

THE WONDER BOOK
OF
PLANT LIFE

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CHAPTER I

CORAL AND THE TREE

The Hydra—Its structure—Its multiplication by budding—Coral—Polyps, simple and compound—Multiplication of polyps—Longevity of polyp communities—Variety of structure—Coral Islands—Geographical importance of Corals—The Corals of past geological periods—The fundamental organization of the Vegetable.

THE plant is the sister of the animal : like the animal, it lives, feeds and reproduces itself. If we wish to understand the plant we shall often find it a very good plan to consult the animal ; and again, if we wish to understand the animal organism, we shall often ascertain what we wish to know by inquiring into the nature of the plant. I shall therefore begin by telling you something of certain peculiar animal organisms whose manner of living will enable us to understand the fundamental structure of the plant, and will give us the most valuable insight into vegetable life.

Amidst those tiny, circular green leaves, commonly known as duckweed, which float, in close contact, on the surface of stagnant waters, forming a brightly-coloured carpet, we shall find, in our dykes and ponds, a curious little creature known to the naturalists as the Hydra. This fragile organism, which consists of a sort of green jelly, measures at most some three-quarters of an inch in length. Picture to yourself a small elongated sac, one end of which adheres to some aquatic plant, while the other end puts forth eight flexible arms, or tentacles, which have the power of moving in all directions : there

you have the Hydra. The eight arms, or tentacles rather, are arranged in a circle round an orifice communicating with the inside of the sac: that is, with the cavity in which the digestion of food takes place. This orifice has two functions, which, in an animal of a more ordinary kind, would seem to be absolutely incompatible: it swallows the prey seized by the tentacles and rejects the undigested residue. In order to obtain its food the Hydra outspreads its arms in the water and remains motionless. If some animalcule happens to pass that way the arm nearest to it immediately seizes upon it, and carries it to the Hydra's mouth.

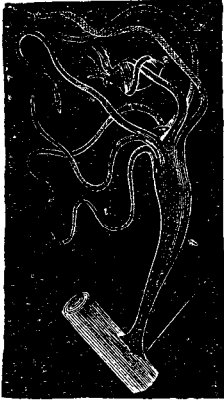


FIG. 1.—The Hydra.

Let us place a well-grown specimen of Hydra in a glass of water containing duckweed. After the lapse of several weeks, or it may be months, according to the time of year, we shall see two, three, four or more tiny warts growing on the lower part of the creature's trunk. These warts increase in size, and are finally crowned with eight tiny nipples, which protrude more and more every day; finally opening as a bud opens to form a flower.—Can you guess the true character of these curious animal flowers? They are young Hydrams, with their digestive sac and their eight arms: young Hydrams, growing upon the mother, just as twigs grow upon a bough. We call the little warts from which they are born buds, because they produce animals resembling the parent organism, just as the boughs of a tree give birth to shoots or twigs.

The Hydra—which is in reality an animal, since it has the power of moving from place to place, of travelling whither it chooses, and is sensitive to pain, hunting,

seizing and devouring its prey—the Hydra in one respect behaves like a vegetable: it buds, giving birth to tiny Hydras just as the stem of a plant sends forth branches.

But these little Hydras, still quite young, incapable of trapping their own food, and earning their own livelihood, are forced for some time to rely on the maternal organism for nourishment. Accordingly, then, the digestive sac of the parent Hydra communicates with the cavities of the young Hydras; the stomachs of the nurslings open into the stomach of the parent. It is the parent Hydra alone that lies in wait for her prey, and eats and digests it; but the liquid nutriment, ready for absorption, finds its way from the mother's digestive sac into the stomachs of her nurslings, through narrow connecting passages, so that the young Hydras are often full-fed although they have eaten nothing. But at last a day comes when the narrow communicating passage leading from stomach to stomach closes up; a constriction appears at the point of junction of the parent and offspring, and the young Hydras, like so many ripe fruits, break away in order to live an independent life elsewhere, and in their turn to produce, by budding, yet another generation.

Now glance at the above illustration. Would you not take it for some species of shrub covered with flowers?



FIG. 2.—Coral.

As a matter of fact it is not a plant at all ; it is a piece of coral. You must be familiar with the pretty red beads which are often made up into necklaces. You have been told that this is coral. So indeed it is ; but before it was made into beads by a skilled workman, the coral was shaped like a small bush or shrub, of a brilliant red, with twigs, branches and boughs. But the little shrub contains no woody substance ; it is of stone, as hard as marble, although this does not prevent it from covering itself, under water, with beautiful little flowers. Now,

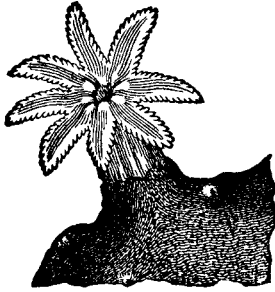


FIG. 3 —Coral Polyp.

these so-called flowers, that grow on the stony branches of the coral, are really animals, the coral being their common home, their dwelling-place and support. They are known as polyps. Their organization is similar to that of the Hydra.

Each polyp is a hollow globule of gelatinous matter, a little sac whose mouth is bordered by eight leaf-shaped appendages, fringed at the edges ; eight tentacles, opening like the petals of a flower. Apart from the shape, which is rather different, you will recognize in the Coral " Insect " the general structure of the Hydra. It is still a digestive sac fixed at the base and crowned by eight arms, especially adapted to seize and hold the polyp's prey. As we find it beneath the surface of the sea, the coral is covered with an unsubstantial husk or shell, riddled by a host of cellular cavities, in each of which a polyp is lodged. Beneath this living rind is the stony support, whose colour is a brilliant red.

Although each polyp has its own cell and is endowed with a separate existence, the polyps of the same branch of coral are no strangers to one another. Thanks to the

inter-communication of their digestive sacs, all profit by what one of them digests. With their fringed arms outspread like the points of a rosette, the polyps, like the Hydra, grasp at such nutritive particles as the ocean currents may bring to them. Chance does not favour them all in an equal degree ; one may make an abundant catch, while another does not once draw in the net of its tentacles. Yet, at the end of the day, all have been equally well fed ; those polyps whose stomachs have been busily digesting their catch have provided the rest with their allotted ration.

How has it been established, this rigid and reciprocal communism of the stomach—a communism which the human mind, even in its wildest aberrations, would assuredly never have conceived ? How is it organized, this strange refectory, in which the individual who has a full larder feeds his neighbour who has no food ? This is how it is done : Every twig of coral is begun by a single polyp, which, hatched from an egg, and at first wandering through the waters, finally anchors itself to some rock beneath the surface, there to found a colony. This polyp, once it has settled down, buds, as the Hydra buds, or a plant. It buds, and a new polyp grows from the side of the first. The communication between the digestive cavity of the second polyp and that of the original “ insect ” is at first indispensable, so that the food seized and digested by the latter may nourish the young polyp, as yet incapable of supplying its own needs. This communication is effected precisely as in the Hydra, with the difference that it is not intended, eventually, to be interrupted. The coral polyps, having reached maturity, do not take their departure, to establish themselves elsewhere ; they continue to live as members of a family, mutually and indissolubly united. And now the first polyp, which developed from a bud, is followed

by a second, a third, a fourth, etc. The first generation of offspring gives birth, in turn, to a second generation, and this to a third ; and so on, no definite limit being set to their powers of reproduction ; and thus successive generations are piled upon one another by dint of repeated buddings, whose numbers are day by day increased. As for the common domicile, the coral, it results from the exudations of all its inhabitants, for these exude stone as the snail excretes the materials of its shell. Each new-born polyp provides its share of calcareous matter, and the stony structure increases, branching in all directions. Such is the process of formation observed in coral and a host of analogous submarine structures, known as polyparies or polypidoms : that is, the stony growths inhabited by polyps. According to this definition coral is itself a polypary.

It follows from its mode of formation that no definite term can be set to the life of a polypary ; that it ought not to perish save by accident. The polyps themselves doubtless die when old, as all animals die ; but before they die they leave in the polypary numbers of offspring, which, in turn, leave even greater numbers ; and as this multiplication goes on continually there is no reason why the polypary should cease to be. Far from perishing, unless some accident does occur, the polypary, constantly restored, and incessantly increased, by successive generations, ought to live, still full of vigour, to any age you please. The Bee and the polyp die ; the swarm and the polypary remain ; the individual perishes, but the society of which it forms a unit endures. In the Red Sea there are polyparies of such dimensions that if we estimate their age by their rate of growth, we must conclude that their antiquity is prodigious. They are still in the prime of life, although they cannot be less than three or four thousand years old ; they date from

the time when the Pyramids were building, and were contemporaries of the Pharaohs. Time has no meaning for these agglomerations of polyps ; the individual dies, but the community endures, through the centuries, always young, always at work.

There are many species of polyp, and the structures which they build display a great variety of forms. As a general thing the polyparies—that is, the corals and madrepores—are of a pure white, the natural colour of the carbonate of lime of which they consist ; more rarely they are red, like the coral used for personal adornment, or they may display still other colours. Nothing could be more graceful than the shape of these structures. Some are like little trees of stone, that put forth branches as graceful as those of an actual tree ; some display parallel tubes, grouped together, like organ-pipes, or clusters of cells like those of a honey-comb. At other times the polypary may develop a round head, like that of a cauliflower, or a mushroom, whose surface, bristling with plates arranged in mathematical formation, displays a multitude of stars, or a network of geometrical accuracy, or a labyrinthine pattern of furrows and ridges ; or yet again, it may be outspread in a wide, stony leaf, as thin as a sheet of paper and perforated as profusely as a piece of lace. On all these structures are thousands of blossoming animalculi, that is, polyps, with their tentacles outspread like exquisitely fragile rosettes, which, at the slightest alarm, are suddenly retracted.

These frail workers enjoy every advantage that might enable them to build up structures which prove their ability and energy to be far superior to our own. For them, duration, numbers and materials possess no limits. In the warm seas of the tropics, on every favourable spot, wherever their colonies are to be found, dwelling side by side, they heap storey upon storey, polypary upon



FIG. 4.—Various forms of Polypary.

polypany, until the surface of the sea sets a term to the scaffolding needful in their building operations. However, their structures, being checked in their upward development, are continued in the horizontal plane; the crest of the polypany becomes a reef; the reef, attaining the surface of the sea, becomes a small island, and the ocean surrounds yet one more tract of dry land.

A coral island is thus the upper surface of an agglomeration of polypanies, whose foundations are rooted in some submarine shoal. At first it is merely a barren surface, but sooner or later the ocean currents and the winds bear thither seeds, or plants, so that its dazzling white area is eventually shaded by vegetation. As a rule a few insects or lizards, arriving on drifting tree-trunks, are its first inhabitants; then the sea-birds build their nests there, while birds of inland species that have lost their way come thither to seek rest and shelter. Lastly, when the soil has become fertile, man appears and builds his palm-leaf hut.

Coral islands rise but a short distance above the level of the sea. As a general rule they consist of a belt of dry land, circular or elliptical, enclosing a shallow lagoon which communicates with the sea. Their appearance is as remarkable for its strangeness as for its beauty. Imagine a girdle of land covered with coco-nut palms, whose sombre green foliage stands out boldly against the limpid blue of the sky. Surrounded by this tree-covered girdle is a salt-water lake, in which the polyps are still building, accompanied by various species of shell-fish; while outside the girdle is a wide beach of the purest white, consisting entirely of broken coral, and surrounded by a circular belt of reefs, on which the ocean, always turbulent, breaks in a flurry of whirling foam. In their savage onslaught the waves threaten at every moment to engulf the island, but the island, low, fragile, and

exposed though it be, is enabled to resist by the polyps, that bear their part in the conflict, day and night, always at work, repairing the damaged structure, surrounded, particle by particle, by a rampart of reefs, constantly demolished and as constantly rebuilt. With their soft, gelatinous bodies these fragile creatures hold their own against the raging ocean ; with their patient architecture they overcome the terrible power of the waves which granite barriers would have been powerless to subdue.

Now take a glance at the chart of the world, if you wish to obtain some idea of the extent of dry land which is due to the work of the polyp ; and above all, reflect upon that multitude of archipelagos, consisting of shoals and small islands, which stretch across the Pacific Ocean from America to Asia. Well ! many of these archipelagos are of madreporic origin ; and those whose origin is other than this are at least surrounded by a barrier reef of coral. The Maldivé Archipelago alone, situated in the Indian Ocean, comprises no less than 12,000 reefs, rocks or islands of madreporic structure. One coral reef off the eastern coast of New Holland covers an area of 33,000 square miles. A fifth of the whole world—Oceania—is thus for the most part the work of polyps. Even though the whole human race were to devote itself to this stupendous task for a hundred thousand years it would never succeed in completing the work performed by the gelatinous animalcule of the polypary. The part played by these builders of worlds was no smaller in those bygone geological periods whence our continents eventually emerged. Certain geological strata, certain ranges of mountains, consist of long-dead polyparies ; in certain parts of France one treads all day upon ancient beds of coral ; while many of our cities are built of a stone whose smallest fragment contains broken relics of madreporic origin.

This preliminary history of the Hydra and the Coral Polyp leads us directly to our proper subject: to the plant, in respect of which I was anxious first of all to explain to you something of its fundamental organization. This organization, which will presently explain a host of facts which would otherwise be inexplicable, may be summed up as follows: A plant or vegetable may be compared with a polypary covered with its polyps; it is not a simple but a collective being, an association of individuals, all related, all closely united, rendering one another mutual service, and working for the prosperity of the whole; like the coral, it is a sort of living hive, all of whose inmates live a life in common.