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LIFE UNDER THE OCEAN WAVE.

CORAL FISHING.

THE tourist who has crossed the Atlantic from New York to Liverpool, seen perhaps a few dolphins sporting on the surface of the water, watched and fed the sea-gulls following in the steamer's track, and been perhaps so fortunate as to see an iceberg or experience a storm, imagines that he has seen the ocean. He has done nothing of the sort. He has seen only the least important and least interesting part of it. He knows no more of Neptune's domain than one knows of Ireland who merely looks upon her bleak and rocky shore at Queenstown from the steamer as she stops in the offing to unload her mails. He has merely glanced, as it were, upon the coast of this great kingdom of nature.

For the ocean has, to change the figure, a soul. As every man carries within himself an inner self, a hidden life that casual acquaintances know nothing of, so the ocean has within its bosom a life which is never revealed except to long acquaintance and an almost loving familiarity. It has a life more

multitudinous, quite as wonderful, and not less beautiful than that of the land. Its mountains rise higher than Mont Blanc. Its valleys and gorges are unequaled by those of the Lebanon, the Pyrenees, or even the Himalayas. It has great steppes and immense plains, which rival those of North America or Central Asia. It has vast and illimitable forests, which the eye of man has never discerned, and never shall, in their entirety—forests that are fuller by far of busy life than the most prolific of the tropics. "The terrestrial forests," says Charles Darwin, "do not contain any thing like the number of animals that those of the sea do." The surface of the waters, which, plowed by storms, are such a source of dread to man, are the protection of these children of the mother ocean. At 550 fathoms there is a perfectly uniform temperature, the same in all latitudes. No cold pierces this wonderful coverlet, no storm ever disturbs the waters beneath. Here in their hidden home, safe from the disturbances of this upper life, are myriads of creatures, living, marrying, dying; warring one upon the other; organizing into kingdoms, republics, families; working in every form of manufacture, as spinners, weavers, architects, builders; endowed with mysterious instincts which are quite as wonderful in their way as our higher reason, and bound together by mysterious ties which we are equally unable to comprehend or to call in question. So true is it that the mysteries of science far outweigh those of morals and theology.

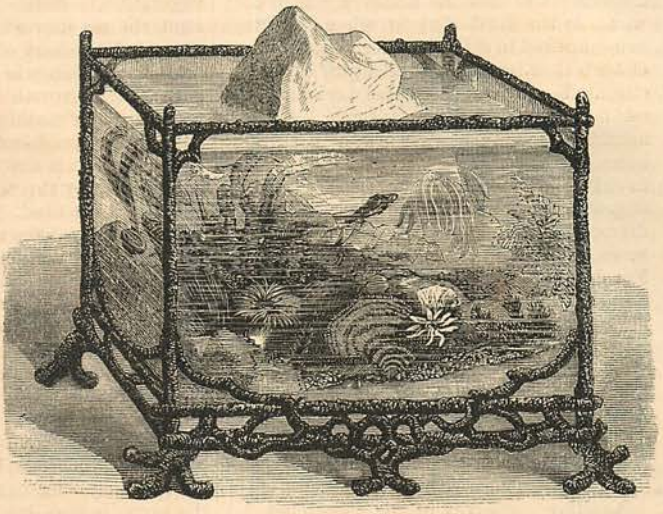
These inhabitants of the sea are found in absolutely countless numbers. No census of old Ocean's population ever has been taken, or ever can be. They exist in all waters, the hot as well as the cold, the fresh as well as the salt. The mariner in the tropic sea is startled to find the ocean all about him growing luminous, as though the very water beneath the hot equatorial sun had turned to flame. Flashes of vermilion-colored light dart from the keel of his vessel as it plows the surface of the waters, and streams of light like lightning sparkle and play upon its waves. If, overcoming his superstitious fears by growing accustomed to the sight, he drops a bucket into the luminous sea, he brings up what seems less like water than like molten lead. It lights the forecastle like a torch. He plunges his hand into the water. It comes out covered with luminous particles glittering like diamonds full of light. How innumerable must be these almost infinitesimal glow-worms of the sea, thus to convert the ocean into a sea of light!

Sometimes these tiny creatures tint instead of illumining the sea. Insects whose diameter is less than that of a hair, 300 of whom placed in line would not make an inch in length, whiten the waters of the ocean by their presence, and make what the Dutch sailors call the Milky Sea, or Sea of Snow. In 1854, in the Bay of Bengal, Captain Kingman passed for thirty miles through the middle of a large patch of sea white with these creatures. Thirty miles of animalcules 300 of whom would hardly constitute an inch! Seamen sometimes meet with "red fogs," especially in the vicinity of the Cape de Verd Islands. Ehrenberg has examined this fog with his microscope. He finds that its tint is given to it by infinitesimal shells of infusoria, brought by the winds from the coasts of South America. Let the reader imagine, if he can, how many of these shells, so small as to be quite invisible to the naked eye, there must be to produce a cloud large enough and dense enough to perplex the navigator. Now, are the plants less minute or less numerous? Freycinct and Turrel, when on board the corvette *La Creole* in the neighborhood of Tajo, in the Isle of Lucan, observed an extent of thirty-five square miles of ocean tinted a light red. This color proved to be due to the presence of a marine plant so small that in a square inch there were 25,000,000 individuals. As the coloration extended to a considerable depth, it would be impossible to form any adequate conception of their number, still less to calculate it. It is the presence of a similar natural dye which has given to the Red Sea its name. These minute objects, however, are by no means confined to the surface of the sea, or to tropical climates; they are found in all latitudes and in all waters. The great rivers teem with them. The Ganges transports in the course of one year a mass of invisible infusoria equal in volume to six or eight of the great Pyramids of Egypt. Water brought up from the depth of 21,600 feet, between the Philippine and the Marianne islands, was found to contain 116 species. In the arctic regions, where the intense cold forbids all other animal life, the infusoria are still to be found, possessing a hardy constitution which defies all climates. In the residuum of blocks of ice nearly fifty different species have been discovered. At a depth of the sea which exceeds the height of the loftiest mountain, Humboldt asserts that there are to be found an innumerable phalanx of animals, imperceptible to the human eye.

It is only lately that science has begun to investigate this before-hidden life, to draw the veil and admit man to the secrets of the ocean. In this investigation it has employed three instruments. Let us stop for a moment to look at the keys to Neptune's door before we apply them to the lock and enter his palace. Of the diving-bell, not the least important of these keys, we shall have more to say toward the close of this article. The other two instruments of which we wish to speak are the aquarium and the microscope.

The aquarium is not merely a pretty par-

lor ornament, nor a scientific toy. It is really a contrivance for bringing the hidden life of the ocean before the savant for his investigation. That of the parlor is of very simple construction. A flat vessel of slate or zinc constitutes the bottom. Four columns of metal, bronze or iron, hold four sheets of glass in a vertical position, surmounted by a metal frame. To adjust the vegetation of this little world to its animal life, so that the plants will exhale just as much oxygen as the fishes need for life, and will decompose just as much carbonic acid gas as the fishes exhale—this is the scientific problem which a perfect aquarium must solve, and which is by no means easy of solution. On these cabinet aquaria science and art have made, however, great improvements. In the Zoological Gardens at Regent's Park, London, and in the Bois de Boulogne at Paris, aquaria are constructed which really afford useful material for the instruction of the student of nature. The latter was inaugurated in 1861. "The building," says M. Moquin Tandon, "is solidly constructed of stone, forty yards long and ten broad, showing a range of ten reservoirs of Angers slate facing the north. These reservoirs are nearly cubic, and have a front of strong glass, through which the interior can be examined. It is lit from above, by which a greenish, uniformly dispersed twilight is secured, which is an exact imitation of the feeble light which illumines the submarine world. Each reservoir contains about one hundred and sixty gallons of water, and in each is a rockery picturesquely arranged in the form of an amphitheatre. Upon these rocks spread and grow different species of aquatic plants. The floor is shingled with pebbles, gravel, and sand, which afford sufficient cover for many animals. Ten of these reservoirs are appropriated to marine animals. The quantity of water used is about four thousand gallons; it is never changed, but is continually flowing. This flow is secured by a somewhat complicated piece of mechanism, which also keeps the water at a uniform temperature. By alternately retarding and accelerating the flow, the rise and fall of the tides are almost exactly imitated.



THE AQUARIUM.

But neither the diving-bell nor the aquarium would suffice to bring the world of the sea within the sphere of man's knowledge, since its most wonderful forms of life are so minute as utterly to elude his vision. For the disclosure of its rarer secrets the world is indebted to the microscope. To whom it owes the microscope it is not easy to say. The honor of the invention is claimed by two citizens of Holland, Leuwenhoek and Hartzzoeker; and the dispute, which was exceedingly bitter while they lived, has not been satisfactorily settled since their death. This instrument gives to man a clearness and a minuteness of vision which are almost inconceivable. Two London opticians have succeeded in constructing lenses of 7500 diameters, equal to an enlargement of the surface 56,000,000 times. Notwithstanding this extraordinary result, it is said that every thing can be seen with great clearness. Such instruments are placed, both by their cost* and by the delicacy which they require in management, beyond the reach of any but the few who give their lives to the study of natural science. But for a few dollars common microscopes may be obtained which are sufficient to reveal to the common student a world of beauty before quite unknown. A very little experience suffices to teach any man how to use them, and they afford an endless fund of instruction and amusement.

The measurements of science surpass even the capacity of the eye. There are glass micrometers in which each circle is divided into nearly 1500 parts or lines, of such tenuity that the most practiced eye can not make them out. This is effected by means of an

* The binocular microscope, in which the objects are seen with a stereoscopic effect, costs in its simple form $150, gold, and admits of extra powers and apparatus.

instrument of extreme delicacy, which only works in the dead of night, when, all things being hushed in stillness, there is no agent to disturb it or impede the accuracy of its tracings. For this purpose the workman himself does not enter his work-room. A mechanism, moved by clock-work, at a suitable hour sets the machine in movement. The invisible divisions of the glass plate are engraved by means of an excessively fine diamond spark, which is found to be totally worn out when its work is accomplished. Nor does this exhaust the resources of modern art. Micrometers exist in which, by means of spiders' threads moved by aid of a simple screw, the inch is divided into nearly 30,000 lines. Armed with these instruments, the scientist explores the wonders of the deep, and studies its minute, its invisible life. With this triple key—the diving-bell, the aquarium, and the microscope—he unlocks nature's most secret cabinet.

Availing ourselves of his researches, let us study a little some of the curiosities of ocean life.

In the richness, variety, and fruitfulness of its vegetation it must be confessed that the sea yields the palm to the land. Nevertheless the products of the ocean deserve something better of man than that name of obloquy which he has bestowed upon them —sea-weeds. These weeds, or, as we should rather term them, these flowers of the sea, are of every variety of form, size, and color. Some are so minute that, as we have said, it takes 25,000,000 to cover a square inch. Some are so large as to extend in length 500 yards, greatly surpassing in size the greatest monsters of the land. Some are stationary, being glued to the rock by a sticky surface; others are travelers, and never tire of journeying to and fro upon the surface of the changing sea. They sometimes resemble wavy thongs, sometimes crumpled threads; some are thick and tough, others are thin and membranous. Some might be taken for little transparent balloons, some for fabrics regularly filled, some for shreds of quivering jelly, some for ribbons of yellow horn, some for belts of tanned leather, some for fans of green paper. Their surface is sometimes glossy, polished, and even glittering, sometimes rough with warts or with real hair. One is found covered with a viscous slime, another with a saline dust, a third with a sweet efflorescence; and sometimes they are found with a shelly surface. Their color is olive, fawn, yellow, brown more or less dark, green more or less bright, pink more or less delicate, carmine more or less rich. They are sometimes found alone; sometimes, interlaced, they form great banks and floating forests or prairies. It was such a bank of floating sea-weed which, not far from the Azores, so astonished Columbus, and was believed by him to mark the boundaries of vegetation. Unlike their brethren of the land, the sea-flowers have no roots, and are quite independent of the resources of their local habitation when they chance to have one. Their growth is wholly from the exterior. Their mother is the water on whose bosom they are borne. When they adhere to the shore it is not that they may find sustenance. They thrive alike on granite, limestone, and the sand.

If as flowers they scarcely equal those of the land, they are yet more inferior as fruit-bearers. And yet these weeds of the sea often furnish the peasantry a very considerable means of support. Sometimes as many as 30,000 persons, it is said, may be seen upon the coast of France gathering the sea-wrack. Since in this harvest the poor could but ill compete with the rich, who can employ both teams and laborers, the Catholic priests established a custom in the Middle Ages, which long usage has invested with the sacredness of law, that the poor of the parish alone should gather on the first day of the harvest. This custom is still preserved in some sections, and the day is called "the day of the poor." The sea-weed, dried, serves for packing cushions and mattresses, or, burned, produces kelp, which in turn furnishes soda and iodine, or is used to advantage in the manufacture of glass, alum, and soap. Thus man finds value in the very waste of the sea, the débris which from its stores it casts, as it were, contemptuously upon the shore.

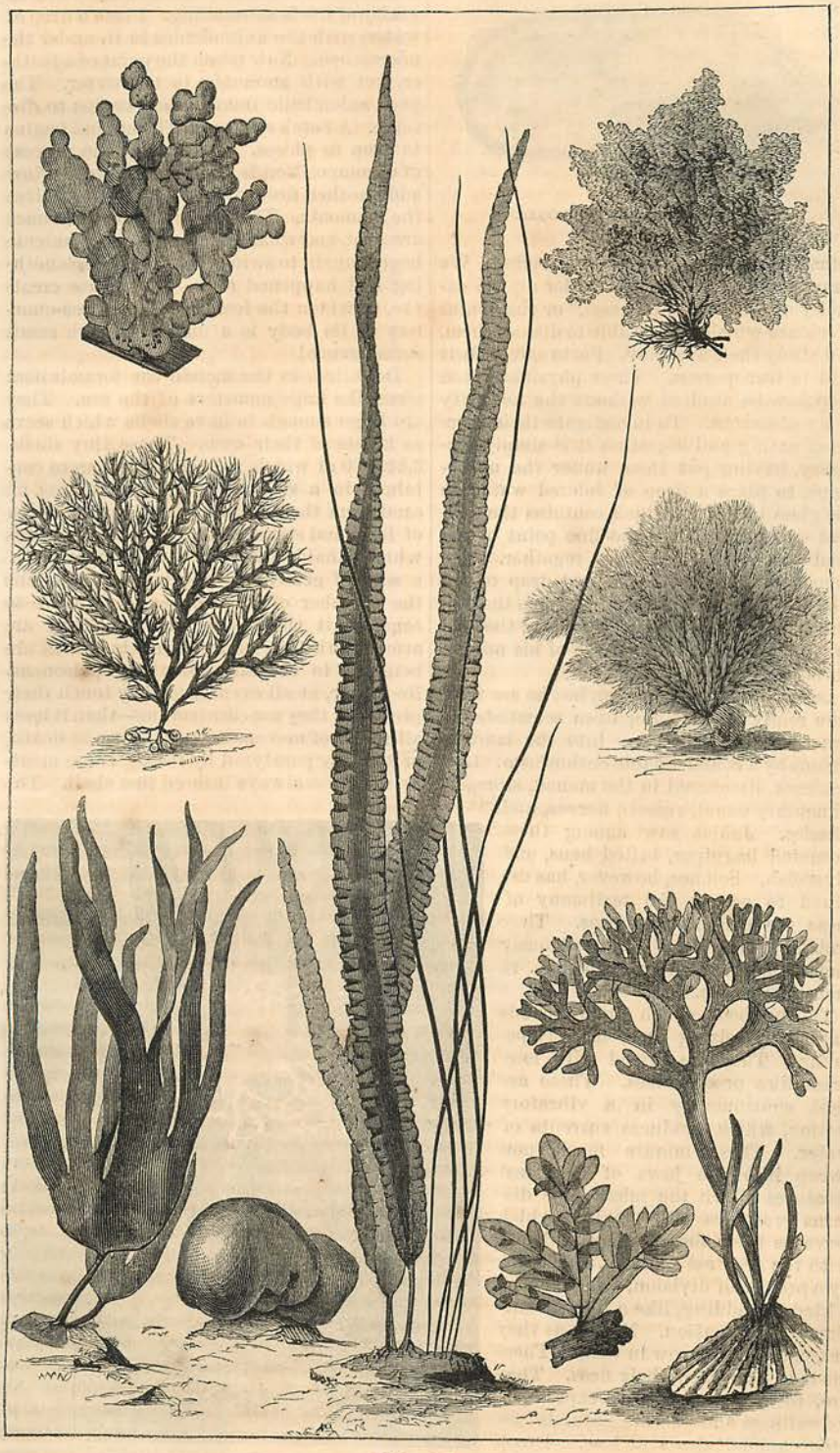
If the vegetable life of the ocean is not equal to that of the land, its animal life is far greater, at least in extent, though not in variety. Nor are the evidences of infinite wisdom in the singular contrivances and varied designs which characterize this world of the waters any less than those which science reveals in the upper air. Had the sweet singer of Israel any premonition of the revelations of modern science when he wrote that inimitable hymn of praise to the God of Nature, the one hundred and fourth Psalm? Surely those revelations give new significance to this stanza:

> "The earth is full of thy riches;
> So is this great and wide sea,
> Wherein are things creeping innumerable,
> Both small and great beasts."

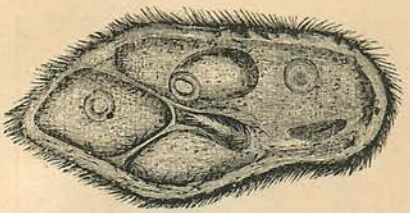
Nowhere else are seen such extremes of life, from the small to the great beasts; nowhere else such multiplicity of life, creeping things so innumerable.

Let us begin with the least, the *Infusoria*.

These little creatures are so minute that a drop of water may contain many millions of them. The diameter of the monad is but $\frac{1}{25000000}$ of an inch. They have been well called "live atoms, points which exist." Yet these infinitesimal creatures have distinct organs, and some of them voracious appetites. Ehrenberg asserts that he has seen



SEA-WEEDS.



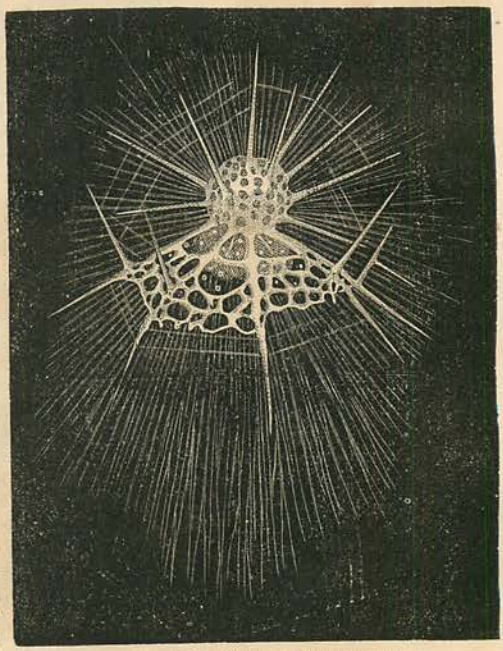
ONE OF THE INFUSORIA MAGNIFIED.

infusoria provided with 200 stomachs! We know not which most to wonder at, the capacity of these "little beasts," or the genius of science which is thus able to dissect them, and study their anatomy. Fortunately their skin is transparent. Their physiology can therefore be studied without the necessity of a *post-mortem*. To investigate their process of eating and digestion it is simply necessary, having put them under the microscope, to place a drop of colored water on the glass near that which contains the subject of study. With the fine point of the needle bring the two drops together. The monad approaches the colored drop to imbibe the molecules of carmine, when the student has the gratification of tracing the food down his throat, and into one of his numerous stomachs.

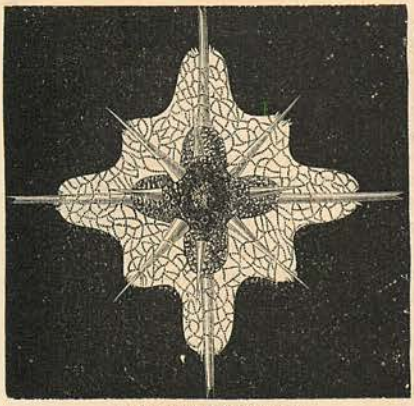
Let him beware, however, lest he see more than really exists. For even scientists are sometimes carried away into the land of dreams by a commendable enthusiasm. Leuwenhoek discovered in the monad, stomach, alimentary canal, vessels, nerves, and muscles. Jablot saw among them animated bagpipes, tufted hens, and silver-fish. Science, however, has declined to accept the testimony of these too excited witnesses. They probably employed unconsciously their imagination in addition to their microscope.

The methods which these monads employ in seizing their food is peculiar. They are armed with long beam-like prominences. These are kept continuously in a vibratory motion, which produces currents of water. These minute maelstroms sweep into the jaws of the least creatures which the microscope discerns creatures still smaller, which serve as their food. They multiply with the greatest rapidity, sometimes by a process of division, sometimes by a kind of budding, like a plant, sometimes by incubation. Minute as they are, parasites burrow in them. These monads have also their fleas. They are, to use Humboldt's expression, "dwellings and pasture grounds" for other animalcules still less. Death and resurrection seem to be in their little sphere common phenomena. Their tenacity of life is astounding. Place a drop of water, with the animalcules in it, under the microscope. Now touch the point of a feather, wet with ammonia, to the water. The poor animalcule immediately begins to dissolve. A notch appears. The animal begins to drop to pieces. Wait until the process of decomposition is nearly completed. Now add another drop of water. It neutralizes the ammonia. The decomposition is at once arrested, and what remains of the animalcule begins again to swim about, as though nothing had happened to it. Fortunate creature, to whom the loss of half or three-quarters of its body is a matter of such small consequence!

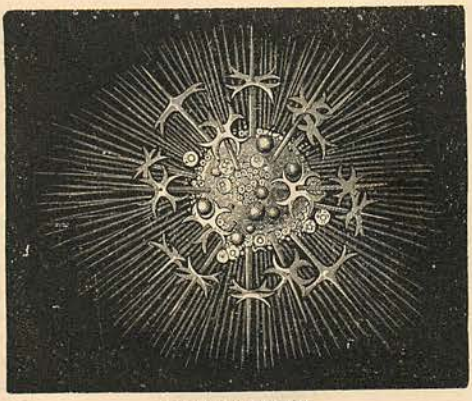
Doubtless to the monad the foraminifera seem like huge monsters of the sea. They are large enough to have shells which serve as homes of their own. These tiny shells, 3,840,000 of which, it is computed, were contained in a single grain (troy-weight) of sand from the Antilles, are of every variety of form and structure. The little creatures which inhabit these shells are composed of a sort of gelatinous substance, which fills the chamber of their house—or are we to consider it their outer body? They are armed with long hairy filaments, which are believed to contain something poisonous. No sooner, at all events, do they touch their prey—for they are carnivorous—than it loses all power of movement, as if stung to death, or possibly paralyzed by fear. These creatures are not always incased in a shell. The



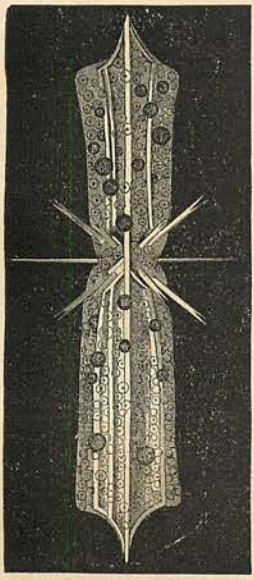
RADIOLARIA—DORATASPIS POLYANCISTRA.



Acanthostaurus purpurascens.

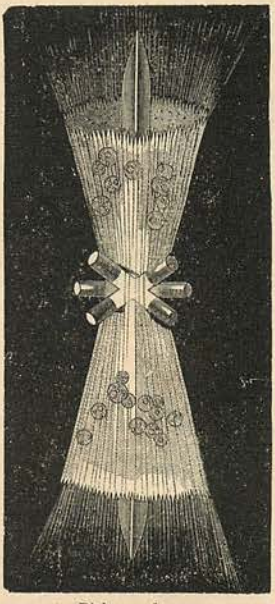


Amphilonche anormala.

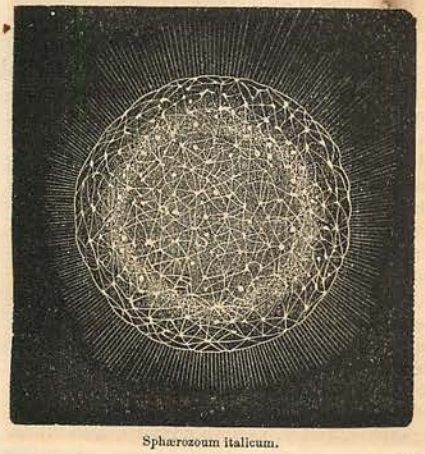


Dyctiosoma trigonizon.

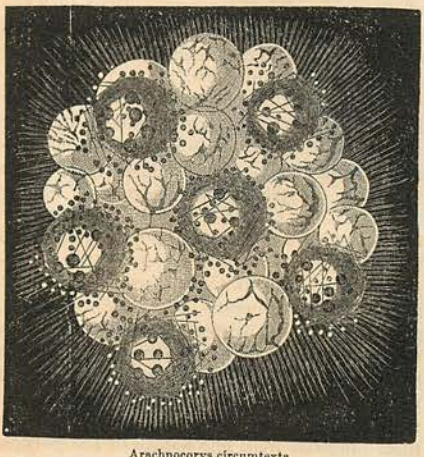
radiolaria float in abundance on the surface of the sea under the beautiful sky of Messina. They are of forms as various and as beautiful as snow-flakes. They are exceedingly difficult to catch. If you take them up with the forceps, they tear. If you lift them from the water with a net, they adhere to its meshes, and you mutilate in endeavoring to detach them. They can be procured intact only by dipping them from the sea in a glass. The loss of a limb, however, is not a serious matter with these jelly-like creatures. They supply it without difficulty. Dujardin observed that when a miliola attempted to climb up the sides of a vase, it could improvise, as it were, on the instant, and at the expense of its own substance, a provisional foot, which stretched itself out



Diploconus fasces.

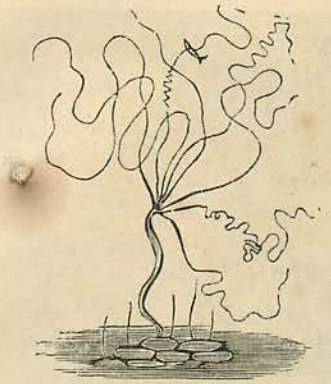


Sphærozoum italicum.



Arachnocorys circumtexta.

RADIOLARIA.



AN ISOLATED POLYP.

rapidly, and performed all the functions of a permanent member. When its task was accomplished, the foot was absorbed into the body. Convenient to be able thus to create an organ and dispense with it at will! How great an improvement on the processes of medicine and surgery practiced among men! And we superciliously rank this little creature among the lowest of the animate creation!

It is not a long stride from the foraminifera to the polyps. Indeed, the line which separates these little creatures of the sea is not very distinctly drawn; perhaps not in fact; certainly it is not very clearly discerned or traced by science. These polyps are verily monsters. They have been known to attain the gigantic size of one-third of an inch in length. "The most prominent member of this group," says M. Taudon, "is the fresh-water polyp, or *Hydra virides*. It looks like a little straight bag, tubular, semi-transparent, greenish, open at one end, and fashioned like a trumpet's mouth, having around the opening six, occasionally eight or ten, tentacles—fine, filiform, and flexible arms, arranged around the mouth in the form of a crown. Thus the bag is the body, the opening is the mouth, the cavity is the stomach, and the tentacles the arms. This, then, is the whole polyp."

It is a voracious creature, and has never learned the virtue of temperance. It never has enough. Its stomach possesses a curious power of adapting itself to its food, so that the polyp has the pleasure of eating occasionally a quantity of food three or four times the bulk of its own body. Sometimes it finds that its meal is too great for its digestive powers. It then ejects a part that it may digest the rest. St. Francis de Sales, pointing to the brutes, drew from them a moral for the benefit of man. "They are sober and temperate," he exclaimed, "and never eat more than their appetites demand." The worthy father was evidently unacquainted with the habits of the polyps. Sometimes a worm swallowed by this monster struggles to escape. The polyp thrusts his long arm into his own stomach, and holds the worm firmly there till he has dissolved. If the end of the polyp is cut off, he does not seem to suffer any serious inconvenience. He eats on as before, though, now that the bottom of his stomach is gone, all his prey simply passes out at the other end of the tube. Indeed, the glutton may count himself fortunate, since he can eat as much as he pleases without any danger of being gorged. Whether the stomach is in time supplied again by growth we are not told. This is by no means impossible, however. For generally amputation only adds a new polyp to the world. In his arithmetic division and multiplication are identical. Cut off his arm, not only does another grow at once to take its place, but the amputated limb becomes itself a new polyp. Cut him into pieces, we only make of the individual a community. He even turns himself inside out like the fabled gymnast; it is of no consequence. His skin makes a very good stomach, and the stomach a very good skin. The polyps naturally prefer to live in the other way; naturalists have, however, succeeded in transfixing them with a fine needle, thus compelling them to remain in their new condition. Their functions go on as before. Without apparent organs of sense, without heart, lungs, intestines, or brains, they perform with seeming success all the functions of higher animals—fight, flee from danger, capture their prey, bring up their children, and, in short, fulfill all the duties which God has devolved upon them. Nor do they seem to lack intelligence, though the organs of intelligence are wholly wanting. In what the marvelous instincts of these brainless, nerveless creatures reside is a question which we commend to the consideration of the phrenologist.

From the polyps we pass very naturally to a study of their habitations.

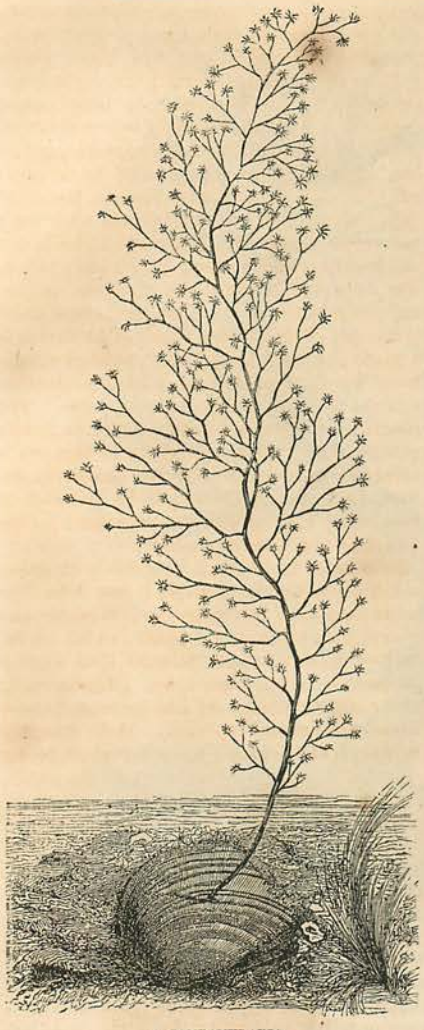
For a long time it was supposed that coral was a submarine plant. Nor did science admit its blunder without repeated investigations, and a discussion which was protracted for many years. In fact, there is perhaps nothing more difficult than to draw an accurate line of demarkation between the vegetable and the animal kingdom. They melt into one another as night into day. We are now about entering upon the twilight, so to speak, a realm wherein, as it has been well said, "animals flower, and vegetables bear no flowers."

If one looks at a specimen of a polypidom —that is, as we shall presently explain, the home of the polyp—he will no longer wonder that this structure was for a long time assumed to be a vegetable substance. It possesses, as the reader will observe, a trunk, branches, twigs, seeming leaves, and buds. Nay, it seems to possess flowers. For the

A HYDRARIA.

birth of the polyp so greatly resembles the opening of a bud that the one was for a long time mistaken for the other. Tournefort ranked coral with "the marine or fluviatile plants, the flowers and fruits of which are generally unknown." Marsigli discovered, as he supposed, the flower. For, watching the growth, or manufacture—it is difficult to say which we should call it—of the coral beneath the sea, he saw its buds open into eight-petaled flowers, formed of elegant white and stained corallæ, outlined upon the reddish bark of the stems. He sent the coral to the Academy of Sciences, and with it this announcement of his discovery: "I send you some branches of coral covered with white flowers. This discovery made me pass for almost a sorcerer in the country, no person, not even the fishermen, having seen any thing similar."

There was, however, one fact which seriously perplexed the savants, and might perhaps have set them upon the right track, were it not for a very satisfactory but purely hypothetical explanation. The coral was rocky, quite unlike any vegetable substance known. Pliny suggested, however—for the character of the coral seems to have been a very puzzling subject to the ancients—that this coral was of such a nature that, though vegetable in character, it hardened the moment it was taken out of the water. This view was generally accepted by the fishermen. They reported that the coral was soft beneath the wave, and this tradition of the fishermen was accepted by science without cross-examination. Indeed, to conduct the cross-examination was a matter of no slight difficulty. For the coral fishers are a poor, ignorant, and superstitious set of people; they cherish the secrets of their craft with as much care as though their livelihood depended on preserving them, and it is rarely the case that any inducement suffices to persuade them to give to the student a piece of living coral. If, overcoming every obstacle, he gets it, it requires no little patience to study its real character and, so to speak, its habits. For the little creatures who at once produce and inhabit the coral—which is a



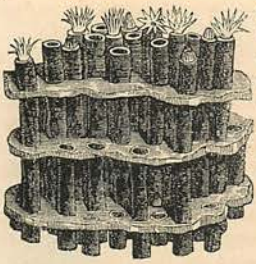
A CAMPANULARIA.

gigantic sea-shell, not of an individual, but of a whole community—are exceedingly sensitive. Drawn up from their home in the bottom of the sea, they lie dormant for hours, and it is rarely by the most patient waiting that you are able to obtain the opportunity of watching the architectural operations of these little "toilers of the sea." M. Nicolai was the first to call in question the universally accepted statement that the coral, which appeared like stone in the air, appeared like wood at the bottom of the sea. He appears not to have doubted the statement, but to have wished to verify it. For this purpose he sent down a diver. The man returned with the statement that the coral was as hard beneath the wave as above it. M. Nicolai was not convinced. It was not till he dived himself that he became satisfied that the theory of Pliny and the traditions of the sailors had nothing to sustain them.

The discovery of the true nature of coral is, however, due to M. Peysonnel. This man, a young physician of France, was sent out by the French Academy to the coasts of Barbary for the purpose of studying certain salt-water plants. He reported in 1725 that "the pretended flowers of the coral were only so many little animals, or polyps, analogous to the madrepores, and which, like them, were really the builders of the false stony shrub." This report, however, received very little attention, and no credence. Réaumur, to whom the report was referred by the Academy, dismissed it almost contemptuously. The name of the author ought, he said, *out of compassion*, to be concealed. De Jussieu would not even take the trouble to examine the coral sent to him. Had he done so, he could not have failed to discover that it was not a vegetable substance. In a word, this notion that great forests of the most brilliant and curiously formed trees and flowers were, or could be, the production of poor, helpless, jelly-like animals, was thought too absurd to deserve serious consideration. It was not till twenty years after, not till Peysonnel, disgusted with the supercilious treatment awarded to his discovery by the Academy, had exiled himself from his native land, and actually disappeared from the sight of men, that the truth was finally and fully recognized, and a tardy justice rendered to his name.

It is now, however, well settled that coral is the shell or the skeleton, the home or the bony frame—for we hardly know which to consider it—of these infinitesimal little polyps. They are found living in genuine socialistic communities. Their motto is *E Pluribus Unum*. Whether they are one or many, it is impossible to say. Linnæus endeavored to solve the problem by calling them "a compound animal." The coral is, then, the home of these monks of the ocean. Each has his own cell. They are bound together, however, by ties more rigorous than any that ever united the members of the most ascetic religious order. The imprisoned polyp never leaves his ocean home. Day and night he is at work, drinking in the sea-water, extracting its calcareous substance, and fashioning it, no man knows how, into new cells, for new polyps. The community and the house grow thus together. Whether these infant polyps be buds or eggs, or little living, sentient creatures, not even the microscope can fully tell us. They seem to occupy a shadowy border land between the animal and the vegetable world.

The perplexity of science is indicated even by the learned names which it gives to this family of sea "architects" to which the coral-builders belong. According to their character and their place in the scale of being, they



TURBIPORINE, OR MUSICAL CORAL.

are respectively known as *bryozoa* (moss animals), *anthozoa* (flower animals), and *zoophytes* (animal plants). They construct their submarine houses in all sorts of fantastic shapes, from the most delicate flower-like growths, which seem to propagate by buds exactly like the flower, to mere aggregations of polyps grouped about a common centre like a swarm of bees. Of these curious forms one of the most singular, and at the same time most beautiful, is that which, from its resemblance to the pipes of an organ, has given to it the poetical name of the musical coral.

Nothing is safe from the rapacity of man; these little creatures in vain hide their houses beneath the waters of the sea. The belles among the human kind demand these beauties of the ocean as decorations, and commerce makes haste to supply the demand. The coral fishers, who carry on their trade most successfully and on the largest scale at the entrance of the Adriatic Gulf, man a small boat, which, from the uses to which it is put, goes by the name of a *coralline*. Six or eight are sufficient for a crew. They are always excellent divers, amphibious creatures, half man, half fish. They take with them a large wooden cross, whose arms are of equal length and very strong. To each arm a strong net is attached. A heavy stone fastened to the centre of the cross serves as a weight, and sinks the simple apparatus to the bottom of the sea. The diver next descends, and by moving the branches of the cross rapidly round among the coral rocks, entangles them in the nets. After about thirty seconds of this work the men on board the felucca haul at the rope, and pull up cross, coral, diver, and all.

But it is not only coral which is brought thus to the surface. "With it," says M. Schele de Vere, "a thousand odd and outlandish citizens of the deep are curiously intermingled. Here hang worthless horn corals, and among them the Black Hand of the sailors, which they love dearly in spite of its uselessness, because it is an unfailing sign of the presence of genuine coral. There come up sepia fishes, with staring eyes, long waving arms, deformed bodies, biting beaks, and mighty suckers, abounding in weird and ghost-like shapes. Between these frightful forms wave sea-weeds with broad green and purple fronds, while little tufted bunches of red and white and violet and yellow lie marvelously close to feathers crusted all over by the salt sea-wave. Elfish faces, with huge staring eyes, peep at you from every side, and seem to threaten you with wild, unearthly horrors if you dare touch them. A fullness of strange things, unseen and unsuspected by dwellers on firm land, comes thus forth from the hand of Nature, in her great workshop of the unfathomable, fertile sea. But they are all pitched overboard; only the men are sure first to open the shell-fish, and to swallow the contents with truly marvelous dexterity, before the shells are allowed to return to their dark homes below. The branches of coral are carefully picked out down to the smallest fragment, and great is the joy of the lucky finder if he discover a piece naturally bent in the shape of a little horn, for it is an amulet, a sure protection against the dire effects of the evil-eye." The result of the day's fishing is carried finally ashore, where all the produce of the sea is carefully assorted, whence it is sent to Naples, Leghorn, or Genoa, to be worked up into every kind of fanciful ornament for the jewelers and their customers.

If science has been a long while in determining the nature of coral, it has been even more perplexed by the sponge. Whether this is really an animal or a plant is still an unsettled question. As late as 1848 Agassiz classed it with vegetables. Linnæus, in the earlier editions of his *Systema Naturæ*, avowed the same opinion. More recently, however, the learned have returned to the

NEPTUNE'S GLOVE.

1. Caryophyllia smithii.—2. Sagartia coccinea.—3. Phyllangia americana.—4. Edwarsia callim.—5. Edwarsia carnea.—6. Sagartia viduata.—7. Sagartia rosea.—8, 9. Sagartia sphyrodeta.—10. Sagartia rosea.—11. Ceriantus lloydii.—12. Actinoloba dianthus.—13. Sagartia chrysosplenium.—14. Balanophyllia regia.

SEA-ANEMONES.

views of the ancients, who classed the sponges among animals, and even attributed sex to them. It is believed that, like the coral, they are the home or skeleton of a great number of infinitesimal little creatures, who not only live in perfect harmony, but work, though without law or leader, in perfect unison in producing one common fabric. If their structure is less beautiful than the coral, it is more extraordinary. That animals unendowed with reason, unable to move from their place, unable apparently to communicate with each other, working in seeming solitude, and at distances which, measured by their scale of being, are almost infinite, should yet produce figures so curiously perfect and symmetrical as that to which the sailors have given the name of "Neptune's Glove," is one of the greatest among all the marvels of this wonderful world of ours.

If the polyps *make* flowers, we may almost say that the sea-anemones *are* flowers. The base of the sea-anemone, or *actinia*, is a plain surface, which acts as a sucker, and by which it clings to the rock. Its mouth is a disk, surrounded by long feelers, or tentacles, which it moves in every direction, and by which it seizes its prey, or creates in the water currents and streams which sweep within their vortex and into its voracious stomach whatever creature is so unfortunate as to come within its reach. They are found of every tint—white, gray, red, pink, purple, fawn, yellow, orange, lilac, azure, green. There is one beautiful species with violet tentacles pointed with white; another with red tentacles speckled with gray; a third spreads out green arms edged with a circle of dead white.

The anemone, unlike the polyp of the coral, has power of locomotion, though its progress is very slow. When it wishes to

change its place, by an imperceptible action it stretches forward one side of its base, gradually drawing in the opposite. Sometimes it draws itself along by means of its tentacles, thus in this instance making them serve as feet. Professor Forbes had an anemone which walked upon the sides of a bottle, sticking alternately by its base and by its disk. So in the kingdom of nature there are flowers that even walk!

These tentacles are not, however, merely arms. They are also fangs. Touch them, a sharp stinging sensation is felt, which produces in the experimenter only a temporary inconvenience, but death in the creatures which serve as their prey. Mr. Gosse tore off one of these filaments just as it had seized a little fish, but the captive only struggled feebly, and soon relaxed all effort. Mr. Holland has seen a young mackerel roll over upon its side and die from merely having touched one of these beautiful but dangerous flowers of the sea.

The anemone has an insatiable appetite. Unfortunate glutton! It is often unable to retain what it has eaten. Sometimes the prey, after it has been swallowed, escapes from the stomach. Sometimes it is seized and carried off by a stronger arm. A shrimp which has seen the prey devoured from a distance will throw itself upon the anemone, and audaciously wrest his booty from him, and, to his great chagrin, devour it before his eyes. Even when the savory morsel has been swallowed, the shrimp, by a great effort, succeeds in drawing it back again from the stomach. Seating itself upon the extended disk of the anemone, with its small feet it prevents the approach of the tentacles, and, at the same time, inserts its claws into the digestive cavity and seizes the food. In vain does the pilfered anemone endeavor to contract and close its mouth—it is useless. The vagabond crustacean generally comes off victorious; but sometimes the conflict becomes serious when the anemone is strong and robust, the aggressor is repelled, and the shrimp runs the risk of supplementing the repast of his victim.

Like the polyps, which we have already described, the anemone has a wonderful power of replacing any missing member, or remedying any physical misfortune, however serious it may at first appear to be. Dr. Johnson tells us that an *Anemone crassicornis*, from having swallowed a shell which separated it into two halves, was well-nigh perishing from hunger, when—*mirabile dictu!*—it opened at its other extremity a new mouth, provided with its proper row of tentacles. So the creature ate at both ends! An accident which to other animals would have insured death became in this sea-anemone the source of redoubled enjoyment. If, however, they eat insatiably at times, they also compensate for their rapacity by long enforced fasts. Unable to pursue their prey, they wait with the exemplary patience of practiced fishermen for their food. They sometimes go without a meal for two or three years. Let us not condemn them severely if, when they get the opportunity, they make up by their voracity for lost time.

THE BEAUTIFUL HAIRED MEDUSA (CYANŒA ENPLOCAMIA).

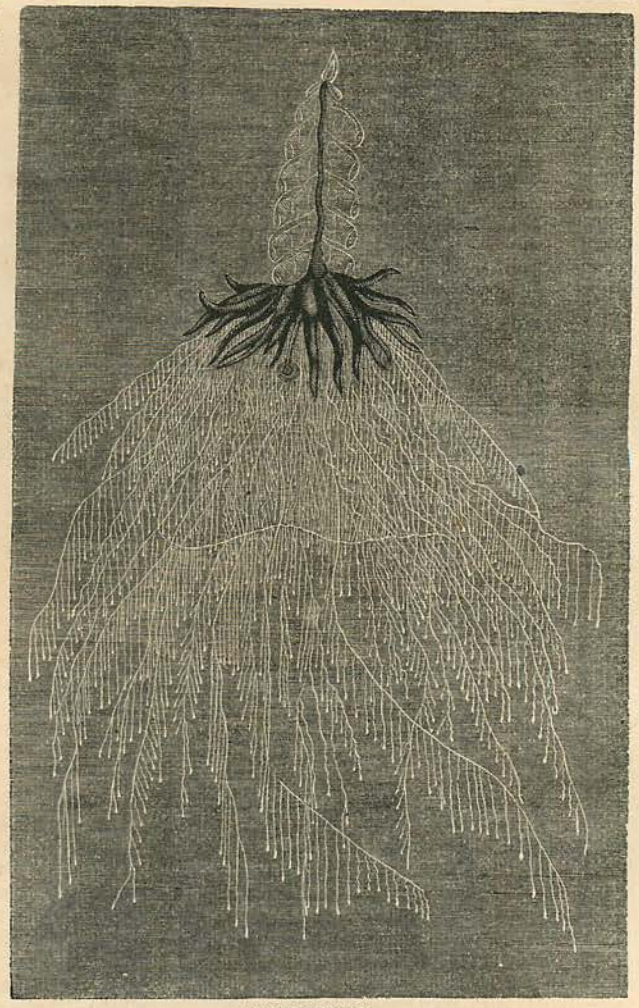
The fangs of the anemone are harmless compared with those of the medusæ. The Gorgon-like hairs of these curious creatures, which have given to them this name of medusæ, are armed with an acrid and sometimes dangerous venom, which has caused them to be christened sea-nettles. Their curious vegetable-like appearance has conferred upon them the title of living sea-weeds. And finally, a peculiar palpitating motion, by means of which they swim, together with their unique structure, has gained for them the name of sea-lungs.

The sea-nettle, by which name, to avoid confusion, we will call this singular creature of the sea, resembles an umbrella, or a bell, or an elegant floating mushroom, the support of which has been separated into lobes more or less divergent, sinuous, twisted, shriveled, or fringed. The edges of the umbrella-like top are sometimes plain, sometimes delicately cut, sometimes ciliated, often provided with long thread-like appendages which descend vertically into the water. Sometimes these filaments are very numerous, as in the Physophora, and give the creature the aspect of a living net. Occasionally the sea-nettle is colorless, and as transparent as crystal. Generally, however, it is slightly opaline, with a delicate blue or pink tint; and in

certain species the shades are bright, and the reflections iridescent. In some specimens the central parts only are colored—red, yellow, blue, or violet—the remainder of its body being semi-transparent. The central mass appears covered with a thin veil, a beautiful film, showing all the colors of the rainbow, which is like a glass shade covering a bouquet of flowers.

These sea-nettles vary in size from about two-thirds of an inch to twelve inches. We speak of the ordinary medusæ of our Northern seas. Larger ones are sometimes found in the tropics, as we shall in a moment note. Their bodies are composed almost wholly of a semi-transparent gelatinous substance, without consistence, and absolutely without any bony structure. It would seem as though it were impossible that they could resist the action of the waves. Their structure is, however, their protection. They conquer the wave by yielding to it. The sea bears them tenderly on its bosom. It is the land only which they have to fear. Cast upon the shore, they melt like ice, and utterly disappear, sometimes in a few hours. In 1819 Mr. Telfair saw an enormous sea-nettle cast upon the shore near Bombay. It weighed several tons. The fishermen of the neighborhood were employed to watch its decomposition, and to collect the bones or cartilages of the monster, if there were any. None, however, were found. It entirely disappeared, like an iceberg under the summer sun. The Lizzia of Kölliker, on the other hand, found often on the coasts of Greenland, is so small that it can hardly be recognized by the naked eye in transparent water. A wine-glass suffices to contain 3000 of them.

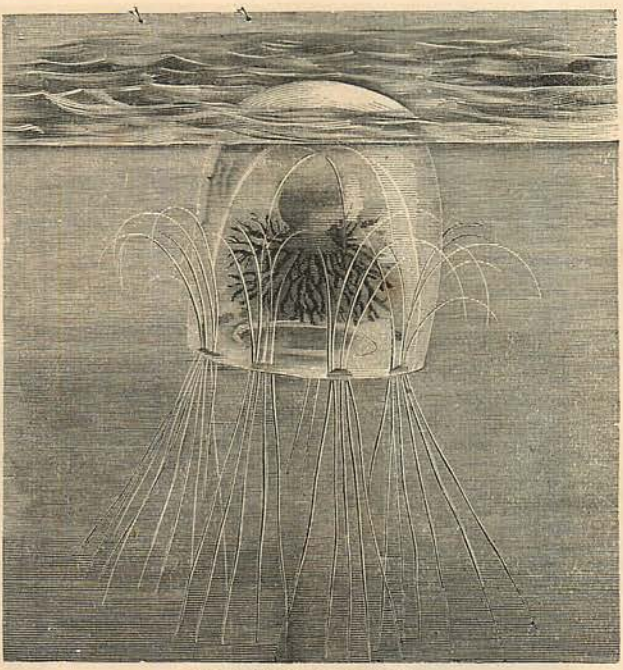
Of an analogous structure, though of a different form from the ordinary medusa, is the Girdle of Venus, so called from its resemblance to a broad long ribbon. It is six feet long and two inches broad, beautifully fringed at the edges. It is even of a softer and more fluid consistency than the medusa.



THE PHYSOPHORA.

These seemingly helpless animal jellies are by no means contemptible foes. They are voracious devourers. They prey upon fish and other creatures of the sea of a considerably higher order of structure and apparent intelligence. They seize their prey, hold it fast till by its struggles it has exhausted its strength, then devour it. They are formidable even to man. Their fine, thread-like hairs, which impart to them their peculiar beauty, constitute a most dangerous weapon. The hairy medusa is a terror to bathers. Any one who ventures to come in contact with its delicate and almost transparent hairs soon feels the most insupportable agony. Though detached from their owner, these little filaments still carry their sting with them. The physalia, or "Portuguese man-of-war," as the

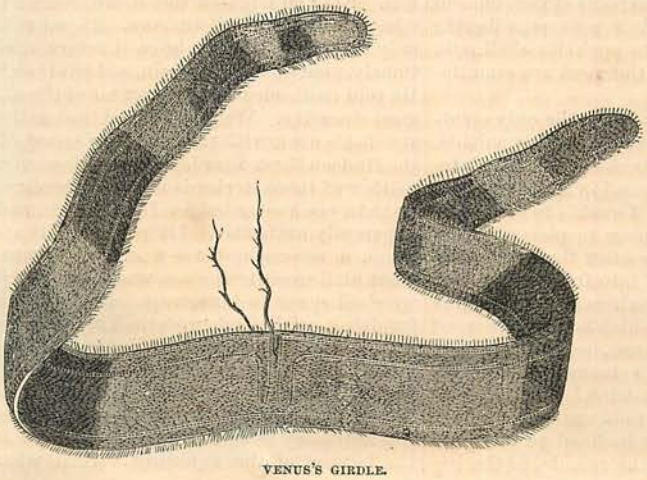
sailors call it, is a still more dangerous creature. Its color is purple, shading off into blue. The pendent threads are of the richest hues. By inflating the upper portion of the body with air the little creature forms a sail, by which it is blown over the waters. Its beauty is deceptive. Be careful how you venture to touch it; its venom sometimes produces convulsions. Father Duterte, when he was in the Antilles, was one day sailing in a small boat, when he saw one of these curious little vessels. Desirous to study its form, he undertook to take it up in his hand. "But I had scarcely seized it," he writes, "when all its fibres seemed to clasp my hand, covering it as with bird-lime; and I had hardly felt it in all its freshness—for it is very cold to the touch—when it seemed as though I had plunged my arm up to the shoulder in boiling oil, and this was accompanied with pains so strange that I could scarcely prevent myself from shrieking." Meyer gives a similar account of the venomous powers of the sea-nettle. A magnificent physalia was seen on one occasion very near his ship. A young sailor leaped into the sea, naked, to secure the animal. Swimming toward it, he seized it; the creature wrapped its assailant with its thread-like filaments,



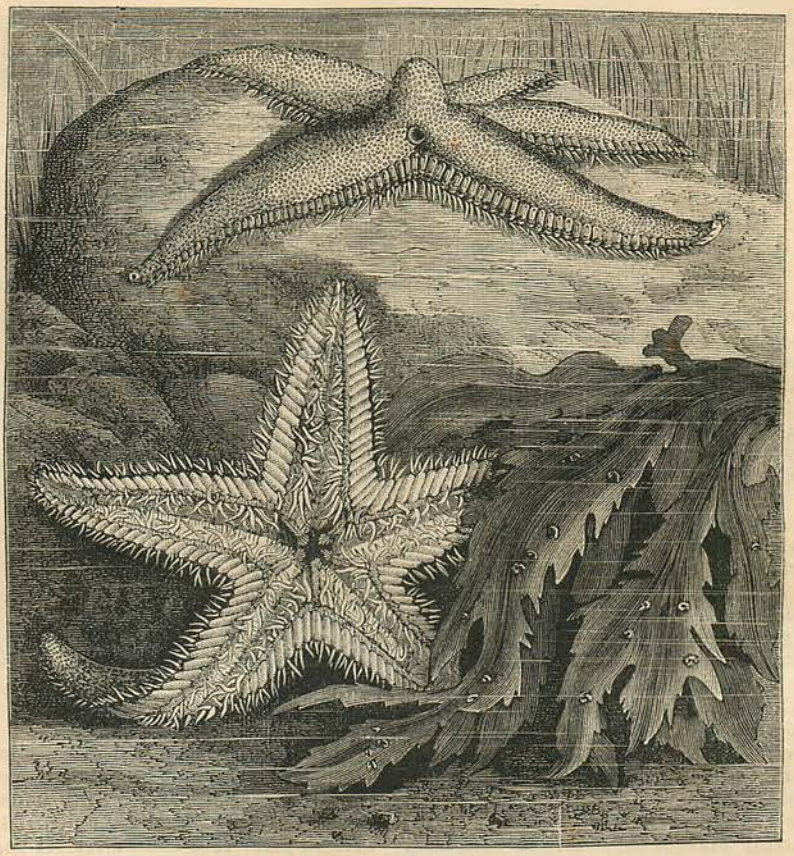
LIZZIA KŒLLIKERI, MAGNIFIED.

which were nearly a yard in length. The young fellow, overwhelmed by a feeling of burning pain, cried out for help. He had scarcely strength to reach the ship and climb on board again. The inflammation and pain were so great that brain-fever set in, and great fears were entertained of his safety.

In marked contrast to the medusæ are the star-fish. The one are formed in graceful curves, the other upon almost strictly geometrical principles. They are without vertebræ, are generally flattened and pentagonal, and invariably possess five symmetrical rays. They dwell at great depths, having been drawn up from 260 fathoms of water. In great quantities they strew the ocean forests. Thus the sea, which produces living trees and living flowers, produces also living stars. They are of various colors. A mouth at the centre of their lower surface affords them the means of supplying a vigorous appetite. This mouth opens immediately into the stomach. When it proves too small for the prey which the star-fish has



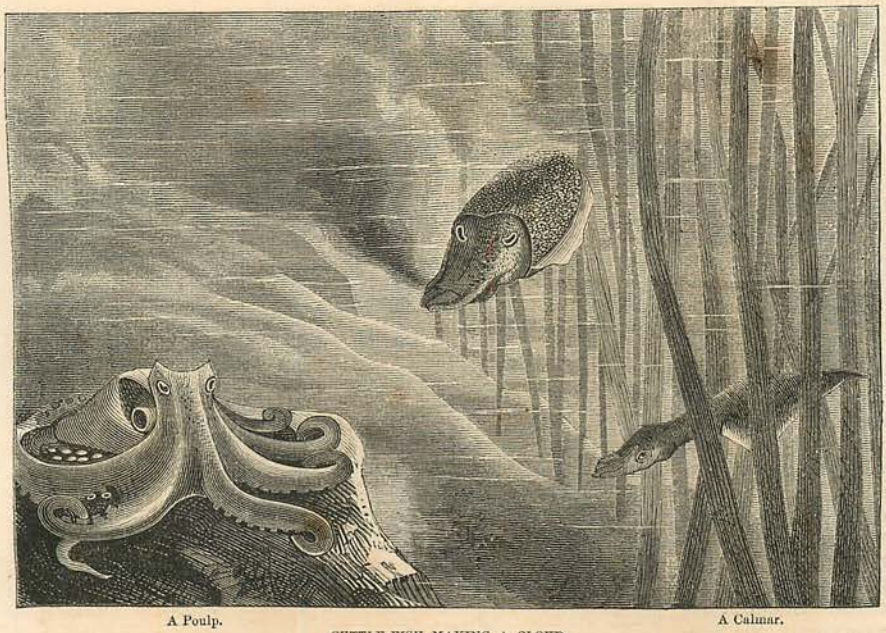
VENUS'S GIRDLE.



UPPER AND UNDER SURFACE OF A STAR-FISH.

seized, the animal has a curious power of inverting its stomach, and so taking the food directly into it. It is thus they succeed in devouring even oysters. They seize the unhappy mollusk by their rays; they then invert their stomach, which infolds the unfortunate victim; from the pores of the stomach there appears to exude a poisonous liquid; the oyster is forced to open its shell, and thus the capture and the meal are simultaneously completed.

We believe the star-fish is the only creature which is ever known to commit suicide. Edward Forbes is responsible for the statement that a star-fish found in the Mediterranean, when attacked, if unable to defend itself, escapes by dropping to pieces. First the arms break off one after the other, then the disk breaks itself into fragments. Not being able to defend itself as a whole, it kills itself in detail. One which had thus escaped him by sacrificing its arms, he reports to have opened and shut its spinous eyelids with something very like a wink! We have already said that scientists are not without imagination. We are inclined to attribute the wink, not to say the suicide, to the imagination of the observer. It is but just to say that events yet more wonderful are reported. An old fisherman pointed out to us not long since on the rocks near the Hudson River a dead lizard. He showed us a very distinct circle round the upper part of the tail. "If you frighten this lizard," said he, "he will drop his tail and run. If you will only wait long enough, he will return cautiously, pick up his tail again, and put it on." He told us this legend with an air of the utmost sincerity. We are inclined to class the star-fish's wink with the fisherman's story of the Hudson River lizard. In truth, however, neither of these stories is more extraordinary than one recounted by Dr. Johnson, and apparently authentic. He possessed, it appears, a sea-cucumber—a creature somewhat analogous to the sea-urchin, of which we shall speak in a moment. He forgot to furnish it with fresh water. The creature became sick and dejected. Under this neglect it wasted away in a most extraordinary manner. One by one it ejected its tentacles, its teeth, its digestive tubes. These fragments lay here and there, scattered at the bottom of the aquarium. Still what



A Poulp. A Calmar.

CUTTLE-FISH MAKING A CLOUD.

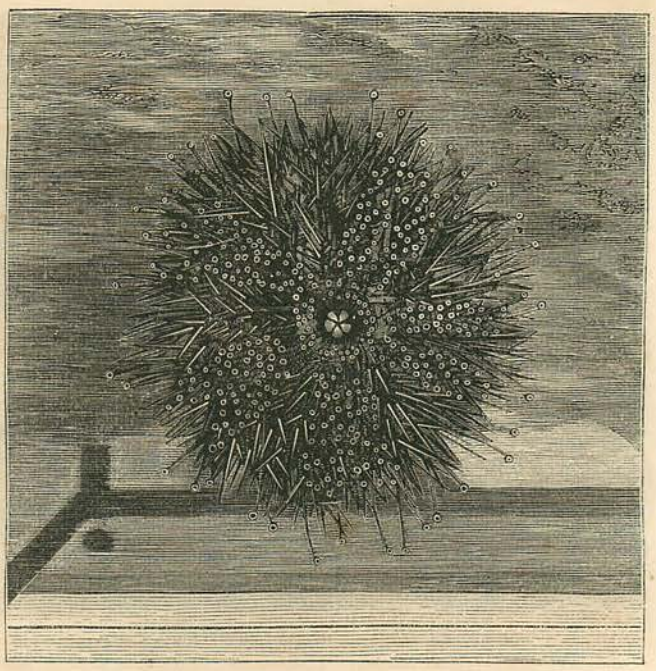
was left of the creature was not dead. Its empty sack contracted at the least touch. But what is more extraordinary, so soon as fresh water was provided the creature began to revive again. It reproduced one after another its lost organs, and at the end of two or three months appeared to be as well and as happy as before.

The disappearance of the sea-star in small pieces is somewhat mythic, but it is scarcely more curious than the resource with which the cuttle-fish is supplied, and by means of which it is enabled to retreat from its foes and quite disappear from their vision. This curious creature is provided with a kind of deep pocket within the abdomen, containing a black inky fluid. It is said that this fluid is used by the Chinese in the manufacture of their ink, though this statement is contradicted, and lacks verification. At all events, it is not to be supposed that the cuttle-fish has any literary propensities because he carries an inkstand in his pocket. It is his means of defense. When attacked he ejects this black fluid forcibly from his pouch, and in the cloud which ensues usually succeeds in escaping from his assailant.

Somewhat analogous in their structure to the sea-stars are the sea-urchins. They live alone, sedentary lives, hidden in the sand, or even in the rock. Their shells are composed of many thousand pieces—in the edible sea-urchins there are 10,000—so admirably and finely united as to appear but one piece. They are protected by prickly spines, which give to the creature both the appearance and the name of sea-hedgehog. In one species as many as 2000 spines have been counted. In the edible sea-urchins there can not be less than 3000. In addition to these spines they are provided with tentacles, terminated by a sucker. These tentacles serve as feet. Professor Forbes once saw one of these prickly creatures crawl up the sides of an aquarium. For this purpose it pushed out certain of its tentacles, fastened them by means of the sucker to the glass, drew itself up a little way, and then fastening its tentacles further up, withdrew the former. How sharp are the spines of the sea-urchins is indicated by the story, apparently well authenticated, though M. Mangin calls it in question, that they hollow out holes for their homes in the hardest granite, and thus add to the protection which nature has afforded them that of an impenetrable fortress produced by art. For this purpose they fix themselves upon the surface of the stone by means of their tentacles, and by the aid of their spines excavate their asylum. Even the infant urchins begin this work of submarine quarrying as soon as they have cut, so to speak, their eye-teeth.

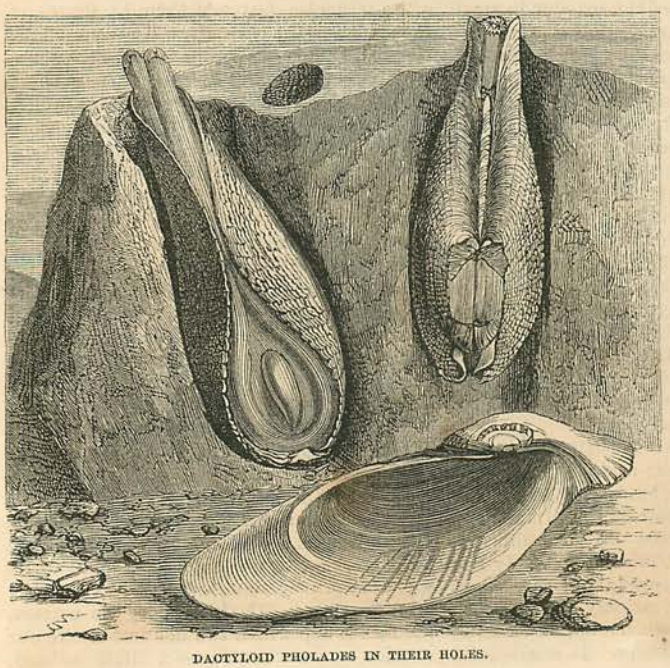
The razor-shell, a mollusk, possesses a similar power. These creatures are found buried in the sand, the wood, the rock. Various explanations have been proposed of the phenomenon. It was De Blainville who first suggested the theory, which seems most probable, that by a simple movement of its shell, constantly repeated, it bores its way into the stone. If this theory be correct, the fact is one which can not but excite our wonder and admiration—a little animal,

without the slightest consistency, boring out for itself a house in the hardest rock. A somewhat similar animal is the teredo. These vandals attack every piece of wood within their reach, just as it is the propensity of certain insects to cover all the wood they are able to with their larvæ. In months, or even weeks, they perforate a plank in every direction, the little miners having the singular instinct never to cut into each other's channel. The wood externally does not appear injured, but crumbles at a touch. Silently, unwearyingly, the teredo bores, until the pier suddenly sinks, or the planks of the doomed ship crumble beneath the feet of the sailors.



AN ECHINUS, OR SEA-URCHIN, CLIMBING UP THE SIDE OF AN AQUARIUM.

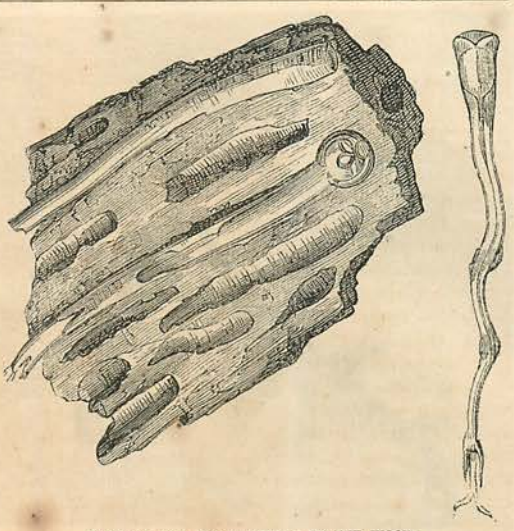
In the beginning of this century half the coast of Holland was threatened with the invasion of the sea, because the piles which upheld the dikes were attacked by the teredo; and it required an outlay of a large sum of money to secure the country from the disaster of an inundation, caused by a contemptible mollusk. A closer study of the habits of this animal has shown that it possesses an insurmountable antipathy to iron-rust; hence all wood which is to be exposed to sea-water is first soaked in a solution containing iron. The covering of copper with which ships are armed renders the appellation Linnæus gave to the teredo —*Calamitus navium* —no longer true.



DACTYLOID PHOLADES IN THEIR HOLES.

The mollusks, certain species of which may thus be called stone-masons, if not carpenters, are also weavers. Certain of the bivalves anchor themselves to the rock by a golden-colored silk. In the mytilus this silk is short and coarse; in the pinna it is long and silky. Attempts have been made to utilize this

filament; indeed, the inhabitants of Taranto make gloves and stockings of it. Cloths of a rich brown have also been fabricated, which are of an admirable texture. Some beautiful specimens of this fabric were exhibited at the French Exhibition of 1855; and in that year M. J. Cloquet presented the Acclimatization Society with a pair of fine mittens made of the byssus of the pinna. Not only does the byssus serve to fix the mollusks to the rock, but some of them attach by its means stones, pieces of coral, and other solid matters to themselves, thus surrounding their shells with a very invulnerable coat, in which they lie in ambush, waiting for their prey. In constructing this envelope, which is not unlike a miniature rockery, the mollusk, by a singular artifice, spins and weaves the material of its byssus. It then lines its interior with a species of tapestry, thrusts this outside, and mats together by its means the solid bodies within its reach. Thus it in turn plays the part of spinner, weaver, and mason. Clothed in a calcareous covering or a stony mantle, buried in a rock or anchored by a cable, the bivalve—the softest and the most delicate of creatures—can exist in a terrible and ever-turbulent element without injury and without inconvenience.



TEREDO, AND HIS PATHWAY IN THE WOOD.

We may, perhaps, pass by the oyster in silence—not because he is an unimportant member of the submarine kingdom, but because it is safe to assume that our readers are somewhat familiar with his character and habits. But we can not pass by the mollusks as a family altogether without referring to the salpas. Solitary as an oyster has passed into a proverb. Nearly all mollusks are solitary. The salpas, on the contrary, though they belong to the same general class, almost invariably travel in company. Attached to each other, formed into a long chain, sometimes forty miles in length, and possessing phosphorescent qualities, they glide over the surface of the sea in undulating curves, manœuvring in concert like a company of admirably drilled soldiers, and looking like a luminous sea-serpent in the darkness of the night. Their mode of locomotion is peculiar. They are propellers. They always swim upon their backs, and drinking in a quantity of water, squirt it out from behind—a method of locomotion to which they possess a

CHAIN OF PHOSPHORESCENT SALPAS.

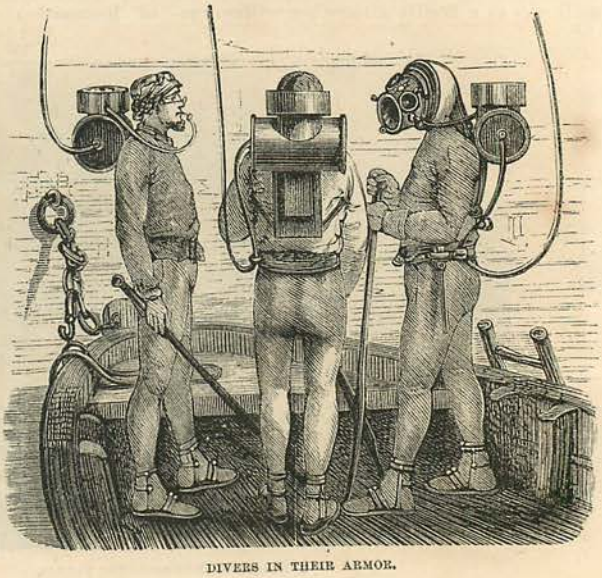
THE PEARL FISHER IN DANGER.

sort of natural and indefeasible patent-right.

We have purposely, in this sketch of some of the phases of life under the ocean wave, passed by the more common phases of that life, or, rather, those that are more commonly known and understood. We can not leave our theme, however, which is far from being exhausted, without speaking briefly of man considered as a submarine animal.

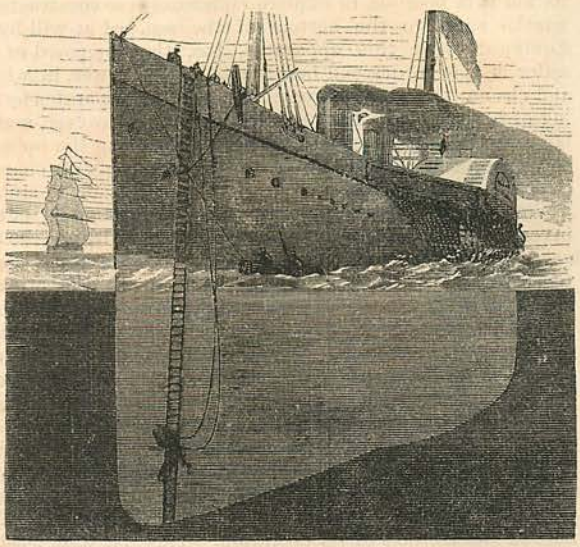
We have already spoken of the coral fishery. At once more difficult, more dangerous, and more productive are the pearl fisheries, carried on on the largest scale both in the Old World and the New. A brief glance at an East Indian fishery will suffice to afford us an illustration of the method pursued, which is substantially the same in all waters. In February or March a fleet of 250 boats appears on the northeast coast of Ceylon. Each boat is manned by ten rowers, and carries ten divers. To prevent the exhaustion of the oyster bank, the fishing is conducted under government inspection. The bank is divided into seven allotments, one of which is thrown open to the fishers in succession every year, so that by the time the seventh is wrought the shell-fish of the first have had time to reproduce and to develop themselves. At the sound of a signal-gun the fleet starts for the bank. The land-breeze wafts it thither. The hour of starting is ten at night. Diving begins at dawn. Diving we call it, yet the word misleads. The pearl-diver drops into the sea feet foremost. To one foot is attached a stone, which accelerates his descent. To the other is attached a net, in which his booty is to be placed. Then seizing in his right hand the cord on which he descends, and with the left holding tightly his nostrils, he commences his perilous voyage. Perilous because the deep abounds with creatures that resent this invasion of their domain. If the diver is so fortunate as to escape these creatures, he rarely is able to counteract the influence upon the constitution of this submarine life. Often water colored with blood oozes from his eyes and mouth and nose when he ascends. Sometimes he dies of apoplexy on emerging from the water, sometimes of suffocation at the bottom of the sea. If he escapes these perils, his constitution inevitably breaks down under repeated violations of the laws of nature, and it is rarely the case that the pearl-diver reaches a good old age. Well may pearls be costly, for which human health, and often human life, are the price. The best divers rarely descend more than eight or nine fathoms, or remain under water over thirty seconds.

Science, however, is the master of nature. Man, equipped with the modern diving-bell,

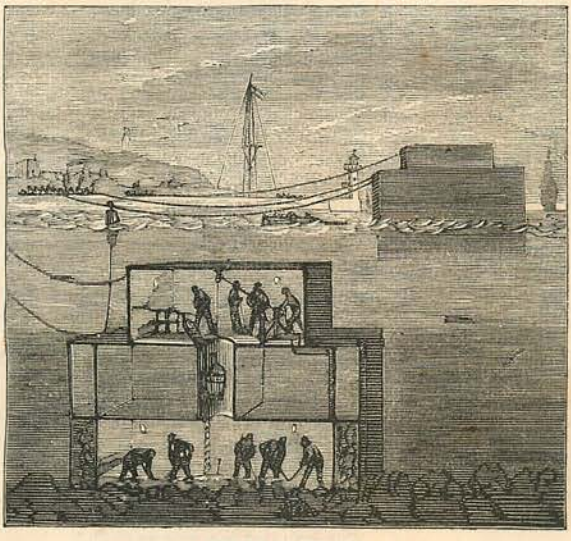


DIVERS IN THEIR ARMOR.

no longer dreads the sea, but walks beneath the wave as though it was his native element. "The diving-bell," says M. Pouchet, "was invented by a spider; we had nothing to do but to imitate it. The copyist has not, however, equaled the inventor." The last sentence, we think, requires qualification. For the modern diving-bell is, for man's purpose, a decided improvement over that of the naiadæ. This water-spider builds a house of silk beneath the wave. This bell-shaped house it fastens to the adjoining grass by a number of little threads, just as a balloon is held back by cords till the moment for its departure has arrived. This house built, the water-spider proceeds to stock it with air. For this purpose he comes to the surface, takes a bubble of air under his abdomen, and carries it to his miniature diving-bell, an operation which he repeats till his bell is completely filled. Man's improvement consists in making an air vessel which is not stationary, but suffers him to move about at will. It has been changed in structure several times since its first employment in the beginning of the sixteenth century. At first it was literally a bell, inverted, sinking by its own weight, and carrying with it a certain quantity of compressed air. Then to this bell a long tube was attached, and air was pumped into it, as needed, from above. For this was substituted a coat of water-proof mail, with a visor of glass. Shoes of lead enabled the diver to maintain an upright position on the bottom of the sea, and a cord served as a signal to his companions to pull him up when he was ready to ascend. M. Rouquayrol, a French engineer, has improved even upon this. A reservoir of compressed air is buckled on the diver's back, like a soldier's knapsack. A system of skillfully disposed valves and a double tube of India rubber fitted to the diver's mouth renders the process of breathing exceedingly easy. A supply pump, worked by men above, keeps the knapsack full.



THE SUBMARINE MAN AT HIS WORK.



TOILERS OF THE SEA.

An experienced and robust diver can work with this machinery at a depth of from twenty to twenty-five fathoms for an hour and a half without inconvenience. Thus science, which has not yet succeeded in endowing man with wings, renders him a truly submarine animal. With what curious emotions, if the inhabitants of the deep have emotions, must the fishes have witnessed the advent of this singular monster among them! With what curiosity must they watch his operations, and even wait, perhaps, his advances toward a better acquaintance!

This diving bell is used more frequently in submarine investigations than in any fishing operations. By

its aid it is possible to explore elaborately wrecks sunk to the bottom of the sea. Equipped with this apparatus, too, the sailor is able to descend beneath the wave and cleanse the sides or repair the sheathing of his vessel, without requiring the delay and the expense which are always rendered necessary by resorting to the dry-dock.

Various curious structures have also been invented for enabling a corps of workmen to carry on investigations or labors at the bottom of the sea. By their aid harbors are cleared of obstructions, foundations for piers are laid, with as much deliberation and as much precision as for buildings on the land; and, in short, all the various operations which the necessities of modern civilization require are carried on with an ease and a perfection which constitute one of the greatest marvels of modern science. Of these the submarine *hydrostat* of Dr. Payerne is perhaps the most curious in its structure, and the most remarkable in the method of its operation. This diving-bell—for so we must consider it—is so constructed that it can be raised or lowered at will by the workmen within it. It is composed of three chambers: an upper and lower, in which the workmen are engaged, separated by an air chamber, through which, however, a chimney or flue passes, connecting the upper and lower rooms. By filling this air chamber with water the machine is made to sink to the bottom of the sea; by pumping out the water and filling it again with air, the bell is made to rise again to the surface of the water. The bottom of the lower compartment is open, and the workmen who are within it are thus enabled to carry on their operations upon the bottom of the sea as safely as they could do upon the land.

We are far from having seen all that the diving-bell, the microscope, and the aquarium reveal to us respecting "life under the ocean wave;" but we have seen enough to assure us that, among all the empires of the world, that of Neptune, by far the greatest in extent—if we except that of Æolus—is far from least in the marvels of its wonderful beauty and yet more wonderful life.

LOVE'S QUEST.

A cross in a greenwood fair;
A pilgrim who kneels in prayer;
Beside him, impatient, stands
A wanderer from distant lands.
"Tell me if she dwells here,
The lady I love so dear."

"How know I thy lady dear?
How know I if she dwells here?"

"The lady I love is fair;
Like sunlight her golden hair;
Her face with its loving smile
Would sorrow and pain beguile.
Tell me if she passed here,
The lady I love so dear."

"How know I thy lady dear?
How know I if she passed here?"

"Her presence is sunshine bright;
Her step like a fairy light;
Snow-white and soft is her hand,
Ready to call or command.
Tell me if she dwells here,
The lady I love so dear."

"How know I thy lady dear?
How know I if she dwells here?"

"Her voice is so low and sweet
When she her dear love would greet;
With lashes low-drooping down,
Her eyes are the softest brown.
Tell me if she passed here,
The lady I love so dear."

"How know I thy lady dear?
How know I if she passed here?"

"The flowers are far more sweet
That blossom beneath her feet;
The sky is a deeper blue
As she the land passes through.
Tell me if she dwells here,
The lady I love so dear."

"I once saw a lady fair,
A lady with sunny hair,
Ride by on a palfrey white;
At her side was a noble knight.
She bowed her bright golden head
To soft loving words he said."

"That was not my lady fair;
That was the false Guinevere.
Sir Launcelot by her side,
She roams through the forest wide.
My love is more fair to view;
My love is both pure and true."

"A funeral train passed by;
A fair face looked up to the sky;
White hands were crossed on her breast;
A maiden lay there at rest.
Could that thy dear lady be,
Grown weary watching for thee?"

"That could not my lady be,
For she would still wait for me,
Although on the heav'nly shore
Bright angels stood beck'ning o'er.
Her dear face I yet shall see;
Somewhere she still waits for me."

"What would thy dear lady say,
Were she by thy side to-day?"

"Her hand she would place in mine,
Her head on my breast recline,
And say, in a voice so clear
An angel 'twould seem to hear,
'I love thee while I have breath,
With love that is strong as death.'"

Away the dark robe is cast;
With golden curls free at last,
With footstep of fairy light,
And hand like a snow-flake white,
Long lashes low drooping down
O'er eyes of the softest brown,

With voice tender, low, and sweet,
She cometh her love to greet:
"Ah, here, on thy faithful breast,
O true-loving heart, will I rest;
And love thee while I have breath,
With love that is strong as death."