CHAPTER 1

PLANTS AND ANIMALS

Reason for classification

In Book I we learned a little about some animals and plants that live in different habitats.

Whilst studying the animals that live in fresh water, in the garden, or in the countryside you may have noticed that some animals are similar in structure; for example, the water skater and the wood louse; pond snails, land snails and slugs; gnats and butterflies. Unfortunately, we have not time to study every animal and plant that we find. All animals and plants, however, have been divided into families, and into each family are put those animals and plants which are similar in structure. The families that have certain things in common are placed together in still larger groups.

If we study one animal or plant from each family we shall know something about the structure of each member of that family, although the members or SPECIES of the family will differ in some respects from one another. You probably found it very easy to study land snails and slugs after studying pond snails. Living things are today classified by their structure, but in the past they have been classified in many different ways—according to their size, or where they lived, or whether they did or did not lay eggs.

Differences between plants and animals

All living things can be divided into two groups: (1) PLANTS; (2) ANIMALS.

How can you tell into which group a living thing should be placed? You will probably say that animals move about from

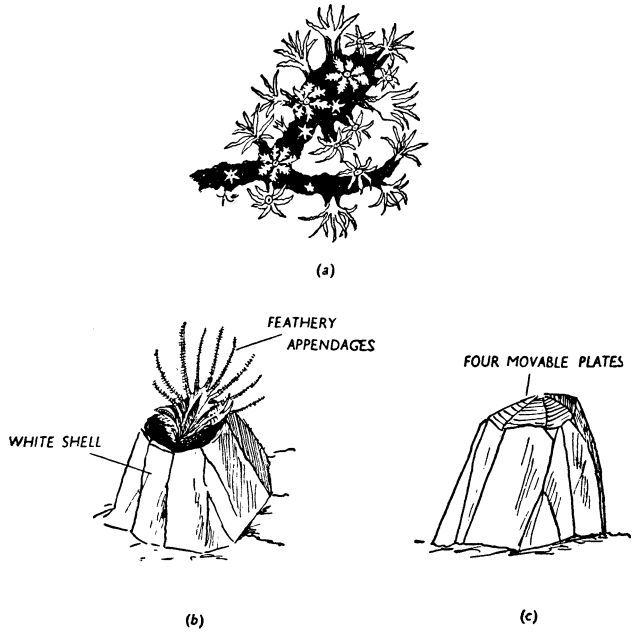

Fig. 1. *Animals that do not move.* (*a*) *Coral: the animals are embedded in the calcium carbonate shell;* (*b*) *barnacle showing feathery appendages;* (*c*) *barnacle with plates closed*

place to place, whilst plants remain rooted in the ground. This is true of most living things, but some animals, such as those which form coral, and barnacles (Figs. 1*a* and *b*), are fixed in one place; whereas some small algae swim about in the water (Fig. 2).

There are six chief differences between animals and plants:

(1) The CELLS of plants are surrounded by a cell wall, which is made of a substance called CELLULOSE. This is not so in animals, where each cell is surrounded by a membrane.

(2) Plants usually contain CHLOROPHYLL, but this is not found in animals. Some plants, such as bacteria and fungi, do not contain chlorophyll. The green hydra, on the other hand, although it is an animal, does contain chlorophyll, but it is not contained in the cells of the hydra's body but in small, round cells, which are really tiny plants that live between the cells of the hydra.

(3) Plants that contain chlorophyll are able to make their own food. During the daytime the green parts of a plant are able to make sugar from carbon dioxide and water. This food, together with the minerals that are taken in by the roots, is changed into more complicated substances. Animals, however, cannot make their own food. They eat the foods that have been made by the plants, either by eating the plants or by eating animals that feed on plants.

(4) Animals usually move from place to place in search of food, whereas plants remain in one place as they can make their own food.

(5) Animals grow to a limited size and the number of parts in their bodies is fixed. Plants continue to grow as their size is unlimited.

(6) Growth in animals goes on all over the body. In plants there are special growing regions, which are at the tips of the roots or shoots, or just beneath the bark in the stems and the roots.

Groups of living things

Plants can be divided into two large groups: (1) flowerless plants that do not produce seeds; (2) plants that do produce seeds.

Animals also can be divided into two groups: (1) INVERTEBRATES, which have no backbone; (2) VERTEBRATES, which have a backbone.

CHAPTER 2

FLOWERLESS PLANTS

There are many plants that do not have flowers, and which are very different from the plants that we have studied so far. We should know something about these plants, not only because many of them are frequently found, but also because some of them are economically very important. These plants have not any flowers or any seeds, but they produce SPORES from which new plants grow.

The green scum on damp palings or on tree trunks, the green scum on ponds, seaweed, mould, yeast, the orange spots on damp wood, the pink spots on dead wood, mushrooms, toadstools, puff balls, mosses and ferns, and even bacteria are flowerless plants. Try to make a collection of flowerless plants and identify them with the help of the books mentioned in Appendix C.

Algae

In this group there are hundreds of plants which are very simple in structure, and which nearly all live in water. Some of them are very big, although their structure is simple, but many of them are so small that they can only be seen through a microscope (Fig. 2). These very tiny algae swim about in the water by means of hair-like projections which may be called CILIA or FLAGELLA. The green scum that you may have seen on ponds consists of very long, fine filaments of algae.

A very common one is called SPIROGYRA (Fig. 3). Place a single thread on a slide in a drop of water and cover it with a coverslip. Look at it under a microscope and you will see that it is divided into cells. Each cell has a cellulose cell wall which is covered with a slimy substance to prevent other organisms from growing on it. Protoplasm lines the cell wall.

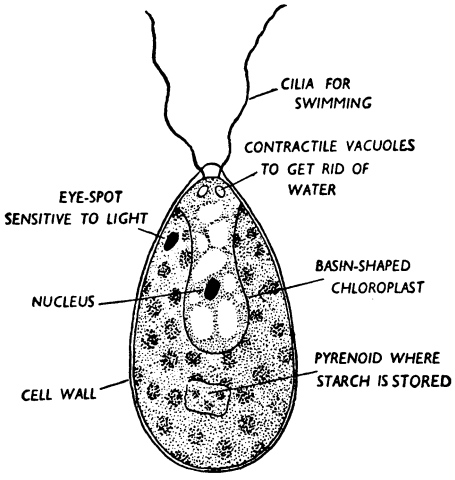

Fig. 2. *Chlamydomonas. A small alga that swims about in water*

The middle of the cell is filled with cell sap and is called a VACUOLE. A NUCLEUS lies in the vacuole, surrounded by protoplasm, threads of which stretch to the cell wall. You will see one or more green spiral bands. These are the SPIRAL CHLOROPLASTS which contain chlorophyll. As the plant contains chlorophyll it makes sugar which can be changed into starch and stored in certain places on the chloroplasts, called the PYRENOIDS.

A strand may break up into pieces and each piece can grow into a new strand. Spirogyra has another way of reproducing itself especially when conditions are not favourable. Two

strands come together and lie side by side, glued together by a slimy substance called mucilage. All down the strands lumps grow out from two cells that lie opposite to one another. These lumps eventually join and the strands now look something like a ladder (Fig. 3*b*). The contents of the cells shrink away from the cell wall and round themselves off.

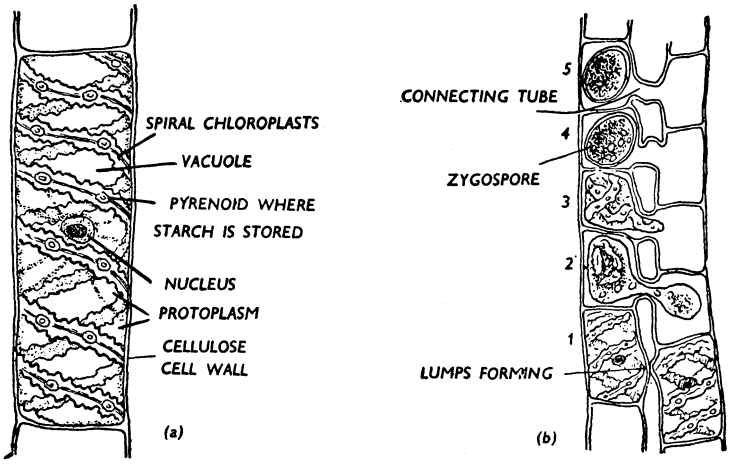

Fig. 3. *Spirogyra. A filamentous alga.* (*a*) *One cell;* (*b*) *reproduction*

Those in the cells of one strand pass along the connecting tubes into the cells of the other strand. Here the two join together and become surrounded by a thick wall. These thick-walled ZYGOSPORES, as they are called, are set free when the cell walls break and fall to the bottom of the pond. They grow into new filaments when conditions are favourable. The old filaments rot away.

Seaweeds

Seaweeds are algae that live in salt water. They vary considerably in size, shape and colour. Make a collection of as

many kinds of seaweed as you can find. Some of them will keep when they are dry, other seaweeds must be dried carefully between blotting paper and then glued to paper. Seaweeds are grouped according to their colour, which may be brown, green or red. Although they vary in colour, they all contain chlorophyll and can manufacture their own food. Pigments mask the green chlorophyll in the brown and red seaweeds. The plants are very simple in structure. At one end there is usually a HOLD-FAST by which the plant fastens itself to a rock to prevent it from being washed out to sea. BROWN SEAWEEDS are very common between high and low tide marks. They are covered with a slimy substance which keeps them moist when the tide goes out. One very common brown seaweed is called BLADDERWRACK (Fig. 4*a*). Look at a piece of this seaweed and you will see large and small round lumps. The larger lumps are air sacs which enable the plant to float, but the smaller ones, called CONCEPTACLES contain the reproductive organs. In bladderwrack the male and female cells are found in different plants. The SPERM cells are produced in ANTHERIDIA (Fig. 4*c*) and the EGG cells in OOGONIA (Fig. 4*d*). When the sperms are ripe they escape into the water through the hole or OSTIOLE at the top of the conceptacle. They swim by means of two tails to the egg cells which have escaped into the water. When an egg cell is fertilized a cell wall forms round it. It falls to the bottom of the water, attaches itself to a rock or to a stone, and begins to grow into a new plant.

The serrated wrack (Fig. 4*b*) is similar to the bladderwrack, but it has not any bladders.

GREEN SEAWEEDS grow in places where they are just covered with water. Two common green seaweeds are the sea lettuce and the sea grass (Figs. 5*a* and *b*).

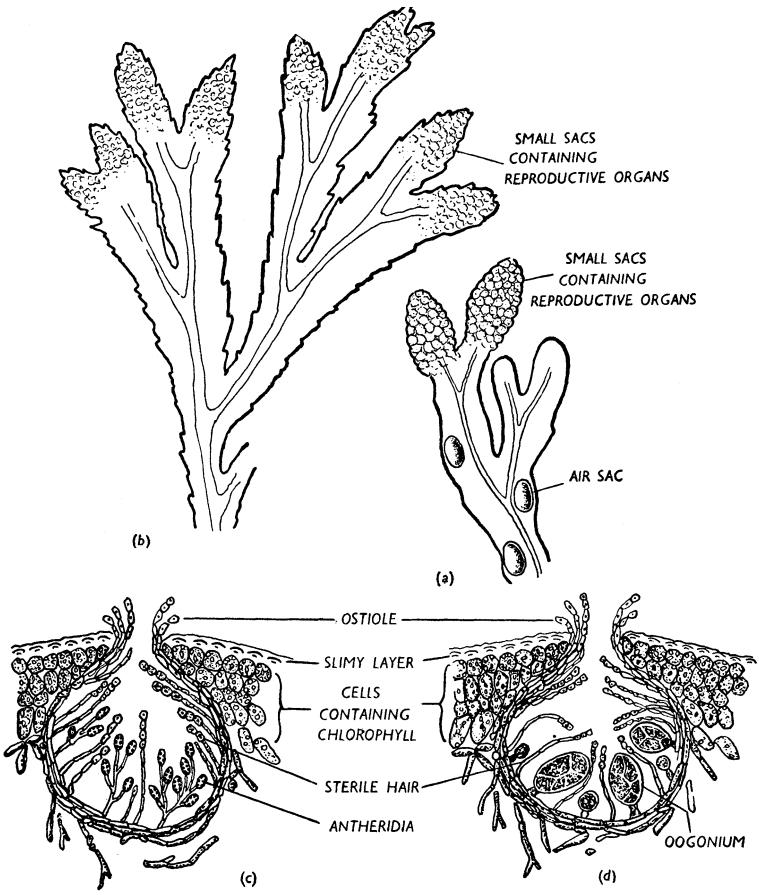

Fig. 4. *Brown seaweeds.* (*a*) *Bladderwrack;* (*b*) *serrated wrack;* (*c*) *section through conceptacle containing antheridia;* (*d*) *section through conceptacle containing oogonia*

RED SEAWEEDS live in deeper water. Some are very delicate and finely divided (Fig. 5*c*), whilst others are covered with a chalky substance that is rather like the shell of a crab (Fig. 5*d*).

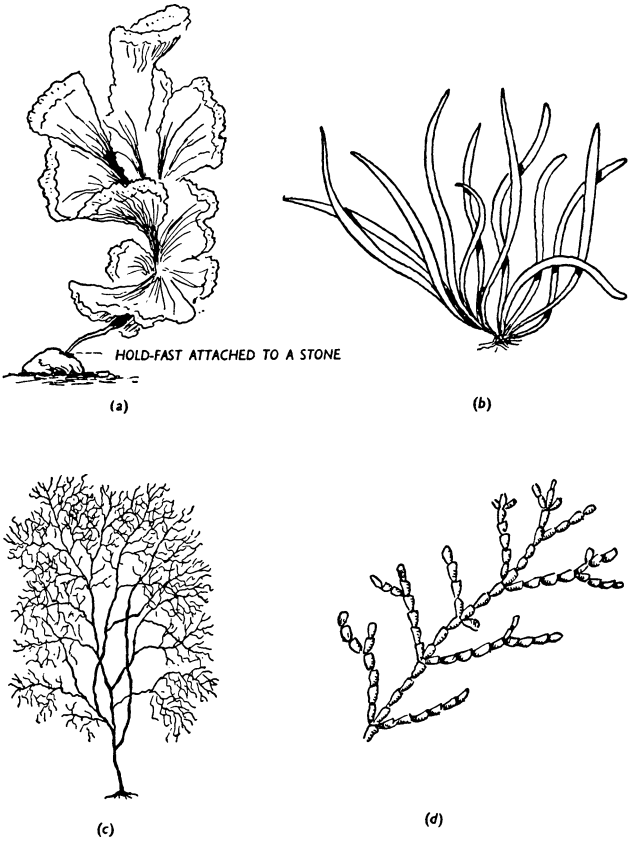

Fig. 5. *(a) and (b) Green seaweeds; (c) and (d) red seaweeds. (a) Sea lettuce; (b) sea grass; (c) a feathery red seaweed; (d) Corallina, a red seaweed which looks like coral*

Fungi

Unlike most plants, fungi do not contain chlorophyll, and so they are not able to make their own food. They get their food from dead things (then they are called SAPROPHYTES) or from living things (they are then called PARASITES). During the autumn look in fields, woods, hedgerows and gardens and