we are more frightened than hurt." He was, however, truly thankful people are well frightened. One benefit from the alarm was that it led many to discover what a scale insect is, and to learn that for years their fruit trees have been injured by native or naturalized species of this class of insect. If the alarm perpetuates, as it appears to have started, a crusade against scale insects of all kinds, much good will result. The destructiveness of this scale and the expense and difficulty of killing it, will, if a few more instances of its introduction from nurseries occur, lead to legislation. Mr. Dearness believed that if the San Jose scale ever became established in this country it would not, like the moths above referred to, be marked by a sudden disappearance, nor would it, like the codlin moth confine its ravages to a single species of tree, nor even to trees under cultivation.

ENTOMOLOGY IN SCHOOLS.

I was glad that the important question of teaching entomology in the schools occupied so large a part in our discussions last year. I have to report that the Western Fair Board repeated its offer of prizes for the life-histories of injurious insects exhibited by schools. The prizes were won by Mr. W. J. Atkinson's school, Avon P. O., and Miss Corsaut's, No. 15, London Township. The former exhibited the cabbage butterfly (*Pieris Rapæ*) in egg, larvæ blown and in alcohol, the pupæ and the imagines and dried leaves showing the effects of the larvæ on their host plants, with a readable account of the observations made upon them.

Miss Corsaut's school showed a series of specimens of grasshoppers, one or two with the red mites (*Trombidium locustarium*) attached to their bodies under their wings, and a dissection of a lust.

I hope an increasing number of county and township fair boards will follow the example of the Western in offering encouragement to the true study of insects.

Collections of insects as commonly seen at fairs have little claim to the honor of being scientific exhibits. Their proper places is with wax flowers, rosettes of seaweed, and other such pretty bric-a-brac. There is little or no scientific value in a small private collection of insects arranged at haphazard, without notes or dates, be they ever so nicely spread, and even though they are pinned over their proper Latin names. Besides in nine cases out of ten economic interest centers in the larval form of insects. Exhibits to be be worthy of the name of science should attempt to show the phases of the life cycle. This remark is particularly applicable to those insects that undergo complete metamorphoses. Hence, I would advise young collectors to prize most the butterflies and moths they obtain by breeding the larvæ While not discarding the net, I would encourage the use of the breeding cage, and I would strongly advise fair boards to offer their best prizes in this class to exhibits of complete life cycles of insects.

During the year I received a few letters from teachers outside of my own district, asking hints on how the children may be directed in the practical study of insect life. Anticipating that others may desire the information, I avail myself of the opportunity afforded by the printing and circulation of this annual report to meet the desire more fully and satisfactorily than I could do by letter.

At the outset the purpose of the lessons should be clearly defined in the teacher's mind. The aim should not be to fill the learner's memory with knowledge about insects, but to train the young eye to see and the mind to reason about, to connect and relate the phenomena observed and to make these observations and reasonings the occasion for practice in correct expression by voice, pen and pencil.

The study, if natural, will be attractive to children. Flowers and insects are the classes of objects, next to mud pies, that they take most delight in.

Each teacher will, as skilfully as he can, introduce the study. Plans to arouse an easily obtained interest will readily suggest themselves. The main points may be illustrated by one or two examples, and the technique rather than the methods may be described here. Take, for example, the cabbage butterfly, the study of which won the first prize above referred to. For a class beginning after midsummer holidays this insect is always easily obtained. Construct a cage by covering a box of horizontal cross section of from 40 to 100 square inches with mosquito netting or cheese cloth; or, being more convenient for feeding and studying, take an ordinary bandbox, remove the bottom and substitute a netting or cheese cloth covering. Use the latter to set over a smaller box such as a chalk-box. Many insects pass the pupal stage buried in the ground, but chrysalids of butterflies are commonly found suspended in dry situations. Earth to the depth of an inch may be put in the box and upon that some brushy twigs upon which to lay the leaves for food, and chips to which the chrysalids may be attached. In the case of the cabbage worm have the children collect the worms of various sizes and with them bring a leaf or parts of leaves to serve as food. If the supply of food is maintained the larvæ will eat voraciously, grow fast, and in a few days prepare to transform into pupæ or chrysalids. When these are formed, in the example under notice the box may be set away in the wood-shed or other secure cool place until the following spring, awaiting the final transformation. Will you await this beautiful surprise to discover to the children the connection between the beautiful white butterfly and the green cabbage worm, or will you lead them to discover it when they are collecting and observing the larvæ? Circumstances will determine. You can and should stimulate a search for the youngest and smallest specimens Some pair of sharp eyes may trace one to the egg, attached alone by its end to the under side of a cabbage leaf. Then institute a search for eggs; these will be brought in numbers and the hatching studied. It is needless to say you should have a magnifying lens; every teacher (and every household) should have one.

In the spring the tent caterpillar is very suitable for study. It is no trouble in early spring to find a bracelet of varnished eggs encircling a twig of apple tree or wild cherry. Cut off the twig with another attached so as to form a fork that the newly-hatched insects may weave a tent upon it. Set two or three of these forks in bottles of water to stimulate the growth of the buds so that when the eggs are hatched the young tent-makers may have some leaves to feed upon. In time transfer them to the breeding cage, with chips resting on the earth; under these chips they will spin their cocoons. These cocoons may be given to the children to watch during the holidays, for before the first of September the moths will have emerged. The conditions of growth in the schoolroom may be so unfavorable that healthy cocoons are not formed; supplement the supply by outdoor captures. These two examples are selected out of many that might be taken. Nothing has been said of the important part of the study; observations on the habits, moulting, organs, mouth, antennæ, legs, segmentation, etc.

When the moths are bred you may, if you wish, release them, but you may wish to preserve what represents a life history of the insect.

Obtain a box six or eight by ten inches, two to four inches deep, with a close wooden or glass cover. Tack linoleum or cork in the bottom and then line the inside with white glazed paper.

The eggs are easily preserved. The leaf, twigs, etc., may be pinned in the box, the eggs may be touched with coal oil to prevent their hatching.

The larvæ are taken at various stages and killed with fumes referred to be ow or by dropping into hot water or into water and alcohol. They may be "blown" as follows: Snip off the anal end, empty by repeated gentle rollings with a lead pencil from the head backwards, then blow up through a straw inserted in the opening, tie to keep the air in and dry. Or they may be preserved in alcohol by putting them first into a twenty per cent. solution in water, the next say in a forty or fifty per cent. solution, the next say into a sixty or seventy-five per cent. solution. They will keep indefinitely in a seventy-five per cent. or stronger solution. The more gradually the strength of the alcohol is raised the better the form and marking will be retained. If put at once into strong alcohol soft-bodied insects are shrivelled out of recognition. Frequently parasites may be found in or upon insects. These should be carefully observed and specimens of them kept.

Butterflies and moths (Lepidoptera, from *lepis*, a scale, the wings being more or less covered with scales or microscopic feathers), whatever way captured—commonly with a net when in the open field—are transferred to a bottle or tin box and killed with fumes of chloroform, benzine, ether, or cyanide of potassium. A cyanide bottle—it must have a wide mouth and tight cork—is prepared by dropping in a lump of cyanide of potassium, say as large as a marble, varying of course with the size of the bottle; merely cover with water and then add enough plaster of Paris to make a cement with the water. Let it get dry before corking. It is well to slip in a thin layer of dry cotton batting or a disc of blotting paper; then keep it tightly corked except when inserting or taking out an insect. To use chloroform, ether, or benzine, put a few drops on a bit of cotton batting and shut in box or bottle with the insect.

Lepidoptera are then spread on a board until dried. The spreading is easily done before the insect becomes rigid. To make a spreading-board take two pieces of smooth, soft board half an inch thick and ten to eighteen inches long by two or three inches wide, tack them a half inch apart at one end, one quarter inch at the other to cross cleats below the opening between the boards tack an inch strip of thick linoleum from cleat to cleat, corky side upward.

Insert a pin through the body of the killed insect just behind the head, stick the pin into the linoleum so that the insect's body will be carried down to the wings through the opening between the boards. Carefully, so as not to "brush the dust" off the wings, expand them on the boards and over or across them pin narrow strips of paper to keep them in proper position until they dry (two or three days will suffice).

In the box we have spoken of nicely arrange the preserved material—eggs, larvæ (dried or in vials of alcohol), parasites (if any) pupæ, moths or butterflies, etc. To keep living insects out drop in a camphor ball or some crystals of naphthaline, and above all take good care of your accurately dated notes of observations. One such box as this, the result of the teacher's and pupils' own efforts, is likely to be of greater practical and educational value than memorizing a whole text-book on entomology, even though such study were supplemented by catching at random and mounting one hundred beetles, moths and butterflies.

One of the most serious defects in our public school system is the lack of exercises that train the children to observe and to reason from their own observations. Such kind of training cannot be obtained from the text books nor tested by examinations, and hence will the more slowly gain its proper place in our system of education. But I hope that the influential efforts of this Society, now that it has taken this subject up, will continue to stimulate and encourage nature study in our schools, at least along that line in which it is particularly interested, and which the quotation from Mr. Sheldon shows to be so appropriate, and which is no less practical than disciplinary.

Prof. Fletcher, in seconding a vote of thanks moved by Mr. Fyles to Mr. Dearness for his able paper, referred to the importance of this subject, which means so much to the financial interests of our country, as quite 10 per cent. of the crop each year is destroyed by insect pests.

Manitoba schools have made a grand start in the study of plant and insect life. Dr. Fletcher recommended the simple teaching of practical entomology. Reference was made to what he observed in Manitoba, where the children were found to be able to distinguish the various weeds which he presented to them.

Dr. Fletcher read extracts from a letter received from Mr. Martin Burrell, of St. Catharines, upon orchards he visited which was infested with the San Jose scale. A noticeable feature, he found, was that it did not spread from tree to tree so much as last year. In discussing the subject, Dr. Fletcher strongly advised Canadian fruit growers to purchase their trees from Canadian nurseries, instead of importing from States that were infested with the San Jose scale. He believed our own nurseries were free from this injurious insect, and if they took proper precautions in procuring their stock, would remain so. If farmers and other fruit growers would dig up and destroy badly infested trees, and give attention to spraying others with kerosene emulsion throughout the summer, more satisfactory results would be obtained than by clamoring for legislation to protect them. He also drew attention to the pea moth, which for the past twenty-five years has been the cause of serious trouble to farmers in Eastern Ontario. In his report of 1895 he described the method of treatment to prevent this maggot. In commenting upon a letter from Mr. Kirkland, who had charge of the work in the State of Massachusetts for the destruction of the gypsy moth, Dr. Fletcher emphasized the importance to Canadians of the successful efforts of the State. Had one of the poorer States been infested he had no doubt but that it might have spread over the greater part of North America. The State Government appropriated the sum of $70,000 to the eradication of this troublesome pest. It required a number of years' hard work before they got it under control. The method pursued was to spray the trees with arsenate of lead.

A paper read by Mr. Lochhead, B. A., London, on the study of crickets, and another by Rev. Dr. Bethune, Port Hope, on the life history of moths, which was prepared by Professor Webster, of Wooster, Ohio, were of considerable interest to those who were interested, as students of entomology.

Officers elected: President, Mr. H. H. Lyman, Montreal; Vice-President, Prof J. H. Panton, O. A. C., Guelph; Secretary, Mr W. E. Saunders, London; Treasurer Mr. J. A. Balkwill, London. Directors: Messrs. W. H. Harrington, Ottawa; J. D. Evans, Trenton; A. Gibson, Toronto; A. H. Kilman, Ridgeway; R. W. Rennie, London; and Prof. Panton, Guelph. Librarian and Curator, J. A. Moffat, London. Auditors: Prof. Bowman and Mr. Lochhead, London. Editor of the *Entomologist*: Rev. Dr. Bethune. Editing Committee: Dr. Flethcher, Rev. T. W. Fyles, H. H. Lyman, and James White, Snelgrove. Delegate to the Royal Society of Canada: Mr. J. D. Evans Committee on Field Days: Messrs. Wolverton, Hotson, Spencer, Balkwill, Rennie, Elliot, Bowman, Anderson, Saunders, and Law, London. Library Committee: Messrs. Dearness, Balkwill, Saunders, Moffat, and Dr. Bethune.

QUESTIONS AND ANSWERS.

[In order to make this department as useful as possible, parties enclosing stamped envelopes will receive answers by mail, in cases where early replies appear to us advisable; all enquiries, when of general interest, will be published in next succeeding issue, if received at this office in sufficient time. Enquirers must in all cases attach their name and address in full, though not necessarily for publication.]

Miscellaneous.

IS COCKLE SEED INJURIOUS?

THOMAS HINDLE, Simcoe Co., Ont., asks if the seed of the cockle (*Lychnis Githago*) can be used in any way as feed for stock, or for any other useful purpose, and states that a farmer of his acquaintance has between fifteen and twenty bushels of this seed.

[The cockle, many years ago, before the machinery for cleaning weed seeds from grain had been brought to its present state of perfection, was a very common weed in grain fields, but, with the exception of a few districts, it is now so uncommon that it may almost be called a rare plant in Canada. I am surprised that any farmer can have the quantity of cockle seed mentioned by your correspondent, unless, indeed, he may have grown this plant as a crop. I fear there is no good purpose to which this seed can be put, and the proper course would be to destroy it with fire, so that the weed may not become more prevalent on the farmer's land. I have frequently heard the statement made that the seed of cockle is poisonous, and when this enquiry of Mr. Hindle was submitted to me I consulted some of the millers here, and also all the works of reference in which the plant was referred to. Millers state that they remove this seed from wheat before grinding it with great care, as it is generally supposed to be injurious, some stating that it produces headache in human beings. The only reference to this poisonous property which I have come across is in La Rousse's large French dictionary, where it is referred to as follows: "The seed is starchy, and can to a very small extent enter into bread, but the skin of the seed contains a bitter, acrid and irritating principle called Saponine, which, when present in bread in any appreciable quantity, makes it bitter and unpleasant, and is stated to be very irritating to the stomach. Serious intestinal hemorrhages observed in Poitou were attributed to its abundance. When these seeds are eaten by stock, especially by fowls, they produce results very similar to the above. Saponine as a powder causes sneezing and acts as a poison on small animals." Saponine, the substance contained in the above-named seeds, is the same as that which in much larger quantity occurs in Saponaria, and gives the English name of soapwort to that plant. This is one of the few economic species in the pink family. When the roots and stems are bruised and agitated in water a soaplike lather is produced, which may be used to a certain extent for washing. Saponine, in varying degrees, is found in many plants, as lychnis, silene, arnica, arum, capsella, the fruit of the horse chestnut, etc. In view of the above, I do not think it would be wise to use this seed as food for stock, but so that the plant may not become more prevalent in the neighborhood, it would, I think, be well to scald and then bury the supply on hand, as it is a difficult matter to burn any large quantity of threshed seeds.

J. FLETCHER, Botanist.

Central Experimental Farm, Ottawa.]