## THE EDUCATIONAL REVIEW

males. Direct your pupils to search the orchards on mild nights with a lantern for the wingless females. They have a rather large body, and appear quite spider-like, as they are found crawling up the trees, and are about the same color as the bark of the tree. You will readily find them, for the males are always near.

Where are they going, and what is their object? Place several in a wide-mouthed bottle along with a small twig of apple tree, cover securely, and in a day or so you will find sheets of eggs attached to the twig. Search the ends of the twigs of apple tree for similar bunches of eggs. Read in Reports about the ravages of this orchard pest. This worm, together with its cousin, the Spring Cankerworm, works great damage in our orchards.

Our winter birds, especially the Chickadee, eat great quantities of the eggs and female moths. It is said that "the English Sparrow was imported largely to destroy these cankerworms, but they have greatly increased where the sparrow has become most numerous, and where our native birds have, in consequence, been driven away."

Plant galls furnish another line of very interesting nature work. Galls are abnormal growths of plant tissue caused by stimuli produced by some organism other than the plant itself. They assume various forms in the tissue of leaves, buds, and young stems. As the modification always takes place in rapidly growing parts, they are formed chiefly in spring and early summer.

Among our most common galls are those found on the leaves of the willow and elm. In the oak gall the entire leaf is modified. Stem galls are common in the golden rod and the wild rose, while a cone gall is found on some species of the willow.

Collect several of each of these galls, and as many others as you can find. The pupils should become familiar with the form and appearance of each. Dissect several carefully, so as not to injure the insect within. Is the insect active, in the larval stage, or in the resting, pupal stage? In either case note its size and shape. Questions at once arise as to how it reached its present location in the plant tissue, on what does it feed, what becomes of its excretions, etc., etc. which has caused these changes. Look carefully among the scales of the cone for grasshopper eggs, and larvae or pupae of the saw-fly, the moth and the gall-midge, which are often found in such locations.

Keep galls for spring hatching. Those on the leaves of the willow should be kept moist and cool, in natural conditions as near as possible; while those from the golden rod and the rose may be kept in closed bottles in the schoolroom. You will be surprised at the number of insects that will come out of one rose gall.

The aquarium will also provide interest, expecially for older pupils.

Collect sediment, leaves, small bits of twigs, sand and mud from the shaded side of a pond, in a glass fruit jar, and allow it to settle, standing the jar in the window. Examine the side farthest from the light for small green bodies attached to the glass and extending into the water for about an eighth of an inch, with the free end surrounded by a number of small arm-like parts. Tap the glass hard enough to set it vibrating and notice the sudden contraction of this little organism. It is now a small oval green mass, but watch it a few minutes, for it will soon extend itself out into its original form. This is a hydra, or fresh-water polyp, an animal belonging to the same great group as the sea-anemone, jelly-fish and coral. Examine one with a hand lens. Count the number of arms in several; is it fairly constant? Note the conical part around which they are arranged. This is the mouth, and it opens into a cylindrical cavity, from which branches extend into the arms.

Carefully turn the jar half around, so the hydra are next the window. On which side do you find them the next day? Why did they change their location, and how do they move from place to place? The teacher should read an account of the hydra in some good school-text.

Work may be extended to other topics, such as: the food of the hydra, how it captures its prey, the stomach and digestion, reproduction, etc., etc. A compound microscope will be of great advantage for working on these topics. For example, mount one in a drop of water on a glass slide, over it place a cover glass supported by small bits of a broken cover glass around the edge, and examine first under low power for movements of contraction and expansion; then under high power for cell structure, especially the nettle-cells in the

Bisect the cone gall of the willow longitudinally, and note its structure. Here the modification takes in a whole branch. Notice how the leaves have been dwarfed to form the scales, and the stem shortened. In the center of the cone, in the stem region, you will find the insect larva or pupa,