NATURE STUDY OF ANIMALS.

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On winter tramps by brooks and ponds, through waste fields and along country roads examine carefully the bushes, reeds and old stems of golden rod, etc., for signs of animal life.

Active animal life abounds in almost every locality, but it is not with this that we are now especially concerned, but with the little dormant creatures snugly tucked in their warm winter beds and rocked in nature's cradle,— the cocoons, plant galls and insect nests (Brown tail moth), one is apt to find on such tramps.

Keep the cocoons in insect cages for spring work; the plant galls are for immediate use.

I. Suggestion for School Exercises.

Select a golden-rod-gall and help your pupils describe it. Make sure they know what to look for, then direct them to bring in several for class work.

Ask for measurements and drawings, and direct a dissection of the gall by splitting it a little to one side of its longitudinal axis.

Of what kind of plant tissue is it composed, near the outside and near the centre? After several have been opened what do you find at the centre? Measure the little pupa, note its color. How did the insect gain admission? Are these enlargements (galls), natural to all golden-rod stems? What caused the gall? At what time of year did it begin to grow? What use has it been to the insect?

Explain to your class how stimulation in the form of pressure upon a rapidly growing portion of a plant induces an abnormal growth of its tissue at that point, e. g. trees serving as posts for wire fences show enlargements in a few years, where the wire is attached to their trunks. This gall has been formed in much the same manner, and the object of irritation was a tiny larva, that hatched from an egg deposited at the centre of the stem, while the plant was young.

Make notes of these facts and place whole galls in wide mouth bottles covered with cheese-cloth. Keep where they may be under observation for several months.

Take up the Pine-cone Willow-gall in much the same way.

In dissection split through the middle of the stem. Of what is this cone composed? What has happened to the central axis of the bud? Of what are the scales modified forms?

Look in the central axis for the insect: in what state do you find it, larva or pupa? Where and when was the egg deposited? Write a paragraph on the value of these cones to their insect guests.

These insects are internal parasites upon the willow; name some external parasites of the willow and other trees.

Among the scales of the Pine-cone Willow-gall you may find another insect, a cousin of the one in the stem; the eggs of grasshoppers have also been found.

Bring in several of these cones during the latter part of April;—place in jars properly covered, and watch for the appearance of the insects. Keep records and write a short description of all the different forms that appear.

Various species of the rose are also infested with a gall. Gather several of these. Are they as symmetrical as the other two just mentioned? Draw, measure and dissect several and note the number of pupae in each. These are called compound galls. Why? Keep several in jars for spring work, and examine frequently; note the size and color of the insects as they appear.

These insects belong to the family Cynipidae of the order Hymenoptera.

II. Outlines of Life-history of Galls.

The golden-rod galls are enlarged portions of the stem of the golden-rod (Solidago), about three-quarters of an inch in diameter. Children are always interested in finding out that they are caused by a tiny baby fly, long before it had wings. It hatches from an egg deposited in the stem when the plant was young, so each gall is the fairy home of a little larva which feeds on the soft pulpy tissues within, and is protected by the harder tissues without. It sleeps during the winter and awakens in the spring, a beautiful two-winged fly about half as large as the house fly, gnaws its way out through the side of its home, spreads its wings and flies away, and thus its life cycle is completed. This fly is called *Eurost Asteris* and belongs to the family Trypetidae, which is represented in