

THE CORAL-MAKERS AND JELLY FISH

(By Sir Ray Lankester, K.C.B., F.R.S.)

A very beautiful kind of sea-anemone (common at Felixstowe) is the Daisy, or *Sagartia troglodytea*, which has a very long body attached to a rock or stone far below the sandy floor of the pool, on the level of which it expands its thin, long, raylike tentacles, colored dark brown and white, and sometimes orange-yellow. As soon as you touch it it disappears into the sand, and is very difficult to dig out. The most beautifully colored of all sea-anemones are the little *Corynactis* (half an inch across), which you may find dotted about like jewels, each composed of emerald, ruby, topaz, and creamy pink and lilac agate, on the under surface of slabs of rock at very low tide in the Channel Islands. One of the most puzzling facts in natural history is that these lovely little things live in the dark. No eye, even of fish or crab, has ever seen what you see when you turn over that stone. It is a simple demonstration of the truth of the poet Gray's statement that many a gem of purest ray serene is concealed in the dark unfathomed depths of ocean! A splendid anemone is the Weymouth *Dianthus*, so named because it is dredged up in Weymouth Bay. It is often six inches long, and has its very numerous, small tentacles arranged in lobes, or tufts, around the mouth. It is either of a uniform bright salmon-yellow color or pure white. When kept in an aquarium it fixes itself by its disc on the glass wall, and often, as it slowly moves, allows pieces of the disc to become torn off and remain sticking to the glass. These detached pieces develop tentacles and a mouth, and grow to be small Weymouth anemones.

If the disc were spread out and gave rise to little anemones without tearing—so that they remained in continuity with the parent—we should get a composite or compound animal, made up of many anemones, all connected at the base. This actually happens in a whole group of polyps resembling the sea-anemones. They grow into "stocks," "tree-like," or "encrusting" masses, consisting of hundreds and even thousands of individuals, each with its mouth and tentacles, but with their inner cavities and bases united. These are the "coral polyps," or "coral-insects" of old writers, of so many varied kinds. One further feature of great importance in a "coral" is the production of a hard deposit of calcite or limestone, which is thrown down by the surface of the adhesive disc, and is also formed in deep, radiating "pockets," pushed in to the soft animal from the disc. The hard deposit of calcite is continuous throughout the "stock," or "tree," and when the soft sea-anemone-like animals die, the hard, white matter is left, and is called "coral." Very commonly this white coral shows star-like cups on its surface, which correspond to the lower ends of discs of the soft sea-anemone-like creatures which deposited the hard coral. In a less common group (represented commonly on our coast by the so-called "dead men's fingers" found growing on the over-hanging edges of low-tide rocks) the hard coral material does not form cups for the minute sea-anemones which secrete it, but takes the form of a supporting central or axial rod (sea-pens), or branched tree (sea-bushes), upon which the fleshy mass of polyps are tightly set. This is the case with the precious red and pink coral of the Mediterranean (which is now being "undersold" actually in the Mediterranean markets by a similar red coral from Japan, usually offered as the genuine article, which it is not!).

On the British coast you do not, as a rule, find coral-forming polyps. A small kind, consisting of two or three yellow and orange-red anemone-polyps united and producing a small group of hard calcite cups (*Caryophyllia* and *Calanophyllia*) is not uncommon at Plymouth at a few fathoms depth. But you have to go to the Norwegian fiords or else far out to sea where you have 300 fathoms of sea water in order to get really luxuriant white corals—the beautiful *Lophelia* which I used to dredge in the North Fiord near Staranger, as branching, shrub-like masses of a foot cube in area, each white marble cup standing out from the stem, an inch long and two-thirds of an inch across, and the stems giving support to a whole host of clinging growths (among them *Rhabdopleura*!) and sheltering wonderful deep-water worms and starfish.

But these, beautiful as they are, are nothing, so far as mass and dominating vigor of growth are concerned, in comparison with the reef-building corals of the warm seas of the tropics. There these lime-secreting conglomerated sea-anemones separate annually hundreds of tons of solid calcite per square mile of sea bottom from the sea water, and build up reefs, islands, and huge cliffs of coral rock. They get the calcite—as do calcareous seaweeds and shell-making clams, oysters, whelks, and microscopic chalk-makers—from the sea—the water of the sea which always has it ready in solution for their use. And the sea gets it from the rivers and streams which wear away and dissolve the old limestone deposits now raised into mountain chains, as well as by itself dissolving again in due course what living creatures have so carefully separated from it. Sea water or fresh water with a little carbonic acid gas dissolved in it dissolves limestone and chalk—it becomes what we call "hard." Neutralize the dissolved carbonic acid (as is done in the well known Clark's process for softening water), and down falls the dis-

solved calcite as a fine sediment. These alternating processes of solution and "precipitation" are always going on in the waters of the earth and sea.

The name "jelly-fish" has reference to the colorless, transparent, soft, and jelly-like substance of the bodies of the animals to which it is applied. There are a number of marine animals, besides the common jelly-fish, belonging

to its transparency—it would encounter unsuspecting, jerkily-moving water-fleas, unwarned by any shadow cast by the impending glass-like monster of half an inch in breadth slowly approaching from above; and as soon as they touched it they were paralyzed (by microscopic poison-threads like those of the sea anemones), and were grasped and swallowed by the mobile transparent proboscis (like that of an elephant, though certainly smaller,

the little jelly-fish, if removed from the tank and placed in a tall glass jar filled with the tank water, spent its whole time in swimming upwards to the surface by the alternate contraction and expansion of its disc-like body—and then dropping gently through the whole length of the jar to the bottom, when it would again mount. On the downward journey—owing and having the mouth opening at its end, instead of a nostril, which hangs from the centre of the disc-like jelly-fish.

Very young fishes are often colorless and glass-like. Young eels of different kinds exist as flat, colorless, glass-like creatures (called *Leptocephalus*) of three or more inches in length, according to species. Absolutely only the two black-colored eyes are visible as the creature swims in a glass of water. It is a puzzling fact that, so far as is known, these very transparent, colorless young eels only come by rare accident to the surface—and exist in enormous numbers at a depth of 500 fathoms, where they were hatched; their parents, in the case of the common eel, having travelled hundreds of miles from fresh-water rivers and ponds in order to breed here—they breed nowhere else. We know that the sun's light does not penetrate below 200 fathoms—so that one is led to ask, "What is the good of being transparent if you live at the bottom of the sea, at a greater depth than this?" There is also a very beautiful prawn, which I dredged in Norway in 200 fathoms, which looks like a solid piece of clearest, colorless glass. And then there are some very beautiful stalked creatures (called *Clavellina*), fixed to the under side of rocks in the tidal zone, which are absolutely like drops of solid glass, an inch long. One cannot easily imagine how colorless transparency can be of "life-saving value" to these varied inhabitants of the dark places of the sea-bottom—any more than we can assign any life-saving value to the brilliant, gem-like coloring of some of the sea-anemones which live in the dark on the under-surface of rocks.

The most probable view of the matter is that neither the colorless transparency of the one nor the brilliant coloring of the other has any value; it just happens to be so, and is not harmful. So, for instance, some crystals are colorless, some blue or green or yellow or red, without any advantage to them! On the other hand, we know that a large number of the animals which live in the dark unfathomed depths themselves produce light, that is to say, are phosphorescent, and it seems probable that at great depths, though there is no sunlight, the sea bottom is illuminated—we can only vaguely guess to what degree—by the strange living lanterns, fish, crustaceans, worms, and even microscopic creatures, which move about in quest of their food, carrying their own searchlight with them. Another suggestion is that the eyes of these inhabitants of the dark may be more sensitive than our own, and even be affected by rays invisible to us. This, however, is not probable, since whilst there are among them some with enormous eyes, we find that at the greatest depths (two to four miles) even the fishes have no eyes at all, and at a depth of a mile there are many shrimp-like creatures in which the eyes have been completely transformed into peculiar "feelers," or otherwise aborted. So that we cannot suppose there is a possibility of developing the eye of the dwellers in deep-sea darkness to a degree of sensitiveness greatly beyond that of terrestrial animals. A limit of obscurity is reached when it is of no use having an eye at all and eyes cease to have life-saving value, and accordingly are not maintained by natural selection.



A Fine View of Hill and Road Close to Loch Lomond, Just Now the Mecca of So Many Eager Holiday-Seekers

to different classes, which are glass-like in transparency and colorless—so as to be nearly or quite invisible in clear water, and some, too, occur in fresh waters (larvae of gnats, notably *Copepoda*). The transparency of these animals serves them in two different ways—some are enabled by it to escape from predatory en-

emies; others, on the contrary, are enabled to approach their own prey without being observed. The latter was obviously the case with the little fresh-water jelly-fish which appeared in great abundance some years ago in the lily-tank in Regent's Park. The water was full of small water-fleas (minute crustacea) and

The transparency and colorlessness of marine animals which float near the surface is, on the other hand, obviously useful, and to this group our jelly-fishes belong. Not only do they escape observation by their transparency and general absence of color, but some actually have a blue transparent coloring which blends with the blue color of the sea. Such are the gas-holding, bladder-like sac as large as your fist called the "Portuguese Man-of-War," and the little sailing "Velella," both of which float, and even protrude above the surface, so as to catch the wind. Others are only semi-transparent, and others are marked with strong red, brown, or yellow streaks. Many of the smaller kinds of jelly-fish have eyes which are bright red in color.

The animals to which the name "jelly-fishes" is now more or less strictly applied are (as that fine zoologist Aristotle knew) in their structure closely similar to the sea-anemones, but even simpler. They are called "the Medusa" by naturalists. Their disc-like bodies are largely formed by a jelly-like material, on the surface of which are stretched delicate transparent skin, nerves, and delicate muscles, whilst in the middle of the disc, on the surface which faces downwards as the creature floats, is the mouth, leading into a relatively small pouch cavity excavated in the jelly, from which a delicate system of canals is given off, and radiates in the jelly of the disc. There is, as in the sea-anemones, only one continuous cavity. The edge of the disc is beset with fine, sensitive tentacles, sometimes many feet in length, and the lips of the mouth are often drawn out into a sort of depending trunk, or into four large tapering lobes, or lips of jelly, which, with the longer tentacles, are used for seizing prey. The commonest jelly-fish on our coast—so common as to be "the" jelly-fish par excellence—is often to be seen left on the sands by the receding tide or slowly swimming in quiet, clear water at the mouth of a river in enormous numbers. It is known as *Aurelia*. It is as big as a cheese-plate, and the four pouches connected with the stomach are colored pink or purple, and appear in the middle of the circular plate of jelly, like a small Maltese cross. The reproductive particles (germ-cells and sperm-cells) are produced in that colored region, and escape by the mouth. There is a fringe of fine, very short tentacles round the edge of the disc, and they, as well as the great lobes of the mouth, are provided with innumerable coiled-up stinging hairs or "thread-cells," similar to those of the sea-anemones, which led Aristotle to call both groups "sea-nettles." Eight stalked eyes are set at equal intervals around the disc.

Usually accompanying the floating crowd of the common and abundant *Aurelia* are a few specimens of a very unpleasant kind of *Medusa* of a turbid appearance, often called "slime balls" by fishermen, from six inches to a foot in diameter. The tentacles on the edge of the disc of this kind of jelly-fish are very long and elastic, stretching to several feet, even yards, in length, and are provided with very powerful stinging hairs. The tentacles not infrequently become coiled around the body of a bather; the stinging hairs are shot out, and the little sacs in which they are rolled up, and the result may be very painful to the person stung in this way and even dangerous. There are two other common large jelly-like pattern of brown pigment on the disc, and the other with the mouth lobes very large and bound together like a column.

The common *Aurelia* is remarkable for the fact that the young which hatch from its eggs attach themselves to stones and rocks on the sea bottom, and grow into little white tube-like polyps, about half an inch long, quite unlike their parent, with a crown of small tentacles surrounding the mouth, whilst they are fixed by the opposite end of the body. Then a very curious thing happens. The little polyp becomes nipped at intervals across its length, so that it looks like a pile of saucers—a dozen or more. And then the top saucer swims away, as a minute jelly-fish, the next follows, and so on, so that the whole pile separates into a number of freely-swimming young, each of which gradually grows into a full-sized *Aurelia*. I have only once had the chance of witnessing this beautiful sight, and that was many years ago in a tank at the Zoological Gardens (they have no such tanks now), where the poppy-like young (called *Hydratuba*) spontaneously put in an appearance, and proceeded to break up into piles of little discs, which separated and swam off as one watched them. The French poet, Catulla Mendes, imagined a world where the flowers flew about freely and the butterflies were fixed to stalks. His fancy is to some degree realized by the swimming away of the young jelly-fish from their stalks. There are a host of very minute jelly-fish, measuring when full grown only half an inch or less in diameter, and originate as buds from small branching polyps, one kind of which is common on oyster-shells, and is called "the herring-bone coralline." The dried skins of these coralline polyps (which are horny) are often to be picked up with masses of seaweed on the seashore after a storm. The little jelly-fish are the ripe individuals of the polyps and produce eggs and sperm which grow to be polyp-trees. These, again, after growing and branching as polyps, give rise to little jelly-fish here and there on the tree, which, in most kinds (though not in all), break off and swim away freely.

EDUCATED COWS

Do Music and More Milk Go Together?

These are the days of scientific farming. Nevertheless it will come as a surprise to many to hear to what a degree of perfection the higher education of the cow has been carried by an American lady, Mrs. Howie by name, who has a farm in Wisconsin.

This lady, it is said, stimulates the milk-giving capacity of her large and amiable pets by playing suitable music to them. She finds that the happy and sympathetic feelings engendered by the harmony produce a particularly abundant flow of rich and pure milk.

Not only does Mrs. Howie's plan contribute to the happiness of herself and her bovine friends, but it leads to very excellent practical results, for there is probably no woman in the neighborhood who can show so large an income from dairy farming as she.

Evidently there is commonsense as well as sentiment in her plan. It has long been recognized that anything which frightened the cow, as thunder and lightning or harsh noises and actions, injured the quality and flow of the milk. Why then, should not soothing the animal by agreeable sounds improve the quality and flow of the fluid? This is the reasoning upon which Mrs. Howie has proceeded, and it has been amply justified by results.

For long she maintained that the farmer did not turn the cow's love of music to practical advantage. He should know, she said, that the cow is a slow, quiet, peace-loving creature. Harsh and violent sounds disturb her serenity and her digestion, while soft, low harmonies promote her well-being. Is not "chewing the cud" a phrase synonymous with placid happiness and contemplation?

Following out these ideas, Mrs. Howie plays soft, low harmonies to her cows, gener-

ally upon the mandoline. Every cow hears at least one tune at milking time. A favorite with nearly all the stable is the old, sentimental song, "In the Gloaming," with its soft, low melodies. The result of playing this soothing tune to one of the cows has been to increase her yield of milk by one third.

Mrs. Howie gained a profound knowledge of music and the arts and the refinements of life before devoting herself exclusively to cow culture. She was formerly a Milwaukee society woman, and followed the usual round of society life until circumstances led her to take up farming. Some inquirers who had heard of her experiments in music and cow culture obtained an introduction to her, and visited her the other day at her farm, where they found her in the midst of her pets.

"I never approach them without a kindly word," she declared as she sat chatting with a black-nosed cow, "and, if that is coddling, I certainly am a coddler; but any fancier who studies cow nature along with scientific cow feeding will coddle them, too. Yes, I love my little—they come next to my family; in fact, I may say they are my babies, for you see my children are all grown up. I believe that the stronger the maternal instinct in a woman, the greater are her chances for success in cattle raising. You see a cow is a mother nearly all her life, beginning at two years.

"I tell every man or woman who has ambition to become a stock fancier that it is not enough to invest in blooded animals and to study methods in scientific feeding. One must have a large reserve fund of love upon which to constantly draw, quite apart from the sentimental side of it; for you may take my word for it, every kindly stroke, every tender word, every bit of attention and appreciation bestowed upon the gentle creatures will come back to you in dollars and cents."

SERVANT'S SENSE OF ORDER

Mrs. Smith was engaging a new servant, and sat facing the latest applicant.

"I hope," said she, "that you had no angry words with your last mistress before leaving?"

"Oh, dear no, mum; none whatever," was the reply with a toss of her head. "While she was having her bath, I just locked the bathroom door, took all my things, and came away as quiet as possible."

LOVE'S DELAY

For nine long years he had been wooing the fair daughter of the farm. "Jennie," he mused, as they sat on the old rail fence, "I read the other day that in a thousand years the Lakes of Killarney will dry up." Jennie clutched his arm excitedly. "Oh, Tom!" she exclaimed. "What's the matter, lass?" "Why, as you promised to take me there on the honeymoon, don't you think we'd better be a little careful that they don't dry up before we get there?" N.B.—The next week the wedding bells rang in the village church.

CHANGE OF CONVICTION

For three weeks he had borne all the horrors of house-cleaning without a murmur. Then his patience gave way.

"And you," sobbed his wife, "you used to tell me I was your queen."

"Yes," he said, with a wild glare in his eyes; "but when a man finds his queen has used his best tobacco-jar for pale oak varnish and his meerschaum pipe for a tack hammer, he begins to grasp the advantages of a republic."