish oars, propel them along with amazing celerity. They serve also another purpose, producing, when an animalcule fixes itself, circular eddies or whirlpools in the water, whose action is so vigorous, that, as Leuwenhoeck remarks, many animalcules possessed of tolerably strong powers of locomotion, when they came within those made by the wheel animalcule, were whirled about for some time and then swallowed. And precisely in the same way the action of Silver-shell's cilia brought its food to its lips.

In addition to the animalcules which provided for it constant banquet, a variety was given to its provision by the minute plants called the *Desmidiæ*, which inhabit the fresh water, and are akin to the *Diatomaceæ*, a great number of which are marine. Mr. Ralfs has exhibited many of them to view in his beautiful monograph, some of which appear in our present engraving (17). The forms of these plants are exceedingly strange. They are those of circles, triangles, parallelograms, and other

mathematical figures, not to be found, indeed, in any other plants, while their surface is often most elaborately sculptured.

Fig. 17.



Desmidiæ.

Feeding, as Silver-shell did from day to day, it presented an example which even some among us might

imitate to advantage. Diverse were the substances offered by the waters to its acceptance, yet it exercised a careful scrutiny, rejecting peremptorily whatever would prove noxious, and imbibing with pleasure all that was nutritious. What a diminution would there be of the dyspetic, with pallid faces and trembling limbs, of doctors' fees, and of "prescriptions carefully prepared" by the "pharmaceutical chemists," were an oyster's instinctive wisdom aspired after and zealously sought by those of the noblest mental and moral endowments!

Lying on its bed from day to day, occasionally opening its valves and imbibing the waters which brought to it so plenteously the animalcules and the desmidiæ, its proper food, Silver-shell was in as good health and spirits as it is possible for an oyster to be. Two changes were, meanwhile, gradually passing upon it. Norman as it was, it became a "native." An alien is incapable of inheriting lands in England till naturalised by act of parliament, and in Scotland he is not entitled to acquire or to succeed to property; but Silver-shell, superior in advantage to a foreigner among us, enjoyed the property which had fallen to its lot without any legal dispute; much less was an act of parliament necessary to prevent its molestation. It had all the privileges of those who preceded it, and when these were resigned they remained unaffected for its successors.

The other change it was experiencing became in due time palpable to the eye. About some of human kind there is a native coarseness which is repulsive to those accustomed to a gentler race; and so, it must be candidly confessed, was it with Silver-shell, when it was brought hither from the Norman coast; but as, under proper treatment, the ungainly boy becomes what is called "a genteel youth," so Silver-shell was now gradually acquiring a sleekness of form and a delicacy of character which improved its appearance and added to its worth.

The only attention received by Silver-shell and its companions was on being occasionally taken up from their beds, well shaken together, cleansed from whatever adhered to their shells,—a service which was aided by the action of the tide,—and then thrown overboard.

If the reader, contemplating Silver-shell lying on its native bank, or subsequently on its bed, calmly imbibing nourishment as its only occupation, has thought that there is an oyster-life of humanity, the allegation may for a moment be entertained, from what we know of the *gourmands* of the past and the present. Not that we should judge without intelligent discrimination. It is easy to heap people together, as was done in a huge machine at the time of the French Revolution, that they might be plunged together into the Seine, to save the troublesome formalities of trial; but we should

guard, even on the smallest scale, against any such outrage of truth and righteousness.

It must, therefore, be admitted that a temperate use of the bounties of Providence coincides entirely with the purposes and precepts of Him who hath "given us all things richly to enjoy." We may not only eat to live, but we may eat that which specially ministers to the gratification of the palate, provided that in so doing we violate no personal nor relative obligation. It requires a well-regulated conscience to describe the precise line any one should observe; but, if the mere epicure has advanced to one extreme, assuredly the other is occupied by such persons as the monks of La Trappe, who confound self-mortification with the highest virtue.

Nor should it be overlooked that a broad line of demarcation exists between the Romans named Apicius and Lucullus, though it is often allowed to be effaced. One of them lived under the reign of Tiberius, and became notorious for discovering new sources of culinary enjoyment, arranging more appetising combinations of those formerly known, and ransacking every kingdom of nature and every quarter of the globe then known for fresh objects to stimulate and gratify his palate. This was the man who, after squandering upwards of £800,000 on the indulgence of his all-engrossing passion, hanged himself because there remained only the

scanty pittance of £80,000, to the mere subsistence on which he thought, in his infatuation, that death was preferable. Sundry cakes, called *apicia*, long kept alive his memory among the Romans. Apion, the grammarian, compiled a work on his luxuries, and his name passed into a proverb associated with the pleasures of the table.

The life of each Apicius was, however, that of an oyster —he lived to eat. But Lucullus, though his feasts were celebrated on a scale of extraordinary magnificence, cultivated literature from his earliest years: he accumulated a valuable library, which he opened to the free use of the public; he patronised men of letters; he associated with the Greek philosophers and literati, who in his day swarmed in Rome; he was remarkable for his equity and benevolence; and, while he maintained in the exercise of these qualities the discipline of the troops he ably commanded, he greatly surpassed his contemporaries in his treatment of the vanquished.

In no instance, then, should we confound a large expenditure with extravagance, or the occasional with the habitual. Even if our judgment be sound—and the proof is always wanting where this is hastily assumed—unless the minutest details are all arranged and surveyed, any decision would only indicate our folly, and may justly bring on us shame. When a balance can weigh the ten-thousandth part of a grain, what a trifle will cause a preponderance?

Still it must be contended that a mere oyster-life is of more frequent occurrence than might at once be admitted. Of one person it is said: "He has learned the science of good eating by practising it, and he often orders down to Salisbury from London a couple of quarts of turtle and a haunch of venison for his own eating, and sits down to dinner by himself; scorning (like Sir Hercules)"—we suppose Sir Hercules Langrish —"all assistance but that of a bottle of Madeira and two bottles of old port."* We have ourselves known parallel instances of as enormous, if not as solitary gluttony; and there are many others that make to it an approach that is lamentable and degrading. For,

> "What is man,
> If his chief good, and market of his time,
> Be but to sleep and feed? A beast—no more."

Even the beast is disgraced, however unintentionally, by the poet's comparison. The quadruped obeys its appetite, but without excess in a morsel or a drop. The bird is equally a symbol of temperance. Even the oyster closes its shell when a sufficiency of food has been brought to it by the waters.

Lucian ridiculed the philosophers who, according to his satire, spent their lives in inquiring into the souls of oysters. But the mere gourmand, whether he be so

* "Quarterly Review."

notoriously or secretly, overlooks his soul, and treats his body as if that were *the man*. And can mind—the soul—be disregarded with impunity?

> "Sure He that made us with such large discourse,
> Looking before and after, gave us not
> That capability and godlike reason
> To fust in us unused."

"All things strive to ascend, and ascend in their striving. And shall man alone stoop? Shall his pursuits and desires, the reflections of his inward life, be like the reflected image of a tree on the edge of a pool, that grows downwards and seeks a mock heaven in the unstable element beneath it, in neighbourhood with the slim water-weeds and oozy bottom grass that are yet better than itself, and more noble, in as far as substances that appear as shadows are preferable to shadows mistaken for substances?"* "No!" Reason exclaims; "it must not be!"

To assume that it may, is even to degrade human existence below the level—humble as it is—of an oyster's life. The oyster—scorn it who will—yes, the oyster, whether it perishes on its native beach, or lives on the bed to which it is transferred to gratify the human palate—perfectly answers the purpose of its being. In no respect does it fail of the end con-

* Coleridge.

templated by Him who called it into life, and who "openeth his hand, and satisfieth the desire of every living thing." Let, then, each one ponder the question: "Do I answer the purpose for which I was created and am sustained in being?" And let the reply be the guide of our future steps.

CHAPTER X.

SILVER-SHELL ATTAINS ITS MATURITY.

THE ESSEX COAST—FLEET OF OYSTER VESSELS—THE DREDGE—VARIOUS CONTENTS OF ONE—LAW FOR THE DESTRUCTION OF SEA-STARS—CAPTURE OF SILVER-SHELL.

On the Essex coast the country is extremely flat, but the land is very fertile, and wheat flourishes exceedingly. The shores in some parts are muddy, and the adjacent borders exhibit, at frequent intervals, large patches of saline ooze, over which the marsh samphire grows in great abundance.

Numbers of sea-gulls frequent these marshy tracts, where innumerable small crabs, and marine insects of various kinds, present a curious spectacle as they creep, twist, and wriggle on its surface; but on the least disturbance down they go, and they are instantly lost in the black slime. All around, and on the paths and dry beach, are scattered the cast-off shells of small crabs, some of which may excite surprise. So perfect are they, that not only every limb-case, but even the living membrane of the stomach may sometimes be observed. In winter the sea-gulls, in flocks like rooks, scatter themselves over the ploughed and fallow lands

in quest of worms and grubs, and may also be seen in spring and autumn following the ploughshare.

Alluding to the river which flows into the sea at Aldborough, "the Borough" on the Suffolk coast, which Crabbe has so graphically portrayed, he says:—

> "Thy gentler river boasts its pigmy boat,
> Urged on by pains, half grounded, half afloat;—
> Far other craft our prouder river shows,
> Hoys, pinks, and sloops; brigs, brigantines, and snows:
> Nor angler we on our wide stream descry,
> But one poor dredger, where his oysters lie."

This solitary person is one, however, of a numerous class, with which it is well to make an acquaintance.

A fleet of oyster-boats at work in one of our bays or estuaries, when there is a freshening breeze, is a sight of no little interest, especially if the sun is going down into its home of mist, yet dyeing with its richest colours, amber, yellow, and crimson, the cirrus and stratus clouds through which he has sailed so joyously the whole day, while the waves, instinct with life, are tossing from one to another the liquid gold with which the setting luminary so bounteously arrays them. The sails may be seen flapping to and fro, and then the boat glides darkly by, with the sun edging the sails, the spars, and the red vane of the mast-head. Everything at such a time assumes the richest colours. The vessels—the scene of the dredger's labours—ever in

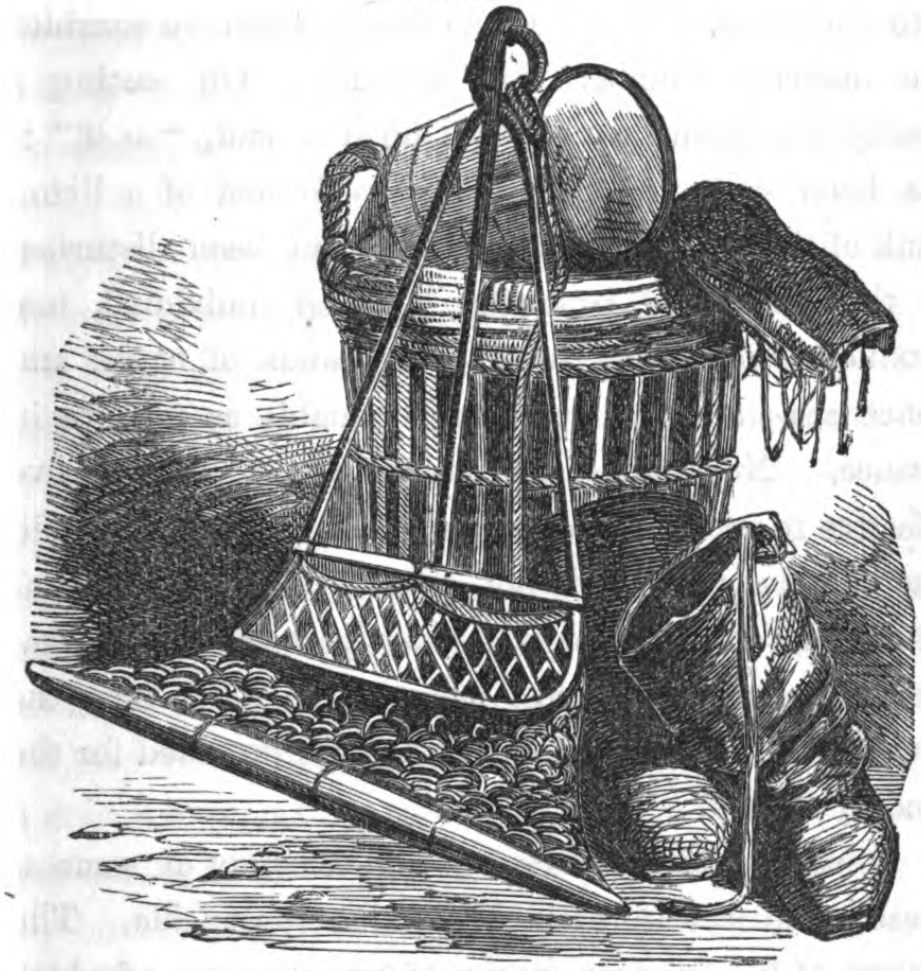
motion, tack to and fro over the oyster-beds, their sails now glowing in the sun-light, and then their bows dashing through the crests of the waves, which in return cast over them a shower of spray, which seems ever and anon like a golden shower. Even the old, brave, weather-beaten hulls which on the beach appear so sombre, when wet with the spray, and dashing back the sun-light, add much to the splendour and gaiety of the scene.

A dredging vessel, more nearly inspected, is moored by an anchor over the oyster-bed, and is often worked by two men and a boy. The net is a strongly made bag with an iron mouth, from which extend three iron shafts, and these, converging, form a rude handle, and to it the end of a strong rope is attached. This dredge is thrown over the gunwale of the boat, and dropped to the bottom of the water. By the management of the rudder and sail the vessel then gently swings away so as to run out a certain portion of the rope. The man begins now to draw in the dredge, and as its iron mouth, lying with one of its rims on the bed, acts as a scraper, the net takes up all it can hold.

The contents of a dredge are often greatly diversified. Among them may frequently be found various species of those curiously-jointed sea-worms, with limbs springing from each segment, which belong to the family of nereides. Some of these are several inches in length,

and twisted about, with an action much like that of the centipedes; and are said to be luminous at night with a pale phosphorescence. There, too, may sometimes be observed that very remarkable creature, an

Fig. 18.



Oyster-dredging Implements.

annulose marine worm, the sea-mouse. Covered above with long, iridiscent bristles, golden, purple, blue, and green, brilliant and changeable as the hues of the humming-bird, who can look at it without admiration? But

far more numerous are the sea-stars, whose cravings for oysters are only terminated with life.

That there should exist in several places local enactments requiring fishers to tear in pieces all the sea-stars they take up, instead of throwing them alive into the water, will appear necessary when we consider the immense number they consume. On casting a dredge thousands are brought up at a haul, "as if," it has been said, "the bottom were formed of a living bank of them, or a submarine hive had been disturbed in the process of swarming." Each individual, too, produces, in every season, thousands of eggs; and hence sea-stars are considered valuable as manure in France. Nor could the enactments of man prove effective to arrest their increase and keep them within due bounds, were they not aided by the natural limit which God has appointed, so that, voracious as the sea-star is among its victims, it becomes, in its turn, the prey of fishes, multitudes of which are provided for the food of man.

A very remarkable fact in the economy of some of these creatures is, their inclination to suicide. The largest of the fourteen species of true sea-stars of which Britain boasts, is the lingthorn, which frequently grows to two feet in diameter. All its race possess, in a greater or less degree, the power of casting away their limbs when convenient; but the lingthorn not only casts them

away, but breaks them into small pieces with astonishing facility. Well have naturalists appended to its name, *Luidia*, the term *fragillissima*.

Professor Forbes thus describes one of his adventures: "Never having seen a luidia before, and quite unconscious of its suicidal powers, I spread it out on a rowing bench, the better to admire its form and colour. On attempting to remove it for preservation, to my horror and disappointment, I found only an assemblage of rejected members. My conservative endeavours were all neutralised by its destructive exertions; and it is now badly represented in my cabinet by an armless disk and a diskless arm.

"Next time I went to dredge on the same spot," adds the professor, "determined not to be cheated out of a specimen in such a way a second time, I brought with me a bucket of cold fresh water, to which starfishes have a great antipathy. As I expected, a luidia came up in the dredge, a most gorgeous specimen. As it does not generally break up before it is raised above the surface of the sea, cautiously and anxiously I sunk my bucket to a level with the dredge's mouth, and proceeded, in the most gentle manner, to introduce luidia to the purer element. Whether the cold air was too much for him, or the sight of the bucket too terrific, I know not, but in a moment he proceeded to dissolve his corporation, and at every mesh of the dredge its fragments

were seen escaping. In despair, I grasped at the largest, and brought up the extremity of an arm, with its terminating eye, the spinous eyelid of which opened and closed with something exceedingly like a wink of derision."

But, to resume our narrative. The time came for the disturbance of Silver-shell. Above it, on the right, stood the dredging vessel, with its men and its boys working alike the sail and the rudder; and as the iron mouth of the net scraped the bed where Silver-shell was lying, it became, with many others, a captive. The contents of the net were, as usual, a variety of living creatures, some to be thrown into the waters as useless, and some to be destroyed, as the enemies of the dredger; but Silver-shell was one of that haul in which his eye could discern no defect. In common, therefore, with its companions which had attained their full maturity, it was turned out on the deck, roughly cleared from all extraneous matters attached to its shell, and put with the rest into basket measures. The oysters on which *spat* appeared, and others whose growth was not sufficiently advanced, were thrown overboard.

The age of a horse is known by looking in his mouth; that of an oyster is obtained by an examination of its shell. The successive layers or plates overlapping each other, technically called "shoots," appear in regular succession up to the epoch of maturity; after that they

become irregular, and are piled one upon another, so that the shell becomes increasingly thickened and bulky. Judging by the thickness to which some oysters attain, it appears that, left to themselves, they might have attained a patriarchal longevity. Among fossil oysters specimens are occasionally found of enormous thickness. Oysters are not fit for the table, as the dredgers well know, under the age of eighteen months, nor in perfection till the second or third year.

That Silver-shell did not acquire a green colour is by no means unusual. The oysters deposited in beds in the River Blackwater, also the property of the Colchester Corporation, at Mersea, and at Tollesbury, are, however, of a deeper colour than those which are placed in the Colne, from the greater abundance of the bodies giving this hue. Some years ago a demand for oysters of this colour having been made by some Dutch merchants, special effort was made to give the oysters the green colour, but it has latterly become a matter of indifference as to their sale.

In Essex the green tint of oysters is ascribed to marine plants, as the marsh samphire; and the abundance of such vegetable substances in places just mentioned, far exceeding the quantity found in the Colne, is adduced as confirming the general opinion. Be this as it may—and here is another task for microscopical examination—the green tinge of the oysters sometimes

obtained here is decided, and the flavour is considered by many superior to that of all others.

Not only on its native sea-banks, but in beds artificially prepared, the oyster proves to be marvellously prolific. Bishop Spratt, who recommended the study of oyster-beds to the sages employed in laying the foundation stones of the Royal Society, as urgently demanding their attention, spoke of oysters of *both* sexes, and proposed to distinguish them by the colour of their beards. It is to be hoped the learned prelate was better skilled in his especial duties than he was so far in natural history, for oysters assuredly are of only one sex. Their extraordinary number of eggs has already been stated.

Silver-shell at its maturity was an oyster—but nothing more. The declaration is made in the view of a theory long since announced, but of late revived. According to this, an animalcule swimming about gaily by means of its *cilia*, advanced to the shore, and, being left there by the retiring tide, gradually became an oyster. Some descendants of the oyster, passing through a similar series of progressive changes, became giants; the grampuses and whales of the ocean. Others, disliking the sea, betook themselves inland, where they developed air-inhaling lungs, and passed through such modifications of structure as would now become necessary.

Thus arose other distinctions, as the jaws, teeth, and claws of carnivorous animals, and the different arrangements for herbivorous creatures. The goat grazed on the mountain side, the sheep preferred the pasture of the valley, the tiger revelled in the jungle, and, as the giraffe preferred the twigs or soft shoots of trees and brushwood, its neck became gradually elongated, as well as graceful and pliable. Amidst this contentment with the earth, others longed to sport in the air; hence wings were obtained and plied. And so, it has been said, by a series of transitions, the monad became an oyster, the oyster a monkey, and the monkey a man!

A theory which asks peremptorily for the surrender of Revelation ought to advance sufficient proof for its support; but of this it has not an iota. No dredger of the Norman or the Essex coast has ever yet found a living oyster effecting even a slight improvement on the structure and habits of its parent. Nor has such an attainment ever been made by any creature of which the naturalist—whether rambling on the sea-shore, or carrying on his inquiries among the living things of the hill or the valley, the desert or the garden—has ever told us. Professor Forbes, as we have seen, affirms that, when his luidia was intent on self-destruction, he grasped an arm, "when the spinous eyelid seemed to wink at him:" and should a similar adventure be met with by a naturalist five hundred or a thousand years

hence, the eye will be no less rudimental, making no advance whatever in its optical structure and power.

This assertion may be confidently made, because it is sustained by the accumulated testimony of the past. Were the theory to which we have alluded well-founded, the fossil hunter would discover in the Silurian and Cambrian, the primary fossiliferous groups, the simplest forms of animal life; and no less certainly a gradual advance in structure as he ascended towards our surface-soil.

But, so far from this, he discovers complicated forms even in the earliest fossiliferous strata. In the Silurian, for example, are trilobites in great numbers, of the various species. Each of these creatures, now extinct, should, according to the theory referred to, have had a rudimental eye, the power of which should have gradually, but certainly, increased with the lapse of ages. But, instead of this, the eye of the trilobite, hundreds, thousands of years ago, was as perfect as that of any one of the crustaceans to which it is allied just taken from the waters. It was, therefore, by no series of advances that its completeness was attained; as Buckland says: "It was created, at the very first, in the fulness of perfect adaptation to its use."

Agassiz has remarked: "It is now a truth, which I consider as proved, that the *ensemble* of organised beings was renewed, not only in the interval

of each of the great geological divisions which we have agreed to call *formations*, but also at the time of the deposition of each particular *member* of all the formations. For example: I think I can prove that in the oolitic formation, at least within the limits of the Swiss Jura, the organic contents of the lias, those of the oolitic group properly so called, those of the Oxfordian group, and those of the Portlandian group, as they occur in Switzerland, are as different from each other as the fossils of the lias from those of the Keuper, or those of the Portlandian beds from those of the Neocomian formation.

"I also believe very little in the genetic descent of living species from those of the various tertiary layers which have been regarded as identical, but which, in my opinion, are specifically distinct. I cannot admit the idea of the transformation of species from one formation to another. In advancing these general notions, I do not wish to offer them as inductions drawn from the study of any particular class of animals (of the fishes for instance), and applied to other classes, but as the results of direct observation of very considerable collections of fossils of different formations, and belonging to different classes of animals, in the investigation of which I have been specially engaged for many years, in order to assure myself whether the conclusions which I had drawn from the

tribe of fishes were applicable to this class only, or whether the same relation existed in the other remains of the animal kingdom."

Dugald Stewart, alluding to the uniformity of animal instinct, justly observes that it "presupposes a corresponding regularity in the physical laws of the universe; insomuch that if the established order of the material world were to be essentially disturbed (the instincts of the brutes remaining the same), all their various tribes would inevitably perish." The conclusion of the acute philosopher is sustained by the naturalist; and the instincts of Silver-shell demanded for its life and vigour precisely similar circumstances and conditions to those of the most ancient of its race. A difference in these would have even forbidden its existence.

"Any naturalist will admit," says Sir C. Lyell, "that the *same species* have always retained the same instincts, and, therefore, that all the strata wherein any of *their* remains occur, must have been formed when the phenomena of inanimate matter were the same as they are in the actual condition of the earth. The same conclusion must also be extended to the extinct animals with which the remains of these living species are associated; and by these means we are enabled to establish the permanence of the existing physical laws, throughout the whole period when the tertiary deposits were formed."

CHAPTER XI.

CLOSE OF SILVER-SHELL'S CAREER.

SILVER-SHELL GOES TO BILLINGSGATE—SALE OF OYSTERS IN DIFFERENT PLACES—"PRAY, REMEMBER THE GROTTO"—OYSTER-BARRELS.

THE dredger, bearing away the oysters of his successive hauls in basket measures, placed them in a pit near to his home, provided specially for the purpose until he had an opportunity of disposing of his produce. This occurred on the next day, and Silver-shell formed part of the freight of one of the fleet of oyster-vessels which, at the close of the month of September—inferior oysters always preceding the "natives"—wafted it to Billingsgate.

That collection of sheds and stalls—not unlike a dilapidated railway station—was then a scene of confusion and abuse which gave to Billingsgate a strange and discreditable notoriety. Buyers and sellers kept up during the early hours of the morning a tumult utterly unendurable by sensitive ears, and absolutely shocking to those who had any regard for morality and piety. Gross frauds were at the same time unblushingly per-

petrated. If, however, the sellers cheated the buyers, and the buyers in their turn cheated the sellers, yet "wrong never came right."

But the times have changed, and are still, we believe, improving. Oyster-fleets are not what they once were; and the railways brings millions of "natives" annually to the great metropolis. No offence either in word or deed is now the penalty of an early walk within the precincts of Billingsgate. There may be seen in full authority the representative of the Lord Mayor—a name of terror to all delinquents, among whom are all who would become purveyors of stale, and therefore unwholesome, fish. Next in rank appear the wholesale dealers—a class of men as respectable in character and conduct as any that may be seen in the first-rate shops of the metropolis, courteously expatiating on the fins of a turbot, the firmness of a salmon, or the primeness of his "natives;" or, leaving this task to one of his shopmen, occupying himself with his day-book, or writing checks, and giving change at his desk. "The third estate," once strangely called "Bummarees," but now recognised as "retailers," are the parties who come between the class just described and those of still inferior grade. Purchasing the various sorts of fish, they arrange them in small parcels to suit the convenience of suburban dealers in fish, whose open windows show to the passer-by what they have for sale, while their oyster-tubs

stand inside on the counter, or outside on a range of stools, and who find other customers in the race whose name of "costermonger" will soon be displaced by some other, at once probably more agreeable, and certainly more descriptive.

Oysters, still sold out of the smacks at Billingsgate, may also be obtained at Hungerford. The real "Miltons" and the "Colchesters" are among the most expensive kind. The costermongers buy oysters of "a good middling quality." At the commencement of the season the bushel, more or less heaped up, costs 14s.; the general price is 9s. or 10s.; but they have been 16s. or 18s. In 1848 very large-shelled oysters, the animals being very small, were brought in from the Sussex coast, and had an enormous sale in Thames-street and near the Borough-market. These "scuttle-mouths," as they were called, were usually thrown down in a yard, had a few pails of water dashed over them, and were then placed on a barrow, or conveyed to a stall. But some of the better class of dealers laid down their oysters carefully, and gave them oatmeal to fatten on.

"The number of oysters sold by the costermongers amounts to 124,000,000 a year. These at four a penny would realise the large sum of £129,650. We may, therefore, safely assume that £125,000 is spent yearly in oysters in the streets of London." *

* Mayhew's "London Labour and London Poor."

The expenditure in other circumstances remains to be estimated. For several months in the year "Oysters" and "Oyster rooms" serve as conspicuous inscriptions on windows and lamps, as well as over doors. Within shops persons may be seen partaking the delicacy in all its native freshness and flavour, or adding to it—as if, forsooth, it must have an acid and a stimulant—no small quantity of vinegar and pepper. Dishes, too, may be observed on the edges of the leaden tanks attached to the counters, supplied by the dexterous openers behind; or, being carried from thence, with a bounteous array, for those who like oysters best when they are eaten at home.

As soon as oyster-day arrives, in the beginning of August, the passenger in the larger streets of London, into which smaller ones run, is beset by groups of little urchins holding a shell, and urging the plea, of no ordinary antiquity, "Please, remember the grotto!" And not far off he may observe a circle of oyster-shells, to which others are being added by the children of the alley or the court; while, as the elevation of the structure will depend on their own industry and tact, so the "illumination," as it is called, by means of a candle or candles stuck in lumps of clay, can only be accomplished as their appeal to others is successful. Our artist, Webster, has painted a scene of this kind, in which, as usual, the various characters of the children are admi-

rably discriminated, not excepting that of the little girl, whose modest shyness shows how new to her is beggary, and that a struggle is going on in her bosom while she asks for a halfpenny. It would be difficult to picture the glee—the eager looks of admiration, the stamping of feet, the clapping of hands, and the vehement shoutings—as night comes on, when a few pence have been obtained, especially if the *genius loci*, some embryo Tite or Barry, has outstripped the grotto-builders around by some house or church-like structure, and placed in it one or more pieces of glass through which the candles gleam.

One story of a grotto, often repeated, may here be told. It was built by the children of a widow on the Surrey side of the Thames; and, as she was from home on that evening, they brought from her dwelling whatever they thought would render the grotto attractive. The great charm, however, was to be wrought by a small but dingy picture, above and around which they placed their oyster-shells, yet taking care that a good view should be had of it by every passer-by.

A Jew, it is said—but on this we would not lay stress, for a Christian, so-called, may be greedy of gain, and one of the children of Abraham may be, in generosity, a noble—struck by the sight, offered a shilling for the picture. What a prize was thus presented to the view of these beggars of coppers! It overcame all

their ordinary feelings, and, while the children exulted over a shilling quickly to be spent, the cunning buyer chuckled over the profitable purchase he had made.

With great delight he bore it from one connoisseur to another, only to be assured that his first judgment was right; and then he was anxious to sell it, not merely at a profit of cent. per cent., but at that which is realised when a shilling is changed into hundreds of pounds. Nor was it long before a purchaser at that amount was ready; he only required to be satisfied as to the applicant's right of sale. But here a difficulty arose in the way of avarice; the man hesitated, then prevaricated, and it was only under the threat of prosecution that he told how the picture was obtained, and agreed that the rightful owner should have the chief part of the sum for which it was to be sold. We leave the joy of the poor widow to be conceived; she was too busy in earning bread for her family to miss the picture; she was not aware that it was gone, until she heard that, placed in the little grotto of oyster-shells as a childish freak, it had thus so singularly obtained for her the means of comfort and improvement she could not have hoped to possess.

The commercial destination of Silver-shell, with bushels of others, was a large fishmonger's in the city, where noble lobsters and crabs have often caught the eye and excited the admiration of the passenger—especially

one from the provinces; here they were deposited, to preserve their full life and health, in vessels containing salt-water; and in one of the barrels speedily made up Silver-shell found its final dwelling-place.

The barrels of oysters ranged on the counters and shelves of such places are not unworthy of passing thought. Many of them become not merely the means of indulgence, but the expressions of kindliness, which are acceptable and useful. It is stated that when Sir Adam Ferguson joined his first regiment at Ayr, and found the officers, especially the young ones, prejudiced against him, because he had entered life in a civil profession, "he found the virtues of a barrel of Edinburgh oysters one element in overcoming the difficulty."

In one of the most interesting and graceful collections of letters ever preserved, those of our poet Cowper, we have many references to similar presents. To Mrs. Newton he wrote:—

"A noble theme demands a noble verse,
In such I thank you for your fine *oysters*;
The barrel was magnificently large,
But, being sent to Olney at free charge,
Was not inserted in the driver's list,
And therefore overlook'd, forgot, or miss'd."

Then follows a particular relation of its recovery, and having offered the advice that all such "commo-

dities" should be forwarded by what was called the "Diligence," the poet thus concludes:—

"We therefore recommend it with the aim
To save at least three days,—the price the same;
For though it will not carry or convey
For less than twelve pence, send whate'er you may,
For oysters bred upon the salt sea-shore,
Pack'd in a barrel, they will charge no more."

It was said of a cold climate, that no fruit ripened in it "except baked apples;" and Bishop Corbett satirically says,

"They never heard of a raw oyster there."

The eaters of raw oysters are doubtless beyond all comparison in the ascendency. The writer of "A Crustaceous Tour," in one of our popular magazines, when in Dublin, is a fair specimen of them. "The amateur," he says, "not ravenously, but appetisingly hungry, directs his impatient steps to a little green door in French-street, either post whereof is decorated with an escutcheon, with two lobsters rampant, and the motto OYSTERS WITHIN! worthily emblazoned in letters of gold. *A l'intérieure*, a marine odour exhales through the little apartment. You may fancy yourself in a bathing-box. Taking a seat on the raised bench, behind a counter white with continual scrubbing, the judicious epicure grasps the pepper-castor firmly in his right hand,

while pats of delicate butter and crisp biscuits are laid before him. If he be as old a customer as I am, there is no occasion to intimate his wish that the fish shall be furnished to his lip from the deep shell."

Dr. Kitchener, who states that he wrote his "Cook's Oracle" with a knife and fork in one hand and a pen in the other, actually devouring all he described, obviously differed from "the Tourist," in opening for himself the oysters he so highly enjoyed. "The true lover of an oyster," he remarks, "will have some regard to the feelings of his favourite, and will never abandon it to the mercy of a bungling operator; but will open it himself, and contrive to detach the shell from the fish so dexterously, that the oyster is hardly conscious he has been ejected from his lodging, till he feels the teeth of the piscivorous gourmand tickling him to death." Perhaps, however, even Dr. Kitchener did not know that the sweetest morsel of an oyster is the adductor muscle.

Strange as it is, it is still true that persons are to be found who pride themselves upon the number of oysters they can eat; but at the head of them stands a Parisian oyster-woman, who made a wager that she would eat twelve dozen oysters and drink twelve glasses of Chablis while the clock of Saint-Eustace was striking twelve. Just before the appointed time, she stood at the pewter counter of the Commerce de Vins, on which were duly ranged a dozen tumblers of Chablis, each of them containing a dozen small oysters. At the first stroke of

the clock she disposed of the contents of one tumbler; the rest followed in steady succession, and when the last stroke was given—the wager was won.

But we must hasten to the fate of Silver-shell. The oyster-barrel in which it was placed had at first a card nailed on it, bordered with the name and residence of the fishmonger to whose lot it had fallen; and the central part being afterwards occupied by the address of the party to whom it was to go, it was despatched and received in due course. But, whether the porter knocked at the door of a town residence, or rang the bell at the gate of a country villa, for its delivery; whether it aided in giving flavour to the cod-fish that accompanied it, or was eaten with others from the shell; whether its taste was exclusively its own, dashed by the briny waters, or combined with the condiments of pepper and vinegar; whether it fell to a little boy, becoming his first oyster, or to his sister, who was repeatedly urged before she could raise it to her lips; or to the splendidly-dressed lady who breathed gently, "so delicious!" or the gentleman in black who swallowed it without a word, or the elder one, with a black coat and yellow buttons, and a vest of the same hue, who quoted the remark of Lord Blayney, at Bordeaux, that "a dozen oysters, with a small quantity of lemon-juice squeezed into each, is an excellent whet when taken immediately before dinner"—are all matters which must be left in obscurity. No one, assuredly, would be wiser or better, could they be stated.

CHAPTER XII.

THE LIVING CHAIN.

EVERY SHELL HAS ITS PROPER PLACE—REMARKABLE POWERS POSSESSED BY MOLLUSKS—IMPORTANT DISCOVERY ON THE NORMAN COAST.

IT has been with the hope of adding to the information of the reader that we have thus passed through the history of Silver-shell; but we should like yet to dwell on the fact that

> "Each shell, each crawling insect, holds a rank
> Important in the plan of Him who fram'd
> This scale of beings; holds a rank, which lost,
> Would break the chain, and leave behind a gap
> Which Nature's self would rue;"

and to urge, by all that has been now advanced, an attentive consideration, so far as practicable, of the great chain of life.

How favourable is the opportunity of doing so which is enjoyed by multitudes in their rambles on the sea-shore. Shells may there be found, exhibiting in form the greatest possible variety. Some consist merely of a simple tube, or a hollow cup; others present the most graceful convolutions, appearing as cones, spires, and turbans; while others are shaped like a box, with

every diversity of hinge, from that of simple connection by a ligament to the most complicated articulation. As Lamarck strongly recommended shells to the study of the architect, he observed, "There is scarcely any possible form of which nature does not here supply examples;" and he specifies certain shells which would supply a choice of models for the ornaments of columns, and which are "highly worthy to be so employed." Many of our beautiful stucco ornaments for cornices and chimney pieces are copied from shells, and are greatly admired.

The colours of shells are often so intensely vivid, so finely disposed, and so fancifully variegated that, as objects of beauty, they rival many choice productions of the animal and vegetable kingdoms, and, in some respects, exceed them. A feeble impression is received from a Hortus Siccus—a collection of dry stems and leaves—when compared with that which is produced by the living plants and flowers, attired in beauty and exhaling fragrance; and there is a vast difference, notwithstanding all the appliances of art, between the appearance of the living and the dead animal. And then, whatever care may be taken to preserve a quadruped, a bird, a fish, or an insect for the cabinet, they often suffer from changes of atmosphere and the attacks of various minute creatures. But shells defy assault, and contain no seeds of dissolution: the collection made

by the parent may be handed down to the child, and by him transmitted to succeeding generations in all its pristine beauty and durability.

When one of the authors of "Rejected Addresses" was satirising the disposition to give splendid names to humble dwellings, of which there are many indications, inland as well as on the coast, he said,—

> "You might as well
> Inscribe marine pavilion on an oyster-shell."

Yet frequently will one of these reward attention, clearly exhibiting not only the action of the waters, but the vigorous and persevering assaults made by worms and sponges to banquet on the in-dweller, who not only constructed a strong dwelling, but kept a good look out, and valiantly repelled its foes, like the bravest heroes of the tented field. The satirist most probably was not aware that, however unworthy a cottage may be of exaltation to the rank of a villa, an oyster's shell is not adequately described when called "a marine pavilion." It more nearly resembles a well sustained fortress.

If, however, the shell of a mollusk is so truly interesting, how much more so is the animal within, adapting it completely to its circumstances, enlarging it according to its growth, and perhaps adorning it according to the pattern adopted by the instinct of all its predecessors. Many of these creatures have powers

which we should not anticipate. The common Acallop, so much like an oyster, has not only eyes, but they are placed in a very extraordinary position, being arranged in shining rows along the borders of the creature's mantle, starring the edges immediately within the margin of the shell, and in front of the tender gills: as if a man should bear a row of eyes instead of buttons on his coat and vest, a place for them by no means improbable or inconvenient, if he were without a head.

The sense of smell is clearly possessed by slugs and snails; for fresh food, as Swammerdam observed long since, attracts them towards it. The seat of the faculty was long a matter of dispute. Cuvier surmised that the whole surface of the skin might have the power of detecting odours, as if each creature were an animated and independent *nose*. But Owen has recently shown that in the Nautilus, at least, there is a distinct organ of smell; and other naturalists have demonstrated that, in the far inferior race of sea-slugs, their smelling organs are elaborately constructed.

Strange as it may seem, the sense most generally distributed among shell-covered creatures is that of hearing. The ear is an exceedingly curious structure, consisting of one or more parts, each supplied with its special auditory nerve. In this little cavity are contained sparry, crystalline bodies, composed of carbonate

of lime, varying in number in different species. These minute bodies are in constant motion, vibrating backwards and forwards, rotating on their own axes, or rushing with violent motion towards the centre of their prison, whence they are as violently repelled. Thus, fact after fact is revealed to us, at once to encourage and reward persevering research. "In these discoveries," says Dr. Johnston*—himself an illustrious instance of his own remarks—"you have a lively example of the nicety of anatomical researches in our times. In my student days it was questioned whether any mollusks besides the cuttle-fishes had eyes, and it was agreed on all hands that they were earless and deaf."

More than a hundred years ago, a native of France, named Peysonnel, made a discovery on the Norman coasts, which may well be recalled. Carefully studying objects brought to him by the fishermen after searching for coral, he found that they were clearly distinguishable from sea-weeds. While others threw them aside, with the remark, "They are only sea-flowers," he observed that they had the same general appearance at all seasons. Testing them chemically, he decided that they had the constituent principles of animals, and, when burned, he found that they emitted the same odour. It must have been truly gratifying to him to announce, as he did, the fact to the Academy of Sciences in Paris.

* Zoophytes.

Ellis, an Englishman, encouraged by the Royal Society, was led by the beauty and elegance of these objects, to examine them attentively by the microscope. They proved to be *Corallines*. There is in each one a central stem, from which branches diverge, each one of which has upon it a row of cells, the dwelling of a flower-like body. Here is discoverable an indescribable variety, differing, as corallines do, in the form of the stem and the branches, as well as in the shape, number, and arrangement of their cells or cups. To these allusion has already been made as frequently observed on the shells of living oysters.

It may be well for observers to know that one of these, the *Flustra carbacea*, or flaxen flustra, is found on shells from deep water on the Southern coast, on that of Durham, on Leith shore, and on the coast of Ireland. It is fixed by a small disc, narrow at the base, with thickened margins dilating upwards, and becoming very broad in proportion to the height, which at most is about two inches; it is thin, yellowish-brown, deeply divided, and the segments are broad and somewhat rounded at the apex.

The cells on one side are large and smooth; the flowers which occupy them have about twenty-two parts or arms, which are nearly one-third of the length of the body, and there appear to be about fifty cilia on each side of an arm, making 22,000 cilia on each one. In this species there are more than eighteen cells in a

square line, and 1,800 in a square inch of surface; and as the branches of an ordinary specimen present about ten square inches of surface, it has more than 18,000 flowers, 396,000 arms, and 39,600,000 cilia. In the *Flustra foliacea*, abundant on our shores, there are at least twice as many, or 36,000 flowers. What, then, are these flowers? In all probability, the heads of one creature, whose body occupies the other portions of the coralline; all actually employed in the seizure of food by means of their arms, and of the rapidly vibrating cilia with which they are covered.

Another fact must not be omitted. Some seventy years ago, there might be observed a young man, the tutor to the only son of Count d'Hericy, whose family residence was on the coast of Normandy, where we have been wandering during a part of our narrative. The study of marine animals became in consequence one of his daily occupations. He compared the living specimens which the retiring waters disclosed to his view, with the fossil remains found in the neighbourhood; and the dissection of a species of cuttle-fish led him to study the anatomy of the mollusca, hitherto but little known, and thus to become acquainted with a race of beings, among which the oyster occupies so conspicuous and important a place.

But with them he could not pause in research: he saw the relation they occupied to all above them as

well as all below them; he advanced, step by step, till he had traversed the entire range of the animal kingdom; and by his descriptions and discoveries threw around the name of Cuvier the radiance which will encircle it even in distant ages. Unprecedented in his day must have been his attainments in the science of comparative anatomy, when he could survey without disquietude the immense aggregate of bones taken from Mont Martre; reduce that chaotic mass to perfect order; and having taken from the heap a single bone, add to it all its kindred bones, until the skeleton was complete;—a task which he continued from day to day until he had formed that wondrous series of skeletons which bears his name in the "Jardin des Plantes." On what a course of delightful and improving research then may they enter who, beginning with the study of the oyster, follow, according to their duly improved means and opportunities, in Cuvier's steps.

We have great hope of such results from the increasing attention given to the structure and use of the microscope. It has been recently discovered that an advance may be made to the desideratum of refraction without aberration, by using lenses of diamond and other highly refracting materials. Lenses of great power have always been costly; nor can we conceive of a purpose so worthy the employment of gems, as that of disclosing wonders of nature hitherto impene-

trable. With great truth and eloquence Dr. Chalmers has remarked, as he compared the microscope with the telescope: "The one led me to see a system in every star; the other leads me to see a world in every atom. The one taught me that this mighty globe, with the whole burden of its people and of its countries, is but a grain of sand on the high fields of immensity; the other teaches me that every grain of sand may harbour within it the tribes and the families of a busy population. The one told me of the insignificance of the world I tread upon; the other redeems it from all its insignificance; for it tells me that in the leaves of every forest, and in the flowers of every garden, and in the waters of every rivulet, there are worlds teeming with life, and numberless as are the glories of the firmament. The one suggests to me that within and beneath all that minuteness which the aided eye of man has been able to explore, there may yet be regions of invisibles; and that could we draw aside the mysterious curtain that veils it from our senses, we might there see a theatre of as many wonders as astronomy has unfolded, a universe within the compass of a point so small as to elude all the powers of the microscope; but where the wonder-working God finds room for the exercise of all His attributes, where He can raise another mechanism of worlds, and fill and animate them with all the evidences of His glory."

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