

THIRTIETH ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY
OF
ONTARIO.
1899.

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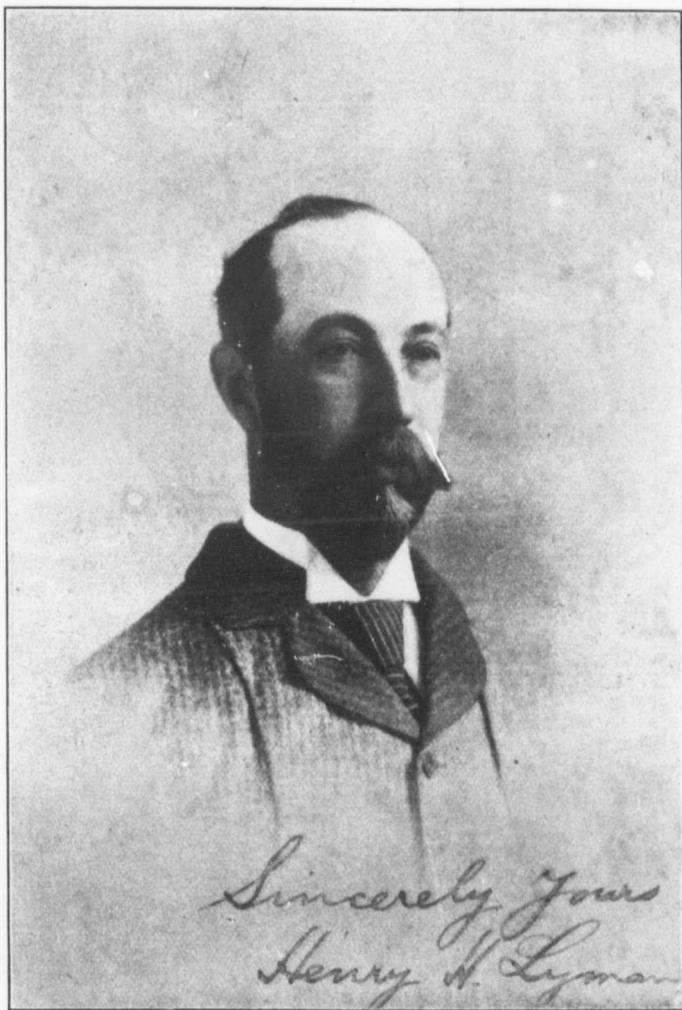
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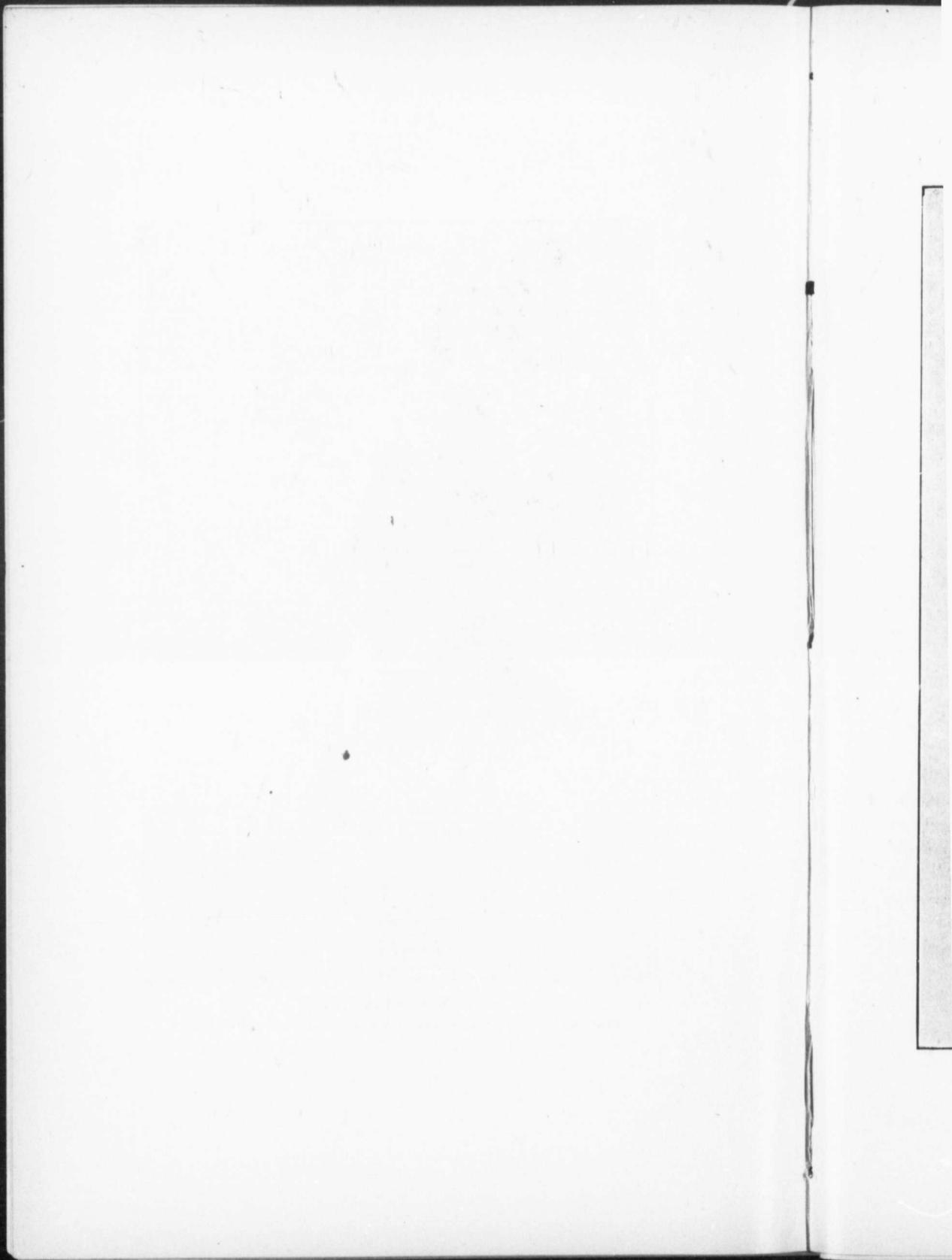
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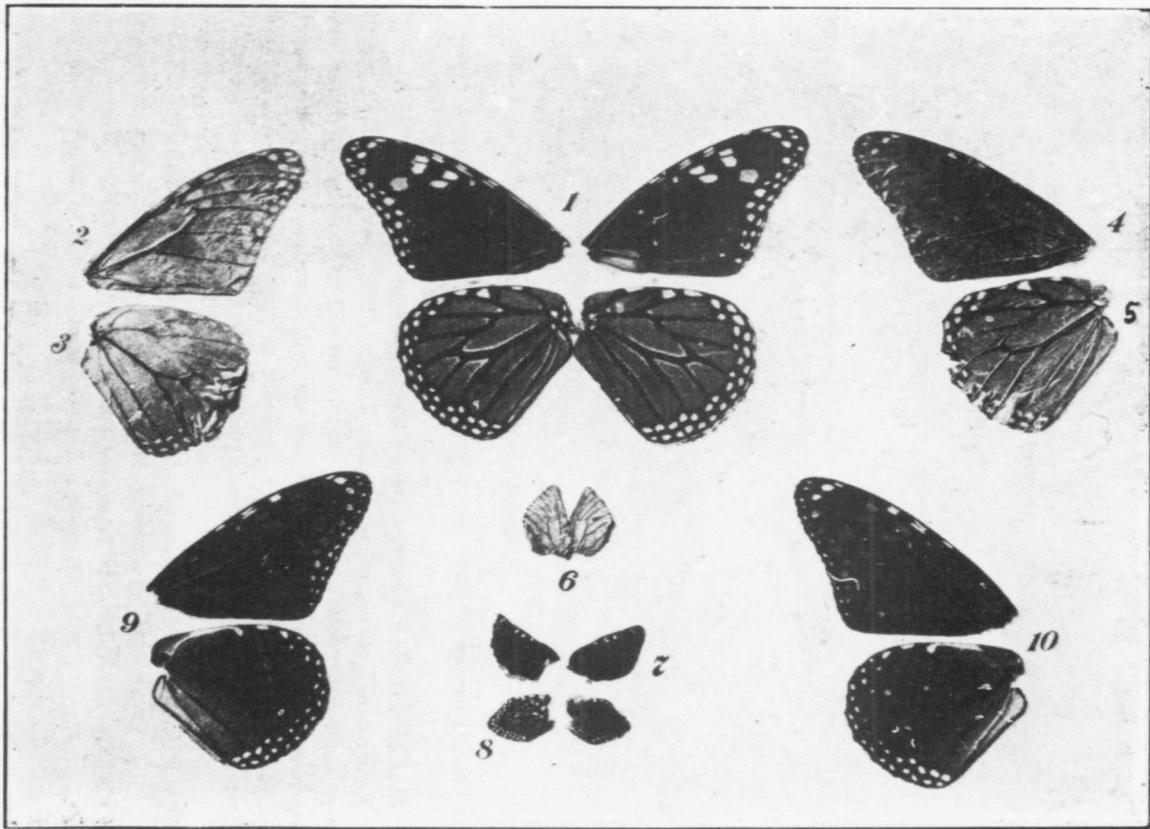
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HENRY HERBERT LYMAN, M.A.,
PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, 1897-1898.





STRUCTURE OF A BUTTERFLY'S WING.

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THIRTIETH ANNUAL REPORT

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1899.

To the Honorable John Dryden, Minister of Agriculture :

SIR,—I have the honor to present herewith the thirtieth annual report of the Entomological Society of Ontario.

The thirty-sixth annual meeting of the Society was held in the City of London on the 11th and 12th of October, 1899, when the officers for the ensuing year were elected and the necessary business of the Society was transacted. The report contains a full account of an important conference upon the San Jose Scale, to which the first afternoon was devoted, the audited statement of the Treasurer, reports of the various branches, sections and officers of the Society, and of the papers and addresses presented during the meeting.

The Society's monthly magazine, the *Canadian Entomologist*, has been regularly issued and has just completed its thirty-first volume. It continues to maintain its high reputation as a valuable scientific publication and to attract the contributions of the most eminent Entomologists of the day, both here and in other countries.

I have the honor to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,

LONDON, Ontario.

Editor.

OFFICERS FOR 1899-1900.

President.—REV. T. W. FYLES, D.C.L., F.L.S. South Quebec.

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REV. C. J. S. BETHUNE, M.A., D.C.L., F.R.S.C. London.

JAMES FLETCHER, LL.D., F.R.S.C., F.L.S., Entomologist and Botanist, Experimental Farms. Ottawa.

JOHN DEARNESS, I.P.S. London.

HENRY H. LYMAN, M.A. Montreal.

Director ex-officio (Ontario Agricultural College).—PROFESSOR WM. LOCHHEAD. . Guelph.

Librarian and Curator.—J. ALSTON MOFFAT. London.

Auditors.—J. H. BOWMAN AND W. H. HAMILTON. London.

Editor of the Canadian Entomologist.—REV. DR. BETHUNE. London.

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Delegate to the Royal Society.—REV. DR. BETHUNE. London.

Delegates to the Western Fair.—J. DEARNESS and DR. BETHUNE. London.

Committee on Field Days.—DR. WOOLVERTON, MESSRS. BALKWILL, BOWMAN, ELLIOTT, LAW, PERCIVAL, RENNIE and SAUNDERS. London.

Library and Rooms Committee.—MESSRS. BALKWILL, BETHUNE, DEARNESS, MOFFAT and SAUNDERS. London.

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THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-sixth annual meeting of the Entomological Society of Ontario was held in the rooms of the Society, Wellington Street, London, on Wednesday and Thursday, October 11th and 12th. The Council met on Wednesday at 11 a.m. for the purpose of preparing its annual report and transacting the ordinary business of the Society. At the request of the President, Mr. Henry H. Lyman, of Montreal, the chair was occupied by the Rev. Dr. Bethune, of London. The following additional members were also present: Rev. Dr. Fyles, South Quebec; Dr. James Fletcher, Entomologist and Botanist, and Mr. Arthur Gibson Assistant Entomologist, Experimental Farms, Ottawa; Professor Lochhead, Ontario Agricultural College, Guelph; Messrs. W. E. Saunders, J. A. Balkwill, R. W. Rennie and J. Alston Moffat, London. Letters expressing regret at their inability to attend the meeting were received from Mr. W. H. Harrington, Ottawa; Mr. J. D. Evans, Trenton; Mr. G. M. Stewart, Secretary of the Toronto Branch; and Mr. Dwight Brainerd, Montreal.

The President brought up the subject of members' subscriptions that are in arrears and gave a tabulated statement of those in this position. After some discussion a by-law was adopted in which instructions are given to the Secretary for dealing with all such cases, and if necessary, discontinuing the sending of the Magazine and Report.

Dr. Bethune drew the attention of the Council to the fact that the membership of the Society had so largely increased during the last few years that the number of surplus copies of the *Canadian Entomologist* had become alarmingly small. He presented a tender from the London Printing and Lithographing Company, and it was decided to increase the monthly issue by one hundred copies, beginning with the number for January, 1900.

The report of the Council was then prepared, and after the transaction of some further details of business, the meeting adjourned.

CONFERENCE ON THE SAN JOSE SCALE.

The Society met at 3 o'clock on Wednesday afternoon, October 11th, for the purpose of holding a conference on the all-important subject of San Jose Scale. The following members were present, in addition to those already mentioned: Prof. C. C. James, Deputy Minister of Agriculture for Ontario, Toronto; Inspector G. E. Fisher, Freeman, Ont.; Prof. F. M. Webster, Wooster, Ohio; Messrs. J. Dearness, H. Gould, J. Law, J. S. Pearce, W. Percival, H. S. Saunders, Spencer, Dr. W. J. Stevenson and others. The chair was taken by the President, Mr. Henry H. Lyman, Montreal.

THE CHAIRMAN: I have much pleasure in welcoming you to this 36th annual meeting of the Entomological Society of Ontario. We are particularly fortunate this year in having a number of distinguished entomologists with us. We had hoped to have the pleasure of welcoming the Hon. Mr. Dryden, Minister of Agriculture for Ontario, but unfortunately he has been unable to attend, but he has sent his Deputy, Prof. James, whom we are all very glad to see. We also have Prof. Webster, who has taken the trouble to come from Wooster, Ohio, to be present, as well as Mr. Fisher, Inspector of San Jose Scale for Ontario; Prof. Lochhead, of the Agricultural College, Guelph, and others, so that our meeting ought to be a particularly important and useful one, but as I unfortunately labor under the infirmity of deafness, I will call upon our Vice-President, Rev. Dr. Fyles, of Quebec, to take the chair and preside over the meeting.

REV. DR FYLES: I am very sorry that our worthy chairman is afflicted with deafness. I am very sorry on my own account. I would wish to express the very great pleasure I feel on seeing so large a gathering to-day, and I may say a gathering of distinguished men. We have a very important subject to consider—that of the San Jose Scale insect, which is doing so much damage in the United States and in Canada.

I am happy to say we have an authority on this destructive insect in Prof. Webster, from Ohio, who will tell us about the pest and his experience in connection with it. We have also our own Dominion Entomologist, Prof. Fletcher, who has given much attention to the scale, and I trust we shall all benefit by the opinions that these gentlemen can give us. There are others who will be able to speak upon the subject under consideration, and I will now in the first place call upon Mr. Dearness to commence the discussion on this interesting subject.

MR DEARNESS: Mr. President and gentlemen. Yesterday evening I was asked to open the discussion on the San Jose Scale insect. I was aware that my name was on the programme, but I did not expect to have the honor of opening the discussion. I have hastily jotted down some notes by way of introduction.

Nineteen years ago Prof. Comstock published descriptions of a number of Coccids in the Genus *Aspidiotus*, one of which he very appropriately named *A. perniciosus*. The first American home of this scale is supposed to have been in the San Jose Valley, California, and hence the popular name of the species. No one knows how long it had inhabited the fruit trees in that district before Prof. Comstock labelled it. One doubtful theory is that it had been introduced ten years before that time from Chili. It is pretty well settled that it is now about thirty years since its effects on deciduous fruit trees were first observed in California. Singularly enough according to Prof. Comstock's information the peach and apricot were exempt from its attacks. In Canada and the United States, if it thrives particularly well on any kind of tree, it is on the peach. Earnest efforts have been made to fix the date of its introduction to the Eastern United States. It seems established that the first extensive distribution of it was by the Californian nursery stock sent out by two firms in New Jersey twelve years ago.

This summer an unsuccessful attempt was made to fix the date of its importation to Ontario. It may be that some of that 1887 New Jersey stock found its way here. A trustworthy and observant fruit grower, Mr. John Vanhorn, of Chatham, testified this summer that he detected this scale in his orchard six years ago, the suggestion to look for it having come from a New Jersey nursery firm—the Parry Brothers—with whom he had had dealings. It is not out of the range of probability that it was introduced into the southwestern part of Kent county ten or twelve years ago.

From the scientific point of view the *Coccidas* are an interesting and attractive family of insects. It is also a large family. Although it cannot be said to be well worked up, Prof. Cockerell's check-list published three years ago gives 770 species, to which his supplementary list, published this year, adds 322 species. More than a third of these additions are in the section *Diaspinae*, to which the San Jose Scale belongs.

Some of these may yet, when they go abroad, rival the San Jose in destructiveness. Several of them are capable, and guilty too, of killing the plant upon which they feed, but at present and for the past five years the San Jose overshadows all its relations in economic interest on account of its destructiveness. The sagacious Comstock nineteen years ago declared it as his belief that it is the most pernicious scale insect in the country.

What makes it so pernicious? Several other species are as strongly armored. Its larvæ are longer exposed than many others. It does not seem to set up a morbid condition of the tissue of the plant on which it feeds; like its congeners, it simply sucks the sap of its host. (It is true that its presence it characterized in some kinds of wood by a reddening of the subcuticular and cambium layers, but there is no distortion of the tissue as in the case of tissue affected by black-knot.) A gravid female does not contain nearly so many ova as a *Mytilaspts*. As a rule an insect that winters in the egg state, as the

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oyster-shell bark-louse does, is safer than one that hibernates. What then gives the San Jose Scale its pre-eminence among its brethren as a plant destroyer?

First, it is the difference between addition and multiplication. A single brood of 600 is left far behind by a three or four-generation multiplication of even 50 or 60. In Ontario the over-wintered San Jose females begin bringing forth their young about the 20th of June. If by the 15th of July each of these over-wintered ones has produced 30 females, these are by the latter part of August ready to produce say 50 each (the later mid-summer broods are said to number 200 to 300 females from each mother) giving a total of 1,500, and each of these 1,500 by the early part of October is multiplying by 50, totalling for the single season, in Ontario, a progeny of 75,000 females from each individual female that survived the winter.

It is probable with us that there are three full generations in a year. The possible ratio of multiplication is probably nearer 100 than 50. (It is said to be between 200 and 300 in the latitude of Washington). A ratio of 100 for three generations would give a total of a million. On trees in certain conditions and of varieties that have resistant bark, probably only a small proportion effect a connection with the sap channels necessary for them to complete their life cycle. There is pretty good evidence that a susceptible young tree may be overrun and literally sucked to death in three years. On the other hand, the increase of the insect on trees of a susceptible kind has in some cases been very slow. Mr. Honner, Amherstburg, testified that on a young peach tree in his orchard the scale had been most certainly established three years and yet in that time it had spread over but a small part of the tree.

Secondly, the comparative activity of the larvae and their plumpness at birth enables them to scurry around a considerable distance and to subsist a relatively long time before they perish for lack of food.

Third, its lack of fastidiousness in the flavor of its nourishment. Trees, shrubs, herbs, foliage, fruit and roots are neither common nor unclean to it. Mr. John Gordon, of Guilds, whose story of his efforts to save his orchard from the officers of the law, was truly pathetic, has spent time and effort without stint in studying and experimenting upon the insects in his neighbors' orchards since his own was burned. He showed Mr. J. H. Smith, B.A., and me, examples of the settlement of the insect and the secretion of its scale on fruit of watermelon, root of carrot, fruit of squash, leaves of poison ivy, garden phlox, high brush cranberry, and hemerocallis. Besides some of the above he had artificially inoculated mulberry, basswood, blue beech, red beech, ironwood and elm. We found on September fourth and fifth, breeding females on hemp, pitch forks, rhubarb, burdock, horse-radish, erect door weed, oriental polygonum, hedge mustard, turtle-head, nettle, touch-me-not, potato, white ash, willow, nine-bark, rose, elm, basswood, currant.

The almost continuous running of the larvae, owing to the fact that they are produced singly over a period of several days, offers the means of their distribution by nesting birds, strong winds, horses and workmen engaged in the orchard, and fruit harvesters.

The desirability, nay the necessity, of checking, eradicating or controlling an insect so fecund, so omnivorous and so destructive as the San Jose Scale is at once impressed by a knowledge of its habits and capabilities. The usual restriction of animal life to its peculiar faunal zone makes some biologists hope that in our latitude this insect, even if let alone, could not become so destructive as in the latitude of Maryland. The extreme severity of the winter of 1899 proves that prolonged zero temperature, while it may weaken and check it, will not eradicate it. Its allies on our fruit trees are usually held in check by parasitic insects. In the trip just referred to, Mr. J. H. Smith and I were shown two trees the worst infested I ever saw with *Chionaspis*. Here and there were groups of the spinulous sloughs of *Chilocorus*. The owner informed us that there had been a great many more of those, but he had brushed them off and killed them. As frequently happens in insect fighting, he was spending his efforts in killing his allies. In one sample of Putnam's scale that I found on hickory, nearly every shield was perforated and its contents devoured by some insect.

I have not seen anything like this degree of havoc by parasites among the San Jose scale, yet it doubtless has its foes among both insects and fungi. Prof. Forbes, State Entomologist of Illinois, reports in Bulletin No. 56, that he has discovered in *Sphaerostilbe coccophila*, Tul. found by Prof. Rolfs on the oak scale in Florida, an efficient fungous disease for the San Jose species. Most of the bulletins report that a little coccinellid beetle, *Pentilia mesilla*, preys actively on the San Jose Scale, and also that in some localities the twice stabbed lady-bird, *Chilocorus bivulnerus* has literally cleared the tree of the scale. Certain species of mites also prey upon it. On specimens collected in South Kent, I found a mite apparently feeding on the scale which Mr. Marlatt pronounces a species of *Rhyncholophus* and another much more common not yet determined.*

Mr. John Gordon, above cited, has been experimenting with the application of hot steam and a small proportion of coal oil. He is making use of one of his neighbor's trees that was nearly killed with the scale as an example of this method of treatment. (Specimen cuttings from this tree were exhibited. Branches cut off before the treatment still had numerous young scale larvæ running over them; while upon cuttings taken from the treated branches no surely living scale could be found.) Mr. Thonger assured me that Dr. Fletcher had reported 97 per cent. of the scale dead on the samples taken from the trees he had treated with a mechanical mixture of coal oil and water. The machine mixes the oil and water in definite proportions at the nozzles and projects the mixture as an "atomized" spray. Mr. Thonger seems to have confidence that if he had been allowed to repeat his spraying with the coal-oil mixture he could have eradicated the scale from his orchard.

Up to the present time the most successful and satisfactory method of remedial treatment is the fish-oil and potash soap solution. This is a soft-soap made with a special fish-oil and strong caustic potash, dissolved in water in the proportion of two pounds to the gallon. Accounts of the demonstration of the success of this kind of treatment on a large scale as made at Catawba Island, Ohio, under the direction of Prof. F. M. Webster and Mr. Willis H. Owen have been published and extensively circulated.

As Prof. Webster is here to-day I will leave it to him to describe the treatment and its results. The potash soap treatment was found to affect the trees so favorably there that growers who had not the scale in their orchards have used it generously. Mr. Owen said that over 17 tons were used last winter on an area considerably less than 1,000 acres. Mr. J. W. Gamble, President of the Ottawa, Ohio, Horticultural Society, for his annual address, read a paper entitled "The San Jose Scale as a Blessing in Disguise." His argument was that the scale had indirectly led the growers to discover the value of the soap as a general cleaner-up and fertilizer of their trees, and on peach-trees it had checked the destructive leaf curl.

When the scale was first discovered in Ontario, the people thought it was confined to two or three situations and within narrow limits at these places. Had that been the case no wiser course could be taken than to cut down and burn the trees. It soon became evident that it was much more widely established than at first suspected. The axe and fire is a primitive method of treatment for insects. Here is one that lives on the surface and has not the power, save in a restricted degree for a short period, of moving its position. Surely science will not remain helpless and useless to kill that exposed insect and save the valuable tree upon which it feeds. In several instances more money has been spent in going over a tree with lenses to discover whether the scale was on it than it would have cost to spray it thoroughly. Drenching with the spraying machine will reach the parts that the lens will miss. The axe and fire method is dependent on the discovery of the insect and discovery is not always possible. Several other species of scale are liable to be mistaken for the San Jose one. By the fire method mistakes are irremediable; by the spraying method no harm comes to the tree though it be drenched with soap suds for harboring one of the native species of scale.

* Respecting the last, Dr. Howard wrote on the 23rd Oct., "I have to inform you that your scale mite has been examined by Mr. Banks, and he identifies it, with some little doubt, as *Hemisarcoptes coccisugus*, Lign. If not this species it is a closely allied one and belongs to the family Canestrinidae. The species is the only one known in the genus, and is a parasite of Coccidæ, having been found in this country on the oyster-shell bark-louse, and in Europe on other scale insects.

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THE CHAIRMAN : I am sure I voice the feelings of the meeting when I say we are very much obliged to Mr. Dearness for his carefully prepared and interesting notes. This Scale Insect is a most disobligng insect. I think with such a choice of fruit trees it should leave other trees alone.

MR. FISHER : What progress did this scale appear to be making on those trees, other than fruit trees, which had been artificially inoculated ?

MR. DEARNESS : Those that had been artificially inoculated had not had time to mature when I saw them. They were only in the stage of brown and yellowish round scales.

MR. FISHER : Have you ever found scales on trees that had not been inoculated that appeared to be doing well ?

MR. DEARNESS : On the Spiraea we found it doing well.

MR. FISHER : Is that a forest tree ?

MR. DEARNESS : That is a shrub ; and we found it growing on the elm and basswood but not doing so well as on the fruit tree.

MR. FISHER : In this connection I understood there was a feeling that the Scale would flourish on the shade trees in the city of St. Catharines, and we made a very careful examination of the shade trees last year. We spent quite a number of afternoons inspecting the trees, with the result that we could not find any trace of the San Jose Scale on these trees notwithstanding that the neighbouring gardens were very badly infested. This year I thought it only fair there should be a further examination made as we found the Scale spreading to much more distant points, and yesterday we made a careful examination of Rodman Street and Geneva Street, with the result that we found no Scale whatever on any of the hardwood trees. The trees along these streets are hard maple and soft maple and elm and horse-chestnut.

THE CHAIRMAN : That would seem to say that the insect preferred fruit trees.

DR. FLETCHER : Are there any fruit trees infested by the Scale growing in the neighborhood of these trees ?

MR. FISHER : There are currant bushes that are rotten with the Scale.

MR. DEARNESS : In reference to that allow me to point out that Prof. Comstock speaks of peach being excepted and apricot being excepted and certain kinds of cherry trees being exempt. We found elm and maple surrounded by badly infested trees exempt. These infested trees have been infested by wind, or men working among them, or by the harvesters. The insect cannot make its connection on the trunk of a tree like the hard maple, but if these insects were brought by these agencies and put up on the top of a forest tree, I cannot see why they would not grow there.

Because a fruit tree is exempt while others surrounding it are affected does not prove that the scale won't live on it. You will find in an orchard three or four trees badly infested and other trees that you cannot see any on right in the immediate vicinity. Here is a branch of a willow that is badly infested and the whole tree was infested throughout.

DR. FLETCHER : There is no question about its attacking the elm. It is one of the characteristics of the Coccidae that you will find a single tree very badly infested, and then touching that tree will be others perfectly exempt. That simply shows that a tree in a weakened state is more apt to be attacked than in a vigorous state.

MR. FISHER : I never found elm infested.

MR. DEARNESS : Here is an elm that is infested (shewing a specimen).

DR. FLETCHER : Of course it is a new importation into Canada, and it is more likely to attack the same kind of trees that it has been feeding on, but at the same time we cannot argue that it will not work on other trees. In the first year of the introduction of the San Jose Scale into the Niagara district we could not find it on peach trees; it was

on pear and plum only ; but the second year it was all through the peaches. In Kingsville likewise it was on pears and plums first, and the next year we found it on the peaches.

What is the object of this discussion : is it not to bring out the known state of affairs in Canada in connection with this insect, its distribution, abundance, etc. ?

THE CHAIRMAN : Yes, and then what can be done to remedy that state of things.

PROFESSOR WEBSTER, Wooster, Ohio : I really do not know whether or not I can tell you anything new that will help you in your troubles. I have had experience enough with the San José Scale, goodness knows, but there are a lot of things yet to learn that I do not understand, and I should like to have it understood that I am not going to explain all San José Scale puzzles. I have a whole note book full of them that I cannot yet explain. You speak of the introduction of the San José Scale into Canada, but in another paper I will give you, I think that I can show you that it is not absolutely necessary to trace all introductions back to the two New Jersey nurseries. We had a nursery in Ohio of which I have never been able to find sufficient proof to convince me that there was not an introduction into that nursery before it could have been gotten from New Jersey. I cannot understand how the premises could be so thoroughly infested since that time. I have no proof of course but it has been a marvel to me and I do not yet understand it. I think I can give you some information at least that will point to a possible introduction in the east, independent of these two nurseries. In regard to the scale becoming established I will give you an illustration of a puzzle that came up. I wanted to get them into the insectary so that we could watch them closely. I planted some fruit trees in the insectary, not wishing to place the scale on those outside. I tried for two years to get the scale started in the insectary on those fruit trees, and it was only after two years that I succeeded. Three times I got limbs from infested trees outside, brought them in, tied them to the trees but we could not get one of those rascals to get off the old original limb and settle down where any sensible insect would. Another instance : I know of a row of peach trees where the pits were said to have been planted where the trees were growing, and about two and a half feet upward from the surface of the ground the trunks were totally crusted with scale. After a half hour's search I could not find a single scale on the limbs, and an apple whose limbs intermingled with those of the peach had no scales on it whatever. There were no infested trees near by.

As to natural enemies I have not found any in Ohio that give any hope whatever of any immediate relief. I suppose that in the course of years our native insects will prey upon it but they have yet to cultivate an appetite for it, just as we do for our oysters. I noticed the little black *Pentilla* very abundant in the orchards of northern Ohio last fall, but this spring I found that they had evidently been killed off by the winter just about in proportion as the scale was destroyed, so that the problem is in precisely the same position that it was before. This year there are not more than half as many of the natural enemies as there were last year. Speaking of the elm, if it is not burnt I can send you a section of an elm tree that is as badly infested as any fruit tree I ever saw, but I have not generally found it as abundant on the elm as on the fruit trees.

MR. FISHER : Do you find it often on the elm ?

PROFESSOR WEBSTER : I have found it bad in the nurseries and have found it in a small orchard growing up in the midst of the woods, where the young elm shoots were growing up from the old roots, these shoots being pretty badly infested with it. Wherever I have found elms intermingled with infested fruit trees, I have found the elm more or less infested but not always as badly. The first experience I had with the scale was in December 1894, when it was sent me from an orchard in southern Ohio, and the trees were very easily traced back to the nursery where they were grown. The first infested trees sent out from that nursery were not peach, because the peach stock was grown in another part of the premises and they were not infested, the points of infestation being near where the apple, plum and pear stock were grown, but since that we found it upon the peach. I did not know what was best to do at the time and the owner was in a desper-

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ate state of mind and asked me if he could put kerosene on the trees. I told him he might if he wanted to but I thought he would kill the scale and presumed he would kill the trees also. He used kerosene thoroughly and, fearing that he had not been thorough enough, he used it a second time and I told him he had probably fixed the scale and his orchard too. I was surprised on learning that he had not killed his orchard, and the fact gave me hope that we might expect something from the application of pure kerosene. Some other experiments were made that did not turn out as favorably, as we killed the trees and since that I have been wondering why it would work satisfactorily one time and the opposite way at another. My assistant has applied kerosene to the same kind of trees, using the same brand of kerosene, and in one case it caused no injury and in the other case it killed the trees.

THE CHAIRMAN: Did he kill the insects in both cases?

PROFESSOR WEBSTER: Yes, he killed those that he reached. In some cases there would be individuals that were behind a bud, or behind some loose bark where he could not reach them, and I should not expect that a single application of anything, except fire, would kill every insect on a tree. Later, while dealing with the Catawba Island outbreak, we heard considerable about whale oil soap, and we used both kerosene and whale oil soap. The fruit commissioners got together and divided the trees into three grades. The first, comprising such as seemed to be too far gone to do anything with whatever, were cut down and burned. Then there were quite a number where it seemed as though, if we could destroy the scale at once, there might perhaps be a chance to save them, and I told these people that I would not be responsible for the results, but they might try kerosene: if there was any benefit to be gained they would get it, and that they could not do any more than destroy the trees and these would have to be destroyed anyway. In some cases the kerosene resulted fatally and, of course, that added to the number of trees that were destroyed. The other grade were such as were not so badly infested but what it seemed they might be saved, and on these they used whale oil soap.

Now, they have not exterminated the San José Scale on Catawba Island by any means. They have in this way simply got it under control by the use of whale oil soap. If the people persist in a proper way I think it can be exterminated. As it is they have simply reduced the pest to a point where they can control it; but just as sure as they give that over for a single year it will come to the front, and I think if they were to allow their premises to go two or three years there would be a great many trees that would not be worth saving.

PROF. JAMES: Has the fact of its being an island helped very much?

PROF. WEBSTER: I do not think so. The place is called an island by courtesy. It is only separated from the mainland by a swamp. There is really no bed of water between the island and the mainland. I do not think that has any effect at all. I do not see why they should have better results there than any place else if the same means were used. We have no law in Ohio that is good for anything. We have a law, relative to the suppression of peach yellow and black knot, and our Legislators thought it would be better to patch up the old law, and sandwich in a paragraph relating to the San José Scale, than it would be to make an entirely new one, and the consequence is we have a patched-up law that is worthless, because no one understands or dares to attempt to enforce it.

All that has been done since 1894 has been by persuasion on my part, the only authority I have being that of referee. If there is a question between the Fruit Commissioners and the owners of an orchard, it has to come to me, and as my decision is final, there do not very many of these questions come before me. That is the reason why they had such good results out at Catawba Island. Mr. Owen was sharp enough to throw the whole responsibility on me, and he would tell these people that my decision was final and that would settle it. What has been done there, has been done by the persistent use of fire and whale oil soap, and appealing to the people to do the same thing and at the proper time. There is as much in that, or more than in anything else. It is not so much what the scale will do as we know that pretty well, but what the people will do with the scale.

I believe it can be exterminated, but it will take a great many years, and the control of treatment must be in the hands of some one man, and that man must not have a great many neighbors.

PROF. JAMES: What would you have that man do?

PROF. WEBSTER: I would put the whole matter of treatment and everything connected with it into his hands. If in some cases he saw fit to let the owner do the work, well and good, but he and not the owner should be held responsible to the Government.

THE CHAIRMAN: I suppose you mean he would have to be protected from his neighbors.

PROFESSOR WEBSTER: I guess if you would give him authority enough he would protect himself. If people come to learn that he can do the work better and cheaper than they can, there will be no trouble.

PROF. JAMES: You would not leave the treatment to the owners?

PROFESSOR WEBSTER: I would leave no treatment to anybody except the one person whom you make responsible to your Minister for its being done properly, at the proper time, and if it is not, hold him alone responsible for it. If you put this work in the hands of the public you will get nothing done, even among very intelligent people. We had an experience of that last week in fumigating nursery stock. A nurseryman wanted me to let my assistant go down and fumigate his stock. I told him if they would get everything ready, so that my assistant could get on with the work just as soon as he reached his destination, and go away just as soon as the work was done, I would let him go. He went down there, and he said they had a fumigating house that he could drive cats through. It was not at all adapted to the use for which it was intended and he compelled them to line it, and then they declared that it was absolutely tight, but after he started work and went outside he said the odor of the gas was very strong and they had to line it again. That shows how far you can trust people who are supposed to be rather above the average farmer and fruit-grower in intelligence. You must have some one person who does understand and make him responsible, and then see that every man has the proper measures and that they are applied in the proper way and at the proper time.

PROF. JAMES: Have you any regulation whereby you can decide whether a tree ought to be taken out or fumigated?

PROFESSOR WEBSTER: No sir, you must see the tree yourself. There are some varieties of trees that are almost worthless, and that would make a great difference. There are so many of these matters to look into that your chief officer must be on the ground and understand the situation in order to be able to decide. I do not know how it is in Canada, but in the United States there are some trees that were not worth ten cents before the scale came on them, but became suddenly valuable about the time they were to be destroyed.

As to the time, I have never found that we could do much except during the winter and spring. Summer treatment would only apply to the young scale. I do not believe you could apply anything to the trees, in the summer, that will destroy very many more than the young, without injury to the tree. During the winter season, when the foliage is off, of course, you have a much better opportunity of reaching the trees and the limbs, and with the exception of the peach you can use a much stronger mixture. You can then use a mixture that will penetrate and kill the scale. With the peach you can do this also, but it will destroy the fruit buds unless it is applied just when the buds are putting out in spring. There is a time just when the fruit buds are being put out when we can use the ordinary mixture, two pounds of whale oil soap to a gallon of water, without injury to the fruit buds.

I urged Mr. Owen to go to work and manufacture a soap that would be of a uniform grade. The great difficulty has been that we would use a certain brand of soap and it would seem to be thoroughly effective and not injurious, and I would recommend that same brand for some one to use and they would get entirely different results, and these brands do not, as a rule, analyze alike; so I urged Mr. Owen to manufacture a soap that

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we knew would be of a uniform strength, and he has done so. I do not know that it varies particularly from Mr. Good's soap, only I believe it is more reliable, that is all.

PROF. JAMES: Has all the treatment on Catawba Island been under your directions?

PROF. WEBSTER: Not lately; I have not had very much to do with it the last year. The most that has been done the last year has been done independently by individuals. Of course, they brought a good deal of pressure to bear on those that were delinquent. I have had very little to do with it after the scale was once gotten under control.

THE CHAIRMAN: It seems to me that we have come to these particulars through the able address of Prof. Webster. That the right remedy is whale oil soap, that should be applied in the winter and in the case of the peach when the tree is about to bud. What is necessary is a strong pull and a long pull and a pull altogether, or else that some one, with considerable powers of coercion, should be appointed to see that the fruit growers do their duty.

MR. FISHER: I would like to ask Prof. Webster what additional benefits seem to result from the use of whale oil soap for the destruction of the scale.

PROF. WEBSTER: It is claimed, and I think with reason, that it acts as a fertilizer, and I would simply say that, to my certain knowledge, it has done so in some of our nurseries. It has been used a good deal stronger than was necessary in some of our nurseries, and when I asked why it was being used so strong the reply was that the stock that had been treated was a great deal more thrifty and in a great deal better condition than the untreated stock, and it was a question if it did not pay in that respect. I think as a fertilizer it has a very good effect. Some of our nurserymen are applying it to destroy the apple leaf aphid.

DR. FLETCHER: That is the potash?

PROF. WEBSTER: Yes, the potash, and, possibly, the fish oil also. Fish is a good fertilizer. I do not know to what extent it is a fungicide, but I do know that trees that were treated in the spring were exempt from the peach leaf curl, where the same variety, untreated, in the same row in the same orchard, was badly affected and the fruit nearly all destroyed. So, as a fungicide, to that extent it is certainly a very great benefit. This, and the fertilizing effects, are two very great benefits that would be gained by its use.

MR. DEARNESS: What about insect eggs on the trees?

PROF. WEBSTER: That I do not know. It has been so stated, and perhaps it will prove true, that fumigation will destroy insect eggs. We have made no fumigation in orchards, but the longer we use hydrocyanic acid gas in treating nursery stock, the more we are convinced of its utility. With a proper fumigating house, and the fumigating done properly, we have never yet had a single living scale pass through the process alive.

DR. FLETCHER: How long do you keep the plants in?

PROF. WEBSTER: About 45 minutes. In regard to effect of kerosene, there was sent to me, I think two or three years ago, a limb that was cut off from a tree infested with the oyster-shell bark-louse. The section sent was said to have been drenched with coal oil, but not only did the young bark lice hatch and live, but we actually got parasites from that scale after it had been treated with the kerosene.

DR. FLETCHER: Perhaps Prof. James can tell us if there are any fertilizing effects from the whale oil soap?

PROF. JAMES: Certainly not in the oil, but potash certainly would be very beneficial.

DR. FLETCHER: Is it not an expensive way of applying potash?

PROF. JAMES: Some contend it is not expensive. Last week, when I was talking to a lady who took over an old orchard near Philadelphia, she told me she started washing the trees with potash solution in order to clean the trees, and she said that the old trees that had not been bearing fruit for years commenced to bear. They seemed to renew their youth, and she said she thought it was a more effective way of applying potash to the orchard than by putting it on the ground.

MR. DEARNESS: There is one point that is of importance, and that is as to the time it injures the peach buds. It does not injure the buds of other fruit excepting peach.

PROF. WEBSTER: Not so far as we have learned. There is a possibility of a similar effect on some varieties of pear.

DR. FLETCHER: It is far better to do the spraying in the spring. One of the great defects in using soap is the want of uniformity. It is simply a matter of accuracy in making it, and the soap that Prof. Webster has used is practically the same potash soap made in an accurate way, so that you can look for the same results every time.

PROF. WEBSTER: I want to ask Prof. James if there is any way that a series of experiments could be carried out whereby we could get some definite idea, or some more exact idea, of the fertilizing value of soaps made of a certain strength.

PROF. JAMES: That is a very difficult matter. Analyses of soils are not very satisfactory, and you are experimenting with a living plant, which apart from the experiment might, or might not, produce. It is different from feeding an animal. Trees vary so much in their production, you might take a row of trees and treat them in different ways, but you are never perfectly sure.

A MEMBER: I notified Mr. John McMechan, who was Secretary of this Society some years ago, and who is a soap manufacturer, to be present here to day, and I also asked Mr. Heard, who manufactures spray pumps, to be present, but neither gentleman is here. I thought they might have been of some benefit to the Society, or we might have benefited them in the manufacture of their products.

PROF. LOCHHEAD: I had the honor of attending the Commissioners during their trip to the west this summer. I was not able to be with them when they went to the Niagara District, consequently I cannot speak for that district. We saw in the western part, especially around Guilds, south of Blenheim, some effects of the San Jose Scale in several orchards. I think that even the most sanguine believer in the non-destructiveness of the San Jose Scale could come to no other conclusion but that it was a scale that was very destructive if left alone. Apparently the scale was first introduced into the Guilds District, in Mr. Warner's orchard, about six years ago, and from what I can gather, the attention of the neighborhood and of Mr. Warner himself was called to the death of some of his trees. From that orchard the scale has spread to other orchards, so that one of the most important conclusions we must come to is that the scale is extremely destructive if left to itself. Mr. Dearness has just given us very many instances of the destructiveness of the scale, and it lies with us to impress that fact upon the orchard-men of the Province. In the Kingsville District we saw one orchard, Mrs. Pulling's, originally one of the J. D. Wigle orchards, which was in a very bad condition. I did not see any dead trees, but the trees were in a bad condition. At J. D. Wigle's the scale had broken out in two or three localities; many of the trees that had originally been set out had died, and their places had been filled with fresh nursery stock. This nursery stock had not been fumigated, and consequently the infestation spread from several centres. Now as to the orchard to which Professor Dearness alludes, Mr. Honor's orchard, near Amherstburg, I may say that we were driven to the orchard one fine morning, and that we saw a splendid object lesson on the effects of whale-oil treatment in an orchard infested with the oyster-shell bark-louse. The trees were large, and any observer could have told at once that they had once been in a pitiable state. I do not know whether Mr. Honor had scraped the bark-lice off or not, but undoubtedly the trees were in a good, healthy, thrifty condition at the time of our visit, and the old bark was sloughing off as if from old wounds. As a matter of fact, the trees had been almost bark-bound before. The recovery of the trees was not due simply to the death of the oyster-shell bark-lice, but it may be partly attributed to the removal of fungi and lichens that incrustated the bark, for I think very serious injury will be done to trees if lichens are allowed to incrust the bark. If the pores of the bark are stopped up, free interchange of gases is prevented, and partial suffocation takes place. The whale-oil soap solution also softens the bark so that it can yield freely to the growth of the tissues within.

After this I had the pleasure of going down to Oatawba Island in Ohio. There I saw another splendid object lesson in the recovery of that peach district from the

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ravages of the San Jose Scale. There are three thousand acres in that island—almost one continuous peach orchard, so that there was no more favorable spot for the spread of the scale. At the beginning of the experiments the owners had taken out, near the centre of the district, about three thousand trees before they began to try this whale oil soap experiment. Through the carefulness, persuasiveness and persistency of Mr. Owen, one of Prof. Webster's pupils, the fruit-men in that district were forced, in spite of themselves, to spray.

DR FLETCHER: How?

PROF. LOCHHEAD: Some of them did not believe in the soap treatment the first season, but when they saw the improvement in the condition of their neighbors' trees they sprayed the next year. Some of these men, when they saw the great improvement that had been done, said that the San Jose Scale had been a blessing in disguise. I need not speak further along this line, but shall briefly state four very important conclusions that I have been forced to draw from the work of this San Jose Scale Commission.

First. The scale cannot be exterminated from the orchards of Ontario by the efforts of either Government or people.

Second. Any radical method that aims at extermination should be discontinued. I mean by radical method the destruction of every tree that is infested.

Third. From our experience in Ontario, and what I saw in Maryland in the spring, I conclude that the scale is not quite so destructive in Ontario as it is in Maryland. We have not had it so long here as the orchardists of Maryland have had it. We have had it in Ontario seven or eight years, and although there has been quite a number of trees killed, not more than one or two whole orchards have been killed outright; while in Maryland one hundred acre, and two hundred acre, and three hundred acre peach orchards have been killed outright. At present we are not in a position to say whether the scale will act in that way here or not, but from what we saw in Kingsville, and from what has been seen in some other parts, it is possible it may become as destructive. I am inclined to believe that the climatic conditions will reduce to some extent the full reproductive capacity of the scale. I do not think it is possible that the scale will develop as rapidly in this Ontario climate as it will in the south in Maryland.

MR. DEARNESS: It is likely to have one generation less.

PROF. LOCHHEAD: There is one peculiar feature which inspectors have observed, and it is this, that the scale seems to gather force for two or three years without spreading, and then all at once, like a plague, it breaks out and spreads rapidly.

Fourth. The fourth conclusion is, that the scale can be held in check by the proper soap solution properly administered. I need not rehearse what Prof. Webster has said. He does not believe in letting the orchard men do this; it must be done by a corps of men employed by a Government Superintendent appointed for carrying on this work. Prof. Webster has given plenty of evidence of carelessness on the part of orchardmen, and the Ontario orchardmen are no exception to the Ohio men in this respect. I must repeat that the scale is a most pernicious one, and to say that it is no worse than the oyster shell bark-louse, or some other pests, is an absurd position to take. Its life-history and powers of reproduction are altogether different from the other pests. It is true that the San Jose Scale is confined to the plums, pears, peaches and apples, but it has the power of reproducing on other plants, so that I cannot emphasize too strongly the fact that this scale is a most pernicious one; and I do not think we should try to give out to the public that it is a pest at all overestimated. We must maintain emphatically that it has not been overestimated if we want to preserve the orchards. The scale is undoubtedly taking to our Province kindly. We find it in sections in the Lake Erie district; how far north of that district there has been no chance to determine. It has also been found at Belleville, and a few miles back of Belleville. Belleville has a far colder climate than this district.

This Society should do all in its power to inform the public with regard to the presence of this pest, and I would suggest that every public school inspector in the province should

be supplied with some good samples of the scale. This action would be safe, because the San Jose Scales soon die, and are perfectly harmless on a twig which has been cut away from the infested tree. Samples should be given to every school inspector so that he could leave them with the teachers, and give them an object lesson on the scale whenever opportunity offered itself. The teachers could ask the parents to call at the school and see the scale, and in this manner the public would be informed generally as to its appearance.

The Government has to rely upon the co-operation of the orchardmen themselves for future action against the scale, and when they find that no radical method of uprooting trees or burning them down is going to be adopted by the Government, they will come forward readily and report the presence of scale to the proper authorities. It would not be difficult for Mr. Fisher to cut down a badly infested tree and cut it up into little pieces, so that thousands of these could be distributed to the schools of the province. Even if the orchardmen find something that was not the San Jose Scale, let them inform the proper authorities and get information on the subject.

PROF. LOCHHEAD then read the following :

NOTES ON THE ECONOMIC ASPECT OF THE SAN JOSE SCALE AND ITS ALLIES.

The past year, 1899, has been a very eventful one in the history of Economic Entomology in Ontario. Early in April the Legislature passed the Fumigation Act, which compelled all nursery stock, with a few exceptions, to be fumigated with Hydrocyanic Acid Gas. To carry out this process of fumigation special air-tight sheds and buildings had to be erected by the nurseryman.

The Minister of Agriculture placed the conduct of the whole affair in the hands of myself, and I at once proceeded to make an inspection of all the nurseries for the purpose of instructing the nurserymen how to build their fumigating houses and how to fumigate. The chemicals were sent out from the Ontario Agricultural College in measured quantities suited to the capacity of each house. Very careful instructions were pasted on each parcel so as to reduce the danger from poisoning to a minimum. The substances used were Potassium Cyanide, 98% pure; Sulphuric Acid, sp. gr. 1.84, and water. The quantities used per 100 cubic feet of air space in the house were $\frac{25}{28}$ of an ounce of Potassium Cyanide, $1\frac{1}{3}$ fluid ounces of acid, and 2 fluid ounces of water. In this the Johnson formula was followed.

The work of inspecting the nurseries, of preparing the chemicals, and shipping them to the different places required much careful work on the part of the College authorities, for the shipping season of nursery stock was very short this year.

At the opening of the season many of the nurserymen were afraid the work of fumigation would delay the despatch of their orders, but it is believed that all received their chemicals in plenty of time, and that very few suffered from the anticipated delay by fumigating their stock.

From reports received from the nurserymen it must be acknowledged that the initial series of fumigation experiments in Ontario has been a decided success so far as the effects of gas upon the dormant nursery stock are concerned. Very few reported injury to the stock, and these few do not state definitely whether the injury was due to the effects of the gas, or to the effects of the very severe winter upon young trees.

It must be conceded that this successful initiation of gas treatment of nursery stock to prevent the dissemination of the San Jose Scale is another victory for Economic Entomology. The people are gradually being convinced that something can be done to help them in fighting pernicious insect pests.

INSPECTOR FISHER:—I came here at the request of the Minister of Agriculture only to answer any questions as to the condition of the country in regard to the San Jose Scale. It has been pretty generally discussed through the Commission and their report so that I think that I can add very little to the information you have got from that source.

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might say that there are only three points at which the infestation has extended to any great proportions, that of Niagara, St. Catharines and in the southern part of the township of Harwich, in the County of Kent, in the neighborhood of Giles. Outside of these there are a few other points where the infestation has spread to very narrow limits. In addition to this, and what seems to me the most important part of our work was that we were furnished with a list of the nursery stock which was supposed to be infested, in fact some of it had been found to be infested. This nursery stock was followed through every county in the province of Ontario without any exception, and last fall and this summer about one hundred points have been liberated from infestation by the destruction of these trees. We found the Scale in about one hundred places altogether and I was very much struck by a remark which was made by a gentleman living in the County of Elgin with whom a couple of Scale trees were found. He said to the young man who found the Scale and who assisted him in destroying the trees: "Young man every such case of Scale that you find, and destroy the trees, is worth to this country at least, \$1,000." Figuring from that standpoint, the value of these trees and the destruction of them is worth to this country at least \$100,000. We have not found Scale generally distributed outside the points I have named, and a few others where it is not widely spread.

Professor Lochhead spoke of the Scale as being in the neighborhood of Belleville,—it was found on these young nursery trees down there at Belleville. It withstood 22 degrees below zero quite safely, and at the time, I thought that was miraculous and I reported it to some of our entomologists and also to Dr. Howard of Washington who seemed to think it was extraordinary, but lately I have read a remark in a Bulletin published by Professor Newell, of Iowa, who said the scale would winter at St. Paul, Minn., where several times the mercury was 40 below zero, so that this Belleville matter does not cut any figure, and we may look for Scale in any part of this country. I believe we may look for Scale in any climate wherever trees will grow.

In the Bay of Quinte district in the County of Prince Edward, we have been examining and the examination is not quite completed, but we have not found Scale on anything but these young trees. The Counties of Elgin, Kent and Essex are being examined in the same way; in Elgin no Scale has been found except on these young trees, and in Kent we have found the Scale only in the township of Harwich and on the Town-lines on either side bordering on the township of Harwich. Then there are several points where these young trees were found and it was only at Kingsville where we found the Scale at all. I have noticed this summer that where the trees were allowed to stand and the Scale to accumulate the destruction was far-reaching and rapid. I have been astonished at the distance the Scale will go. It spreads most rapidly in the direction of the prevailing wind, and we can congratulate ourselves that in the district where it is most extensive the prevailing winds will carry them out into the lake. I think that insects carry the Scale a good deal. We have noticed in Niagara lately that owing to the exceedingly dry weather that has prevailed there, the grass seems to have lost its nourishment and the grasshoppers have taken to the trees for food. You can stand and watch them. Sometimes their flight is only for a short distance from one tree to another, at other times they will go away across the orchard. Frequently they fly for a considerable distance. Of course the Scale goes with them wherever they go. I have an idea of my own and I would like very much if some of these learned people would help me to work it out. I have been trying my best to solve the matter for myself, and I find if we put a mature male under the microscope and a little louse beside him the male is about six times as large as the louse, and I have an idea that the male Scale is responsible for distribution. They have broad strong wings and when they fly they go off with a bound, it is no feeble flight. They can go right up in the air like a lark, and I think them quite capable of carrying one or more of these mites with them; however, I have never caught them in the act, although I have spent a great deal of time trying to do so. I had a splendid specimen the other day. It is difficult to get these males where you can watch them, I found a splendid sample of Scale and I put it on a slide on the stove just a little warm and the warmth of the fire started him out and I watched the male Scale slide about on that piece of wood, and the way he figured on the stick was very instructive to

me. He moves about with a business air, he seems to think the whole responsibility of continuing the race rests upon him and he has no time to lose, and I have stirred them up with the point of my knife and watched them as they would fly as far as I could see them, and I have been surprised at the rapidity with which they can fly.

I think they will travel very much further than a few inches, I have watched them very often when they walked more than an inch in a minute. I have watched them at it many a time, and last October, about a year ago now, I was in the Wigle orchard and I found a pear tree there of which nearly the whole of the bottom had been cut away because of blight, and as a natural result of this the growth was strong. There were suckers there about that stump that reached up about six feet, and on the bottom of that young wood there was Scale. It may have been carried there by something else, but in my opinion it would be a very easy matter for them to get there from the stump of the tree, and if you reduce it to figures a little over an inch in a minute would simply mean an hour's walk to get up that stick.

I do not know how we are going to cover the ground by spraying. The past summer there is no doubt the Scale extended beyond the proportion it held at the beginning of the season. We have to spray the peach trees within how many days before blossom?

PROFESSOR WEBSTER: That would depend upon the season, sometimes it would be a very few days.

MR. FISHER: A good many instances have come to my knowledge where last year there was no Scale and now the trees are covered with scales.

MR. C. C. JAMES, Deputy Minister of Agriculture: I come, as your President stated, to take the place of the Minister who regrets exceedingly his inability to be here. I have come not to talk but to listen. As you of course are aware this subject has presented itself in very large proportions to the Department. As we went on with the work it opened out more and more, and unless you have had special opportunity of following the development, I am quite sure you have no idea of the enormous amount of work that has been done in connection with it.

The work done last year was quite extensive, and this year at least twenty-five thousand dollars will be expended in following up this microscopic insect. I do not know what we would have done if we had not had Mr. Fisher. He is one man in a thousand. We have given him the task and he has gone ahead with it, faithfully and energetically. I know that he and his assistants have been working, not simply in the day, but night and day, and the fruit-growers have been well served by him. (Applause.)

This question presents itself to the Department from various standpoints. As Professor Lochhead said, the Government cannot do everything; we can only direct matters and we hope to have the co-operation of the many persons who are interested. It seems to me that if, during the past years, we had had some instruction in our public schools as to the simple first principles of Entomology, we might have been wonderfully helped in this work. If the public school teachers had known a little more about insects, and had given the children of farmers and fruit-growers some instruction in the subject, we might have made a census of this Scale from one end of the Province to the other, and have started out on our work with more knowledge. Perhaps we would have been warned much earlier. We need more nature study in our schools.

A MEMBER: Mr. Dearness advocates that.

Mr. Dearness is one man in a thousand along that line. There are very few school inspectors who take the interest in the matter that he does. What the Minister desires at the present time is to get some idea as how to carry on this work. Professor Webster says this treatment must not be left to the individuals. Must we send out a corps of men to look after this work? How are we going to introduce this work and carry it out successfully? If it is done it must be done thoroughly. We must employ for it only men who are competent. We feel that this is a question of tremendous importance, that the fruit-growing interests have much at stake in the matter. The further we have investigated it the more we have been convinced of the enormous risks we have been

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running. The Scale was here at least six years before we really found it out. That shows you how easily it can avoid the observation of the fruit-grower. If it can so readily avoid observation you can see at once that it presents a very serious problem. You have been told of only one of many things we have done. Let me add another fact. We went to the nurserymen who had unintentionally introduced infested American stock, we obtained lists of the men to whom the stock had been sold, and then we endeavored to trace every one of these sales. In some cases the stock had gone through the hands of two or three persons. All these trees were gradually traced and examined at their final location in the orchard. Take the case at Belleville. The stock had been auctioned off on the market-square and nobody knew where it had gone. That stock had to be found and most of it has been examined.

If you have any suggestions as to how this work is to be carried out, we would like to get them. Our interests and the fruit-growers' interests are the same. Some people thought we were moving too cautiously and considering personal prejudices too much; others said we were pushing on too vigorously and are asking us not to move so rapidly, to take out only those trees that are badly infested and to allow them to treat the rest. Professor Webster says that if we allow the owners to treat, nothing much will result, and that the Government must come in and do the treating if it is to be done thoroughly. What is your opinion as to what should be done? Any suggestions that will help us will be exceedingly acceptable.

DOCTOR FLETCHER: We have had this afternoon a discussion on one of the most difficult and important subjects which entomologists and fruit-growers have ever had to deal with. It is wise, I think, that we should look at the matter squarely and find exactly where we are. We have had our society here for a great many years under the patronage of the Ontario Government, striving hard and doing good work for the country. We have done much excellent work this afternoon in this discussion. The Government has shown a manifest desire to get at the real facts with regard to the San Jose Scale, so that the wisest legislation may be enacted. To-day we have here the Minister represented and the Provincial entomologist and the Provincial Inspector of San Jose Scale, and we as a Society should recognize this compliment. These men have come here to assist in the discussion and give us the benefit of their experience in working out this problem that we have still to solve. I suppose like every other man I change my views very often. I hope so, when new evidence warrants it; but with regard to the treatment of the San Jose Scale, I have not changed much yet. If I am asked what my views are I can only refer you back to my annual reports for the last three years; every year the same thing. There is no doubt in my mind, or in the mind of any one else that understands these insects, that this scale is to-day, what Prof. Comstock said many years ago, the most pernicious insect we have ever had to deal with. As to how long the insect has been in Canada, notwithstanding all that has been said, we all know well that it was only discovered in Ontario in Mr. Vanhorne's orchard in the spring of 1897, (See Cent. Exper. Farm Rep. 1897, p. 213) and we also all know how quickly it has spread.

Now can it be treated? I acknowledge that it can be treated if—and there comes the rub—if you can get specialists to undertake the work and if you can teach the whole of the fruit-growers in this country that *they are* concerned, that the whole welfare of the country is concerned and that it is their duty to do what will give them some little trouble and expense, but will save the whole province from an enormous loss, I say you cannot do it and you will not do it yet, and I maintain that the time has not yet come when the prosperity of the whole Province should be put at the mercy of men that we know beforehand are not going to do their duty because they have not yet learned that it is necessary. This is not a time for dilly-dallying, and it would appear as if there is little choice for the Government as to their future actions. However, I consider the matter is such an important one that I shall do my utmost to show the danger which I believe exists. Is Ontario going to act in haste and allow a thing to be done that everybody should know is very

dangerous, namely, the suspending of the San Jose Scale Act, because a few people who lose a few dollars are making trouble about it? All I can say is that they will repent at their leisure. On page five of my evidence before the last Agricultural Committee at Ottawa, last spring, I spoke rather fully of this matter and I shall be glad to send a copy to anyone who wishes for one. I believe the time has not yet come when we can trust the fruit-growers to treat their trees with sufficient care for an insect like this and protect Ontario from a very great ill. Now, it is a very great ill. Mr. Fisher who is a most accurate, careful man and the one man in Ontario who has had the best chance to see exactly what the effect of this insect is upon orchards, tells us that since the Government relaxed its efforts the insect has decidedly increased.

Is the insect only to be compared with oyster-shell bark-louse? Numerous writers have written and said that it is and is only an ordinary insect. This I say emphatically is nonsense and dangerous nonsense at that. I should like to see an expression from this Society, as a Society, commending most heartily and thoroughly every step that Mr. Dryden has taken in this matter of the San Jose Scale. I did not agree with him at first, but looking back over the history of the infestation during the past three seasons and it is only three seasons, I say I do back up, most strongly and thoroughly, every step he has taken. He has been wise from the beginning, and I say this with all the light of the experience I have had, which is a great deal. I think the operations of his department are to be commended at every step, and to-day I hope that public opinion will back him up and that instead of relaxing the efforts of the department that he will continue to do good for the country as he has in the past.

Mr. Dryden would have been here to day if possible. He has sent us assurances that he could not come here on account of important business. I know personally that he had intended to be here. He has been worried and had great anxiety over this matter because he wants to do what is wise for the country and that is the only thing that has guided him in carrying out measures to protect Ontario fruit-growers, who as a whole have misunderstood him. He has taken steps to destroy all infested trees. He has appointed efficient inspectors, and I lay great stress on that title of efficient inspectors, for I believe they are efficient. I have been in consultation with them through the whole of the work and I do not remember a single serious mistake that has been made by them. Prof. Lochhead is in the same position. Prof. Webster has been consulted and I say that the work has been most remarkably accurate for it was a work of very great difficulty and I maintain that the title of efficient inspectors should be applied to our inspectors. Notwithstanding what was said by some before the commission, the work has been good and of enormous importance to this country; I say it is of enormous importance because directly the efforts to control it stopped the enemy has increased and it is now much more difficult to overtake it; however, I believe it is not impossible to eradicate it even now. I cannot see that it is impossible to eradicate an insect that is once placed under control. When you have got a thing under control it means that you can do what you like with it. When we know that the insect is practically restricted to three small areas in Ontario, I say it would be a thousand pities if the country does not back up the Minister in wiping it out altogether. Some of the owners of infested trees who hid that fact and are now complaining that the compensation is not enough, are themselves responsible for the failure to eradicate the scale. Some of the destroyed trees have been paid for to the extent of one quarter of their value. Let them congratulate themselves on having received any compensation from the Government. What takes place when we are visited by an epidemic disease? Does the Government come forward and say: You have lost three children we will therefore give you three hundred dollars? Not a bit of it. I say the fruit growers have largely themselves to thank for the danger they are in, they have bought from infested districts after they have known well that there was great danger.

Before the San Jose Scale was in this country a warning was sent out saying there was an injurious insect that we were liable to suffer from. "Don't get poor stock, or don't get it from infested localities." But when we give an object lesson the fruit-growers won't even take the trouble to walk across the road to see it. As to the treatment being

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left to the fruit-growers throughout the country, if that is done by the Government it is simply throwing up the sponge, and I believe it means the wiping out of the fruit industry throughout the Niagara Peninsula for a long time, because I maintain that the San Jose Scale is still with all of our latest knowledge one of the worst enemies we have ever had to fight against.

The treatment of it, if persisted in as it must be to succeed, is expensive and more trouble than these people will go to as a class. Let me give you one instance. Every fruit-grower knows that he can save fifty per cent. of his apples by spraying to prevent the codling-moth injury. I ask you, gentlemen, to think among your acquaintances how many ever spray. It is true ten years ago there were perhaps not more than one hundred spraying pumps in the country; now there are perhaps a hundred thousand. That means we have some thousands of good business men who want to save their money; but are there not hundreds of thousands who don't do it, and that with a big caterpillar nearly an inch long which they can easily see? That being the case how can we expect that they will do it with an insect you cannot see, except by the use of a microscope, even when the trees are swarming with them?

I agree with Mr. Lochhead in everything he said. The Scale is not quite so destructive in Ontario as in Maryland. I have here a photograph of an orchard of 28,000 trees, absolutely destroyed in three years from the time they were infested. What was the value of these trees? An average of \$5.00 apiece at the very lowest estimate. They were wiped out in three years and the whole orchard wiped away. That is what the San Jose Scale can do in the South.

Then we have some accurate statistics telling us about the rate of increase of the Scale. The increase of the Scale in Maryland and the Southern States is 300,000,000 from one in a year; let us reduce that, because we are further to the North, and say it is annually increased half of that number, 150,000,000 from one in Ontario, is that not enough? Is not 150 millions from one insect enough of an increase in a year? Then they say it is not likely to come up here in the North and do harm. The plague of London is the same black plague of Asia, but it spread up into England and in 1665 wiped out the greater part of the population of London. We know the San Jose Scale is a bad enemy and we do not want to play with it.

We have got it now measurably under control and we should let the Ontario Government go on doing what they have done, and as I say, every member of this Society ought to back them up in doing it. The Ontario Government has certainly been a benefit to the whole country in this matter, not only to Ontario but the whole country, and I say we should back them up and say that we appreciate the great efforts they have made and I do hope Mr. Dryden may long be the Minister of Agriculture to carry on the administration of the department. I am not a politician. I am a Government servant. I never cast a vote and as long as that is the case never mean to. I do not care whether a man is a Liberal or a Conservative. It is nothing to me; but I say here is a man who is a good servant doing good work for the country and work that has been done in the best way, and to stop or hesitate now is bad for the country. What are we going to do in the future? I say let us help him. We have with us to-day Professor Webster: we have known him for a great many years; one of the first economic entomologists in the world; one of the first in America and that means the world, because with the exception of Miss Ormerod they hardly know what economic entomology is on the other side of the water. Mr. Webster is a man that would tell the President of the United States:—"You are wrong," just the same as he would me or any other insignificant person, if he thought so. We have him here and if he advises us as to the best treatment, let us listen to him. Experience has taught us, there are two good things—treatment with hydrocyanic acid gas and spraying with kerosene. These are so difficult to use safely that people won't, I feel sure, take the necessary trouble. In the whale oil soap we have a remedy easy to use, not very expensive, but a little more expensive than our fruit growers will go to after the first year. They are not going to pay the price of even three cents a pound for the amount which will be necessary to control the pest after the first year.

MR. DEARNESS :—You can get it for two cents a pound now.

DR. FLETCHER :—They won't go to the expense of two cents a pound for it. It takes a good many pounds to go over an orchard and after the first year I don't think we can trust our fruit-growers to do that work. This is no experiment. Many things can be done that are not, if they cost money and trouble, it is the same with the hydrocyanic acid gas. If Prof. Webster was going to fumigate trees, I would say he can kill every Scale, but an ordinary man will not do it. We have to deal with the actual defects which commonly occur in mankind. The thing is practicable if carried out properly and the man who makes the statement that it cannot be carried out is not a practical adviser. If we can teach the fruit-growers of this country that it does pay them and can persuade them, well and good, but I doubt it. For ten years I have been working on this kind of work and I know only too well there is a great deal of difficulty in persuading people to do even what will save them money, when you go to the orchards and houses of fruit-growers and see the way they do this work of fighting insects. I was in the fruit house of a fruit-grower whom I persuaded to buy a pump, and I said "Where is your pump, why don't you use it?" He said, "We did not use it this year, there is no crop." Another man wrote to me from British Columbia showing great interest in spraying. "What is the best kind of pump? I want to get nothing but the best," etc., etc. I was in his orchard this summer and asked him about the pump. He said, "I have not unpacked it, I have been too busy." He imported it from here, got it out there and then had not time even to cut the string that tied the handle on to the pump!

I approve most heartily of the measures adopted to wipe out the San Jose Scale by the Provincial Government and I shall help them in any way in my power. Of course, politics are a very different thing from entomology. As an entomologist I say the work was well done. I do wish to express my appreciation of the work that has been done by the Government, of Professor James for his activity in the department, and Mr. Fisher in his honest and straight-forward dealing with this question. I said to Mr. Dryden last year, "If Fisher has got to go into an orchard and find the San Jose Scale he will treat his own brother or himself as he would anybody else and will destroy everyone of his own trees if he finds them infested." At first Mr. Fisher was a specialist, now he is an expert both as an entomologist and as an enthusiastic man, and I say to-day is the time for people to acknowledge it for the country should know it. We must recognize this question as one to be fought out. It is a serious matter and we have not got to the bottom of it yet. Let us have every suggestion that will help us.

THE CHAIRMAN :—I think we should not undervalue the force of example. There is a place called Abbotsford in the Province of Quebec, one of the few places where apples are grown to perfection. There was an intelligent fruit-grower there, Mr. Charles Gibb, who took to spraying his trees, and I know that a few years afterwards there was not a man in that neighborhood who did not spray his trees. Whether they continued to do so I do not know; the example was catching. Would it not be possible for the Government to induce some good man in one district that has been referred to, to spray his trees and to watch the result and see whether his neighbors would not catch the idea from him and follow up his method? Whatever other plan may be taken by the Government it seems to me that the power of example should not be overlooked. We have had a very valuable amount of instruction to-day, and if there is any one else who would like to make any remarks we would be pleased to hear him.

Mr. W. E. Saunders then moved, seconded by Mr. J. Law, that a committee be appointed to draft the resolution asked for by Dr. Fletcher, to consist of Mr. Lyman, Dr. Bethune, Dr. Fletcher, Mr. Balkwill, Mr. Dearness and Mr. W. E. Saunders. and to report at a later session of the meeting.—Carried. The meeting then adjourned.

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EVENING MEETING.

A public meeting was held in the hall of the Y. M. C. A. building at 8 o'clock. There were about seventy-five persons present, including the Right Rev. Dr. Baldwin, Bishop of Huron, and many ladies. The proceedings were opened by the Rev. Dr. Bethune, who cordially welcomed those present, and introduced the President, Mr. Henry H. Lyman, of Montreal, who delivered his annual address as follows:

THE PRESIDENT'S ANNUAL ADDRESS.

By HENRY H. LYMAN, M.A., MONTREAL.

LADIES AND GENTLEMEN:—It is again my duty as well as privilege to address you at this the thirty-sixth annual meeting of our Society, and to congratulate you upon the continued success of its work and the high standing maintained by its monthly journal. At our last annual meeting it was a matter of regret that so few members from headquarters were able to attend, but it was a great treat to the members of our Montreal Branch to have the meeting held in that city, in connection with the celebration of the twenty-fifth anniversary of the formation of the branch, as it was the first opportunity that our members had had of attending an annual meeting of the parent society since 1882, the only other occasion when the annual meeting was held in Montreal.

In beginning my address last year I dwelt upon the difficulty experienced by an amateur entomologist in composing an annual address, but if I was in difficulties last year, I am in much greater straits now, as not thinking of a second term in the presidential chair, and following the scriptural injunction to "let the morrow take thought for the things of itself," I not only put into that address almost everything I could at the time think of, but also all the items of interest that I could beg or borrow of my friends, and now find myself somewhat in the position of a clock which having struck twelve has to come down to striking one.

Last year I had, shall I say, the temerity to lay before the meeting a great many suggestions, the adoption of which would, I ventured to think, be of material benefit to those engaged in the prosecution of studies in this science, but I am not aware that the slightest movement has been made towards the adoption of any one of them.

I hope that it was not a case of a fool rushing in where angels, if there are any entomological angels, fear to tread, and shall, in order to save my amour propre, at least try to believe that it is only another instance, of which there have been so many in the history of the world, of a reformer being in advance of his time. But while the non-success of my suggestions last year should, perhaps, be a warning to me to leave the making of suggestions to more influential persons, I cannot refrain from re-iterating the opinion that a well-organized Entomologists' Union, on similar lines to those on which the Ornithologists' Union is carried on, could be made of very great benefit to the science of entomology.

Last year I ventured to point out a number of matters which such a union could deal with to advantage but many more could easily be suggested. I recently had an example of the necessity for such an organization for the settlement of matters of nomenclature. A gentleman friend, not a naturalist, but only one who takes a sympathetic interest in such studies, invited me into his office and proceeded to describe enthusiastically the beautiful chrysalis of our milkweed butterfly which he had been shown by a gardener who had found it, and when I said I knew it well, he rashly asked me its name. Immediately I was in a quandary, should I give him only one name, choosing maybe that which I might myself prefer, or should I risk his mental equipoise by plunging him without preliminary training into the vortex of the battle of the synonyms? After a moment's hesitation I decided upon a compromise giving him his choice of three names, writing down, lest even these should be too great a strain upon his memory, that

it used to be called *Danais Archippus*, but that many authorities now hold that it should be called *Danais Plexippus*, while Dr. Scudder calls it *Anosia Plexippus*, and as they say, I let it go at that.

Last year I suggested, as one of the things which such a union could deal with, the question of a uniform standard method of pinning and spreading specimens, but there is another point in this connection upon which a recommendation might be of some service, and that is in regard to setting a fair number of specimens to show the under side. Nothing has caused me greater surprise than finding large and important collections of butterflies without a single underside showing. I defy anyone to separate the North American species of *Argynnis*, *Colias*, *Grapta*, and a number of other genera from a study of the upper sides only, and when I am shown ten or a dozen cabinet drawers filled with specimens of *Argynnis* with not an underside among them, the effect is simply maddening, and I am sure that an attempt to study this group under such circumstances would speedily reduce me to a state of utter imbecility. In the magnificent work of Mr. Wm. H. Edwards the undersides of the species treated of are invariably shown, and why they should be excluded from the cabinet I cannot conceive. The failure to show the undersides of the species not only renders the study of types much more difficult but also greatly endangers the types as it becomes necessary to remove the glass covers of the drawers and handle the specimens in order to see the undersides.

Another point which could with great advantage be decided by such an authority is the nomenclature of the larval rings. Considerable diversity has existed upon this subject, some authors counting only twelve segments, excluding the head, while others, and doubtless the majority of recent years, have, possibly to show their superiority to antiquated superstition, made the number thirteen by counting the head as number one. But one is still frequently in doubt as to which method an author follows until one has made a careful study of the description. Would it not be better to discard both these systems and follow that adopted by Dr. Scudder, and divide the larva into head, 1st, 2nd and 3rd thoracic, and nine abdominal segments? Under such a system there could be no possibility of any misunderstanding.

Last year I ventured to assert that we should never have a natural and therefore scientific and satisfactory classification of the Lepidoptera until we know them in all their stages, and if this is admitted, the importance of working out the life histories becomes immediately apparent. An encouraging amount of this work is now being carried on though very much less than might and should be done. The reasons for the paucity of this work are not very far to seek. In the first place there are not half enough entomologists, and those that we have are generally overworked. The amateurs, like myself, are generally only able to snatch a half hour or so at a time from their regular occupations to do such work as describing preparatory stages, which can only be done satisfactorily by daylight, while many who are much less favourably situated cannot even do that. Many, unfortunately, care only for accumulating a collection of imagos, and in the case of these we can only hope that they will grow from mere collectors into true entomologists, but probably the chief reason why more do not take up this interesting and important work is its inherent difficulty. With many species it is easy enough to secure eggs and to rear the species through all their stages, but to make descriptions of those stages which shall be of any use to a specialist is generally speaking a very difficult matter unless one has had very special training. This is, of course, largely due to the great advance of our knowledge, the requirements of which have become continually more exacting. The older authors, those who have been called the fathers of entomology, were certainly more comfortably off in this respect, as it seems to have been considered sufficient to give such descriptions as the following: "*Senta Ulvæ*; Larva, yellowish ochreous, with several fine lines. In reed (*Arundo Phragmites*) September, March, April," or "*Xanthia Aurago*; larva grey, with oblique darker streaks, on beech in May."

Nowadays such descriptions would not do as we are expected to note and describe everything, down to the minutest detail. We must begin with the egg-laying by the parent and go through all the stages to the imago.

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Many hints and directions for the uniform description of larvæ have been published from time to time. Such a paper from the pen of Dr. William Saunders appeared in the second volume of the "Canadian Entomologist," and our society published forms for this purpose, but for some reason, possibly from their not being listed with the other entomological supplies, they were not much used. But these hints and directions, though excellent, are hardly up to present requirements.

The following are the directions of Dr. H. Guard Knaggs in his Lepidopterist's Guide for the young, not the veteran, collector.

"In carrying out observations upon the egg state, the student should note:—

How the egg is laid: Whether unattached or attached; or if so, by what means, and also by what part of its surface; the position of the female (and of her abdomen) at the time of laying—whether hovering, at rest, or in what other act; whether the eggs are laid singly or in batches, and, if so, in what number, and whether unarranged or how arranged; also the total number deposited and whether nude or covered, and, in the latter case, how covered or protected, together with any exceptions, individual, special, natural or abnormal.

When laid: At what date or dates, at what time or times of day or night; at what intervals, how long after copulation and how long after emergence of the female.

Where laid: If not on the food plant, where; if on the food, the exact position.

The duration of the egg state, in species and in individual cases; influences of temperature, soil, locality, altitude, time of year, etc., which promote, retard or modify the natural changes.

The appearance of the egg itself, as to form, colour, or colours, markings, elevations, depressions, and sculpture on the surface; together with changes, normal as well as irregular, from the time of exclusion to that of hatching.

The mode of exit of the larva should be exactly observed and any other remarks or experiments which may present themselves to the student, should if possible, be followed up; such as, for instance, those of proving how long the egg state may continue (i.e., the ovum retain its vitality) with a view to throwing light upon the, at present, hidden causes of the disappearance and periodical re-appearance of certain species; and of discovering if there be any sexual arrangement of the eggs, as laid, to account for the emergence of a preponderance of one sex of the future moth at one time, of the other at another, from the same batch of eggs.

In describing, the best order will be to give the names of the parent species, and then, by the assistance of microscopical examination, in their order, the measurement, form, sculpture, colour, markings and changes; the arrangement of the eggs, time, situation, etc., after which a diagnosis from the allied species may be added, as well as any further remarks which may suggest themselves."

So far Dr. Knaggs, and when we have got that far, mind you, we have only got these little creatures out of their eggs, and I might go on at great length giving the directions for observing and describing the caterpillars, but I spare you. Let it suffice to say that we are urged to carry out the observation and description of all the succeeding stages, with the same care and attention to all the possible and impossible minutiae; but surely this is a "counsel of perfection" unattainable by ordinary mortals, and especially by busy men.

But even taking a much lower view, the standard expected is still high. We have before us a little creature, perhaps barely a tenth of an inch long, divided into a head and twelve other segments, upon each of which there are various appendages, and we are expected to describe all these things correctly in spite of the fact that the owner of the appendages is constantly crawling out of focus, and perhaps after all our trouble, when we think that we have drawn up a fairly correct description and venture to publish it, some subsequent observer, in a "criticism of previous descriptions," perchance accuses us of having put some appendage upon the wrong segment. Of course, when we have

abundant material we can kill a specimen or two occasionally in the cyanide jar and then describe them at our leisure, but often we cannot spare any for this purpose, especially in the case of species which are difficult to rear.

Occasionally we come across a species, the larva of which is easy to describe, but as a rule it is very difficult to make a satisfactory description. The markings are often puzzling and the colours are frequently indescribable, it being almost impossible to give them names. This chiefly arises from the more or less translucent nature of their bodies and from the way one shade melts, as it were, into another. In many cases in which there is not much change after the first moult, we still notice, as the larva grows, certain things which we had not noticed in the earlier stages, and then we are haunted by a horrible uncertainty as to whether these points have really developed in the later stages, or were only overlooked when the creature was much smaller.

But, doubtless, the chief difficulty in the way of the general preparation of useful descriptions of preparatory stages is that probably at least nineteen men out of twenty do not know what are the chief points to be observed and described, and hence we find some men describing, with conscientious and laborious exactness, organs or appendages which are common to at least all the larvæ of the particular group to which the subject of their observations belong, or on the other hand, contenting themselves with making the slightly vague statement that there are "a number of warts with radiating bristles on each segment."

To overcome these difficulties and to bring the work of as many observers as possible into harmony, it seems to me that we require a simple but comprehensive "Manual" for the study of preparatory stages which, while avoiding diffuseness and unnecessary technicalities, should still be precise and explicit, taking only the most elementary knowledge for granted, and as fully illustrated as possible; not only showing a figure of a typical caterpillar, but having outline figures of all types of larvæ, showing how organs and appendages are modified and how they can be homologized, and with the fullest particulars of the important points to be observed in each type of larva, and with typical descriptions drawn up from common and well-known larvæ as models.

After a careful study of such a work with as many specimens as we could conveniently lay our hands on, we would be in a position to make thoroughly useful descriptions because knowing what we should look for, we would not overlook important points, but would find them, if present. But I shall probably be asked who is the man for this task, and in reply would say that, in my humble opinion, Dr. Harrison G. Dyar, who has made such extensive studies upon many different groups of larvæ, is well qualified to undertake it, and it could probably be issued as an official bulletin by the Department of Agriculture at Washington.

Another work which is also much needed is a supplement to the "Bibliographical Catalogue of the Described Transformations of North American Lepidoptera," prepared by the late Henry Edwards, and issued as Bulletin No. 35 of the United States National Museum in 1889; or what would be still better, a revised edition brought up to date of the same work. Such a work is most important in order that people may be informed as to what work has already been done, and what is lacking to fill up gaps.

I have said that a knowledge of the preparatory stages is necessary for a satisfactory classification of species, but I believe it to be also necessary in some cases even for the discrimination of species. An extremely interesting case of this kind is that of the two forms, or as I believe them to be, the two species of *Halisidota*, viz. *Tessellata*, A. and S., and *Harrisii*, Walsh. You are doubtless aware that as long ago as 1864 the late Benjamin D. Walsh called attention to the fact that there were two kinds of larvæ of *Halisidota* producing imagos which were indistinguishable, one being the species named *Phalena Tessellaris*, by Abbott & Smith, but now known as *Halisidota Tessellata*; and the other an undescribed form or species which he named *Halisidota Harrisii*. These two forms of larvæ differ remarkably, and would never be taken for anything but species of the same genus. The larva of *Tessellata*, as you know, varies remarkably, but only within well-known limits. The body is usually black or blackish; the head generally black, but

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occasionally tinged with reddish brown, the feet black, the prolegs blackish, the hairs cinereous, blackish on the dorsal ridge, or a yellowish-brown with darker ridge. Occasionally one is found when about half grown of a gamboge yellow, with a tinge of pink in it, but these change before maturity to one of the usual types. The principal appendages are four pencils of black hairs, with white pencils below them on the thoracic segments, two each on the second and third thoracic segments, and two black pencils on the eighth abdominal segment. There is also a lateral white pencil on each side of the second thoracic segment and some long hairs on the ninth abdominal one. In *Harrisii*, on the contrary, the body and hairs are milk-white up to the last moult, the mature larva being of a rather dingy brownish-yellowish shade, slightly darker on dorsal ridge. The head is yellowish-brown, while the pencils, which are black in *Tessellata*, are orange in *Harrisii*, except that there are no orange pencils on the posterior part of the body, but only two whitish ones projecting backwards on the eighth abdominal segment. The feet are yellowish, tipped with reddish-brown, and the claspers whitish. Thirty-five years have now elapsed, and yet the question as to whether these are distinct species or only interesting varieties has not been definitely and satisfactorily settled, a fact by no means creditable to North American lepidopterists.

Some years ago I became interested in this question, and with a view to making experiments imported and set out in our Mount Royal Park in Montreal a plane tree (*Platanus Occidentalis*). It has now grown to be a fair-sized tree about 25 feet high, and last year I began my experiments by securing the eggs of *Tessellata*. These in due time hatched and were divided between several glass breeding jars, in one of which I had leaves from my plane tree, and in the others oak, bass and other trees. I had no difficulty except with those on the plane, but they refused to eat. Fearing they would starve immediately I gave them an oak leaf for a start, and after they had had a meal or two took it away and left them only the plane. This hunger forced them to partake of sparingly, but they did not relish it, and the mortality was heavy. A number passed first moult, but I only succeeded in carrying two past the second, after which they died.

This year I appealed to Dr. Dyar to try to get me specimens of *H. Harrisii*, and he and his assistant very kindly devoted part of a day to looking for them, but they were only successful in finding four. These were sent me, but naturally I was not able to make many experiments, and only found that while they preferred plane they would still eat bass and elm. The larvæ, are however, so very distinct from *Tessellata* that it seems probable that the species is distinct in spite of the imagoes being indistinguishable. I would be inclined to lay down a law that where any two forms are certainly distinguishable in any of their stages, and where the two forms are never found to breed, the one from the other, or to occur in the same brood, they are entitled to rank as distinct species.

The truth in regard to these particular forms ought to be easily investigated in any locality where *Harrisii* occurs in moderate abundance. All that is necessary is to secure a fair number of larvæ, and when the moths are disclosed from the resulting cocoons to mate them and then secure as many eggs as possible, preserving the parent moths and keeping the batches of eggs separate. If under these circumstances the larvæ were all of the *Harrisii* type it would be fair to conclude that the form is a good species, though it would be all the better if a further experiment were tried, viz., to see if *Tessellata* and *Harrisii* would mate and produce fertile offspring with characteristics of both forms in the preparatory stages.

I have thus attempted to show the importance not only of the study of preparatory stages, but also of experimentation therewith, but there are many other and more practical subjects for study and experimentation than those to which I have alluded, such as the possibility of propagating and disseminating bacterial diseases among caterpillars as a means of checking the ravages of injurious species, and this leads me to direct attention to the utter lack of all provision of facilities for the carrying on of such work at the Central Experimental Farm.

Last year I referred to the excellent work being done by our Dominion Entomologist Dr. Fletcher, but he is greatly handicapped by the lack of almost every requisite for the efficient prosecution of his work. It is true that since our meeting last year he has been given another assistant in the person of Mr. Arthur Gibson, a director of this Society, but much more than this is needed, and the farm should be equipped with an insectary of the most approved design, and also, I would suggest, with a small cold storage chamber for the successful wintering of pupæ and hibernating larvæ, which might be the subjects of experimentation. There are many such insectaries in the United States, and it is high time that we had at least one in Canada, especially as no great outlay would be necessary, and I would respectfully represent to "the powers that be" that there is no economy in employing a first-class entomologist and not giving him every facility for doing the very best work of which he is capable.

But I must pass on to other subjects, and would invite your attention to a rapid review of some of the more important work being carried on by leading workers in this branch of science.

In Canada, owing to the opposition to the working of the San José Scale law in Ontario, a commission was appointed to inquire as to the extent of infestation, whether it had spread beyond its former limits, whether the destruction of infested trees would check the further spread of the scale, whether it would be possible to exterminate it, whether there was danger of further infestation from scales being carried across the Niagara River, whether opposition to the act was unanimous, how the work of inspection had been performed, the commissioners being invited to make any suggestions they thought desirable as to changes in the mode of procedure, and as to measures for the complete suppression of the pest. The commissioners appointed were Dr. James Mills, President of the Agricultural College at Guelph, chairman, with Mr. John Dearnness, ex-President of this Society, and Mr. W. H. Bunting, of St. Catharines. The inquiry was opened on 20th June and closed on 14th July, the Commissioners visiting the counties of Lincoln, Welland, Wentworth, Elgin, Kent and Essex in Ontario, as well as the New York side of the Niagara River and Catawba Island in Ohio, and examining one hundred and sixty-eight witnesses. In regard to the amount of infestation and the extent to which it had been controlled, it was found that the greatest infestation is in one corner of Niagara Township, near Niagara-on-the-Lake, and in the Township of Harwich, Kent County, in the neighborhood of Guild's Post-office. There is a limited infestation at Kingsville, and less important ones at St. Catharines, Winona, Burlington and near Chatham. In ninety-one other cases trees planted within the last two years were found infested. These trees were all destroyed, and this year's inspection failed to discover scale in any but thirteen out of the ninety-one places. The scale was found in five nurseries, but the infested stock was destroyed. While the areas of infestation are not large the inspector estimated that it would be necessary to destroy over 150,000 trees to be reasonably sure of exterminating the scale. The inspector thinks that the scale can be exterminated by the prompt and vigorous enforcement of the Act, but the Commissioners incline to the opposite opinion, and they also believe that the damage which the insect is capable of doing in this latitude has been overestimated. They found that, as was to be expected, the owners of orchards were not unanimous in opposition to the Act, for while those whose orchards are not in immediate danger are overwhelmingly in favor of it, those whose orchards are infested or in immediate danger of becoming so oppose it, largely on account of the inadequate compensation allowed for trees which are destroyed, but also because no effort was made to save valuable trees which were only slightly affected, and because the owners had no voice in the determination of the value of the trees destroyed. The Commissioners, while acknowledging the faithful work of the inspector and his assistants, thought that more consideration might have been shown for the feelings of the owners of infested trees and a less offensive method of marking such trees adopted. They advised a continuance of the inspection on modified lines for some time to come but that valuable trees be treated for the purpose of destroying the scale without cutting them down and that owners of trees not so badly infested be required to treat them by a prescribed method once a week from the time of notice till the 15th

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October. They also recommended that the compensation for trees destroyed be increased, the owner being allowed twenty-five per cent. of the value including the crop and that he be represented in some way at the valuation. They also recommended that the utmost care be taken to prevent the spread of the scale and that a circular of instructions be prepared and sent to every orchardist in the infested areas and that every owner of an orchard in the Province be encouraged to make a careful inspection of his orchard next winter to discover whether or not there is any San José Scale in it.

In the United States the work in connection with the San José Scale has been largely carried on by the Agricultural Experiment Stations, but the proposed law governing interstate commerce in nursery stock failed to pass the American Congress. An important series of investigations, however, was carried out last autumn at Washington for the purpose of determining whether it is possible for the scale to remain alive upon any fruit dried by any of the methods in use in the United States. This work was aimed especially at the German regulations prohibiting the introduction of American dried fruit into that country. The results of that work as published in Bulletin No. 18, New Series, were very satisfactory as it was fully established that any one of the commercial drying processes is absolute death to the scale insect.

Mr. Marlatt has undertaken a systematic study of the armoured scales (*Diaspinæ*) and has cleared up many doubtful points of synonymy, the most interesting point, perhaps, which he has brought out being the occurrence of the European *Aspidictus Ostreaformis* in the United States where it has existed unrecognized for several years, although late correspondence shows that it is already distributed from New York to the Mississippi River and even to Idaho.

Dr. Howard has had a careful study of the insects injurious to the forest trees of the extreme north-western states carried on by Dr. A. D. Hopkins who was employed as a temporary field agent for that purpose. He made a careful study of forest conditions in Northern California, Oregon, Washington and Idaho and found very many new Scolytidæ and has been able to make practical suggestions which will be of value to the lumbermen in that region. This work should also be of value to our lumbermen in British Columbia and the information obtained should certainly be made available to them.

Further work on the study of insects liable to be introduced from abroad has been carried on by Dr. Howard and his assistants. One of the latter was sent to Porto Rico in the spring and made large collections of the injurious insects of that island and further observations are being made. Dr. Howard has been accumulating a large collection of injurious insects of first-class importance from different parts of the world, especially Australia, Japan, Mauritius and Reunion, while the collection of European injurious insects has been greatly added to. The importance of this line of work was strikingly illustrated in an instance which occurred in the spring of this year, when an insect boring in the stems of orange received in California from Japan was at once recognized by a comparison with the specimen received some time ago from that country, the habits of which had been previously reported upon.

Late advices show that the importation of *Novius Cardinalis* into Portugal, which were sent by the Washington office through the courtesy of the State Board of Horticulture of California, was fully as successful as anticipated and all danger from *Icerya* in the extensive orange groves along the River Tagus is now considered a thing of the past.

Mr. Chittenden has been working mainly on garden and orchard insects and has published his results in Bulletin No 19, New Series, a pamphlet of 99 pages replete with most interesting information.

The usual Western field work on injurious grasshoppers has been carried on and it is claimed that Mr. Hunter, the temporary field agent, has set at rest all rumors in regard to the Turtle Mountains region in North Dakota and Manitoba as a possible permanent breeding ground of *Melanoplus Spretus*, and it is charged that the occasional swarms which have settled in Dakota and Minnesota have come from the region of the Assiniboine River.

Dr. Howard has published in the year book of the U.S. Department of Agriculture for the year 1898 an important paper on the insects affecting the tobacco plant, which is admirably illustrated by a new series of cuts, and three new pests are treated of. But by far the most interesting and important work which has been recently accomplished by Dr. Howard and his assistants is the successful introduction into California of the insect named *Blastophaga Grossorum*.

Hitherto it has been found impossible to grow in that state any figs which would compare with the Smyrna fig of commerce, which is grown about the eastern end of the Mediterranean Sea. The Smyrna fig tree had been started in California but the flowers were sterile and the figs invariably dropped to the ground before attaining the size of much more than three-quarters of an inch in diameter, but in its native home the flowers are fertilized by this minute insect known as *Blastophaga Grossorum*, which normally inhabits the flowers of the wild fig commonly known as the caprifig. These figs growing on the mountain side are broken off by the inhabitants and are tied to the branches of the Smyrna figs at the proper season of the year. The insects issuing from the caprifigs and covered with pollen crawl into the Smyrna figs, pollenizing the flowers and bringing about the ripening of the fruit and the production of the seeds upon which the flavour of the Smyrna fig largely depends, and it was decided that the only way in which a fig equal in quality to the Smyrna fig could be grown in California was to introduce the *Blastophaga* into that state. Private attempts to do this failed and the government was appealed to for aid, and Dr. Howard, after laying the matter before the Secretary of Agriculture, was authorized to make the attempt and succeeding in introducing living specimens of these useful little insects among the Smyrna figs and caprifigs of Fresno, California. The introduction in 1898 was unsuccessful, but this year success crowned the efforts and not only have two generations of the insects developed but many Smyrna figs have been successfully fertilized.

Work is being continued by the Washington Staff on the study on the geographical distribution of injurious insects; the bibliographical work also continues and it is intended to publish another supplement to the Bibliography of Economic Entomology bringing the list down to January 1900.

That the importance of entomology continues to attract increased attention is shown by the appointment of a state entomologist for Texas. The lamented death of Mr. H. G. Hubbard early in the year interrupted the completion of his elaborate work on insects affecting the citrus trees, and caused a great loss to American entomology. He was an able entomologist, a wonderfully good collector and a truly lovable man.

Last year I had the pleasure of announcing the approaching publication of Dr. W. J. Holland's *Butterfly Book*. Shortly after our meeting this work was issued and received a hearty welcome from the entomological world, and up to 1st of July last upwards of 3500 copies had been sold, which is certainly remarkably encouraging. Among other important works which have appeared during the year may be mentioned the *Monograph of the Species of Acronycta* and certain allied general with nine plates of moths, four plates of larvæ and nine plates of structural details, by Drs. John B. Smith and Harrison G. Dyar issued in the proceedings of the United States National Museum, and which is a very important and useful work. About the same time in December last appeared Dr. Henry Skinner's *Synonymic Catalogue of the North American Rhopalocera* replacing Mr. W. H. Edwards's catalogue of 1884 which had been out of print for some time. This work was much needed and will be of great assistance to lepidopterists. Dr. Dyar's proposed check list to which I referred last year has not yet appeared as the author informs me that he is waiting for Prof. Fernald to complete his revision of the Tortricidæ. Dr. Ottolengui has not yet completed his monograph of the *Plusias* but expects to issue it during the coming year.

I am glad to say that we are likely soon to have a monograph of the Sesiidæ. The late Henry Edwards who had done much work in this group and had described a very large proportion of the known species contemplated the publication of such a monograph but was not able to do so, but after his lamented death his mantle fell upon Mr. Beuten-

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muller who had special facilities for the work in having all Mr. Edward's types under his care in the American Museum of Natural History, and who has been working upon the group for some years. He has now secured the consent of the Directors of the Museum to the issue of the monograph and it is expected to appear next year. Dr. Packard has been delayed in regard to the publication of the second volume of his monograph of the Bombycine Moths and it will not appear during the coming year. He is waiting to fill up some gaps in the life histories and to obtain good coloured drawings of the larvæ of *Platysamia Gloveri*, *P. Columbia* and other forms. The part will include the *Ceratocampidæ* and *Saturniidæ*, and any collector who can obtain the eggs or larvæ of *P. Columbia* would be rendering a service to science by contributing them to aid in the completion of this work. Though not published during the present year attention should be directed to Dr. Packard's Text Book of Entomology, a most important treatise on the anatomy, physiology, embryology, and metamorphoses of insects which has been accorded a very flattering reception not only by the leading entomologists of this continent but also by those of the old world.

Among other publications may be mentioned the pamphlet on the Hessian Fly in the United States prepared by Herbert Osborn and issued as Bulletin No. 16. New Series, of the Division of Entomology at Washington.

Mr. Wm. H. Edwards although retired from active entomological work has not wholly given up his interest in this subject, and recently wrote me that he had urged Mrs. Peart to fill up some of the gaps in his album of drawings of preparatory stages of the butterflies, and said that he wanted to see these drawings deposited in some public institution where they would be available for reference, and it is much to be hoped that this disposition of them will be made. The formation of an Entomological Society in the Canadian North-West Territories is an event of which we should all be glad. It is much to be hoped that the interest which the energetic President has awakened will continue and increase and bear good fruit, and that the Society may become affiliated with us as a branch, and this leads me to the suggestion that it would be an excellent thing if there were more co-operation among the branches of the Society. The Montreal Branch suggested that an interchange of all the more important papers read before the various branches would enable all the members to have the benefit. This suggestion was warmly received by the Toronto Branch, and a few papers were sent up from Montreal, and although the idea has not proved as fruitful as we hoped it would, better results may be, and I trust will be, achieved in the future.

One other event of the past season to which I should refer, was the advent through the medium of the daily press, of a terrible bogey in the form of a bloodthirsty insect which was "written up" by the knights of the quill under the name of the Kissing Bug. It was said that its scientific name was *Melanolestes Picipes*, and the wildest stories were told of its deadly ravages. Illustrations of it were published, and various kinds of insects of different orders were exhibited in newspapers' windows as genuine specimens of the bug. Quite a number of deaths were attributed to it, and many timid people, especially women, were seriously alarmed. It started from Washington (there is something very suspicious about this, but perhaps our friends of the Division of Entomology can establish an alibi) and spread all over the continent, creating devastation everywhere with the exception, it is said, of Baltimore, whose newspaper men are reported to have been too conscientious to write it up, though the latter statement seems almost more incredible than the stories told of the bug. At last the secret was given away and the kissing bug pronounced a myth, the story having been started as a hot weather silly season hoax.

I have again to acknowledge my indebtedness to Dr. Howard for his kindness in favoring me with much interesting information and valuable suggestions which have been of much service to me in the preparations of this address. And now in laying down the office with which you have honored me, and retiring to the comfortable dignity of a Past President, I desire to thank you most heartily for the honor you have done me in electing me to the highest office in your gift, and especially are my thanks due

to the other officers of the Society for their unflinching courtesy and their readiness to afford me every assistance in their power, and to you, ladies and gentlemen, who are not entomologists, I would say that if you have been dreadfully bored by my address you must pour out the vials of your wrath upon the heads of the Council who arranged that it should be delivered at this meeting instead of being read in the sanctity of the Society's own room.

The Rev. Dr. Fyles expressed the thanks of the meeting to the President for his interesting and valuable address. In the course of a humorous speech, which was much enjoyed by the audience, he stated that when it is borne in mind that at least one-tenth of the vegetable products of the country are annually destroyed by insects, the study of their habits and of the best means of dealing with them is of manifest importance.

Dr. Fletcher gave an address illustrated with lantern pictures, on "Some Interesting Insects." He prefaced his remarks by referring to the statement of the previous speaker regarding the loss caused by insects and said that if there was even a chance of saving some of this ten per cent. loss the study of entomology must be of great economic importance. He considered that a great deal of the destruction of food products by insects is preventable and that entomologists were doing a most valuable work in instructing the community as to what measures were the best to be taken for the purpose. He spoke also of the many points in the life-histories of common insects that still require to be investigated, and of our want of knowledge of the manner in which they lived through the winter. Here was a field that would afford ample employment to every entomologist. Beautiful illustrations of the following and several other insects were thrown upon the screen and their peculiarities or points of interest described by the speaker: The Gipsy Moth (*Oenieria dispar*) which derives its specific name "Dispar" from the great disparity in the sizes of the male and female moth, the latter being nearly double the size of her mate. The state of Massachusetts has been engaged for the last nine years in trying to exterminate this insect and has spent close upon a million dollars in the effort. While the object in view has not been completely accomplished, the insect has been prevented from spreading over the surrounding country and is confined to an area that is gradually becoming more restricted.

The Brown-tail Moth (*Euproctis chrysorrhoea*, Linn.) is another importation from Europe in the state of Massachusetts which is proving very destructive. Active measures however are being employed for its extermination in a similar manner to the preceding species.

The Mediterranean Flour Moth (*Ephestia Kuhnella* Zell) Fig. 1., which has also come to us from Europe, has been found in several mills in Ontario and various parts of the

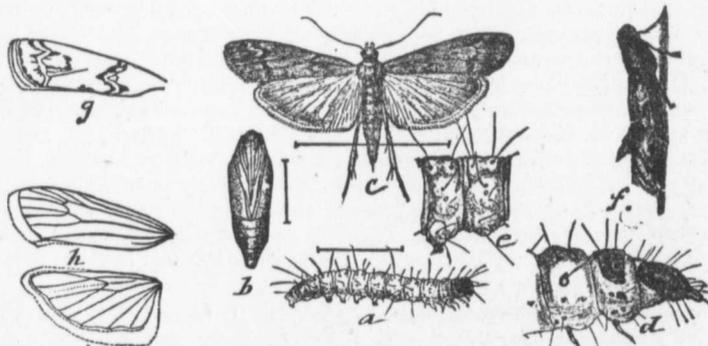


Fig. 1. The Mediterranean Flour-Moth; a Caterpillar; b Chrysalis; c Moth, slightly enlarged; d and e enlarged details of Caterpillar; f side view of Moth; g markings on forewing; h and i venation of wings.

United States. It is a serious pest, as the larva clogs up the bolting cloths with its webs and prevents the flour from sifting through. The moth itself does no damage.



Fig. 2. magnified below natural size.

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Fig. 2. Chinch-bug magnified; the hair line below shows natural size.

The Chinch-bug (*Blissus leucopterus*) Fig. 2, caused a loss in the State of Illinois alone of seventy-three millions of dollars in a single year by its destruction of corn and wheat crops. It is now controlled to a large extent by means of a fungous disease which is disseminated by distributing affected individuals wherever the bug is numerous. Fortunately for us this insect is rarely found in Canada and has never done any harm to our crops.

The Hessian Fly (*Cecidomyia destructor*, Say) Fig. 3, is doing considerable damage in the wheat fields of Ontario to-day. In some parts of Manitoba it is also doing great injury, destroying from five to twenty per cent. of the crop. There it has only one brood in the year, but here and further south there are two.

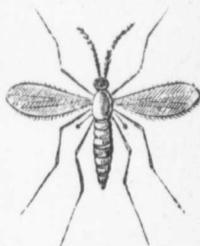


Fig. 3. Hessian Fly greatly magnified.

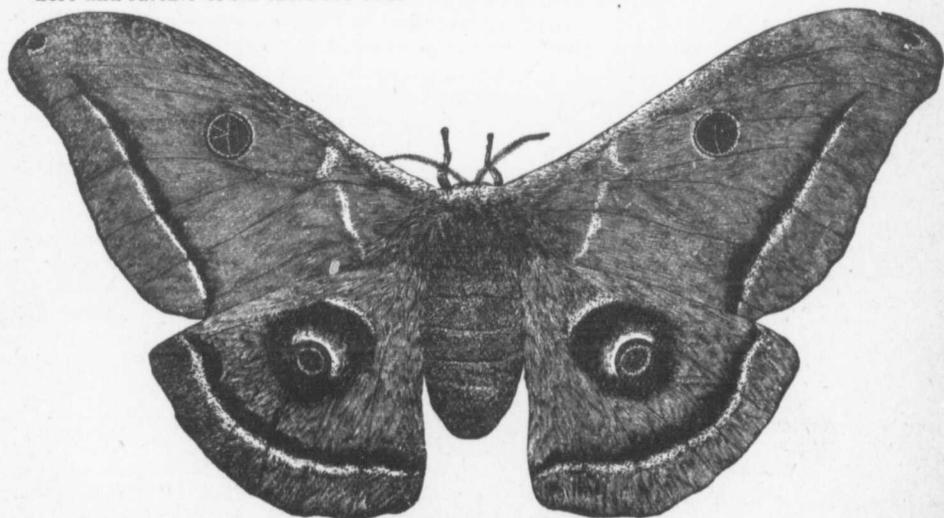


Fig. 4. Polyphemus Moth, female, natural size.

The Polyphemus Moth (*Telea polyphemus* Linn) Fig. 4, a very handsome insect, whose larva feeds largely upon elm. The caterpillar eats out a large portion from one side of a leaf, and, when resting, fills the space with its body. The colour matching that of the leaf, and the serrated outline of the creature's back corresponding closely to the original leaf, afford it a remarkable protection against ordinary enemies.

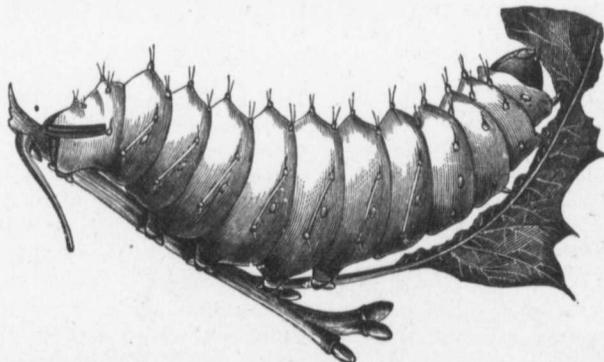


Fig. 5. Polyphemus Caterpillar.



Fig. 6.] *Sphinx drupiferarum*, natural size.

The Plum Sphinx (*Sphinx drupiferarum*, Sm.-Abb.) Fig. 6, whose larva is furnished with a stiff bristly tail, erroneously supposed by ignorant people to be a poisonous sting.



Fig. 7. *Sphinx drupiferarum* larva.

The Yellow-necked Apple tree Caterpillar (*Datana ministra*, Drury) and several other interesting species of insects were next exhibited and briefly described. The closing picture displayed the extraordinary chrysalis of an African butterfly which bears a striking resemblance to the face of a monkey. The lecturer regretted that he was unable to obtain an illustration for the lantern of a similarly grotesque chrysalis found in this country, that of the well known butterfly *Feniseca Tarquinius*, Fabr., whose larva feeds upon the woolly aphid of the alder.

The following paper was then read by Professor Webster :

ONE HUNDRED YEARS OF AMERICAN ENTOMOLOGY.

By F. M. WEBSTER, WOOSTER, OHIO.

This is an appropriate year for retrospections; and why not in the science of entomology as well as elsewhere? Why may we not stand on the threshold of a new century as the footman who has made his way over the snow-clad prairies, and, at setting sun, faces about and follows with his eyes the stippled, undulating line of tracks that marks his wanderings over the plain of glistening white? Mayhap, as the wanderer turns again to resume his journey, it will be with renewed vigor and encouragement that will support him in his onward course. And yet the illustration is, in some respects, inapplicable to the case in point, as the entomology of 1899 contains not only all of the knowledge

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that is being accumulated in regard to the science at the present time, but all that has come down to us through the past. The results of a piece of entomological work, carried out at the present time, represent not only what the present author has himself accomplished, but the best that has gone before, precisely as the four monster battleships, two Russian and two American, now in course of construction in the Cramp shipyards at Philadelphia, represent not only the triumphs of modern ship building, but the lessons taught by the failures and successes of hundreds of years of ship building. As entomologists we are now working, not alone with our own light, but with our own plus that of all that has been done before us, or so much thereof as has not been eliminated by the siftings of time as the dross is eliminated from the pure metal by the crucible. But for the labors of those who have gone before us, crude though such may now appear, the present status of the science could not now be possible. He that does his best in his day and generation will have little to regret thereafter.

Going back to the beginning of the present century, we find the science of entomology but little more than in embryo; even in England and Europe, it was still in a very primitive state as compared to the present. Up to about 1775, all information relative to American insects was only obtainable by collections being made in this country, and sent over to England, France or Germany, for determination and description. Thus it came about that original descriptions of many of our species of insects, especially the more common ones, are to be found in foreign publications, and the types of these species are scattered through the collections and museums of England and Europe. In fact, during the latter half of the last century and the beginning of the present, this was the only course possible to pursue, as there were no collections or libraries in this country, and the educational institutions were exclusively classical in their nature. Even so late as 1815, Harvard offered no direct instruction in natural history, except in the lectures of Prof. Peck, and for these an extra fee was charged, while, when Thomas Say went to the Philadelphia Academy of Science, in 1812, he found a company of men had founded it with a view to anything but the advancement of science, and the collections consisted of some half dozen specimens of common insects, a few madrepores and shells, a dried toad and a stuffed monkey. But the facilities for securing entomological material from this country, by foreign entomologists, must have been exceedingly slow and unsatisfactory. A few specimens brought home by a returning traveller, or secured through the hands of captains of ships or from army officers, were probably the channels through which the major portion of the material was obtained. Even the American post was slow and expensive, and it was often necessary for entomologists to wait for months until some friend happened to be going in the right direction, and could be prevailed upon to carry letter and specimens to a fellow worker. The correspondence of all of the early workers in entomology indicates very clearly, how much they were hampered by these deficient methods of communication. Even so late as 1831, Dr. T. W. Harris wrote as follows, in some remarks appended to his catalogue of the insects of Massachusetts: "Should any young sons of New England have the inclination to turn their attention to this interesting branch of natural history they must for want of necessary books on the subject remain in ignorance of the labors of their European contemporaries; and although they may have discovered many curious and valuable facts respecting our insects, they must resign to foreigners the honor of making known the objects of their investigations."

In view of the foregoing, then, it is not surprising that the close of the last century should have found so little accomplished in entomological research in America, and that except for an occasional fragmentary paper published in some local journal, or at best in the transactions of some semi-scientific body, there had been but two contributions to the knowledge of American insects and one of these was published in England, being entitled to consideration here because of its relating wholly to American insects. The first of these was entitled "Natural History of the Slug-worm," a pamphlet printed in Boston in 1790 and written by Professor Peck, and for which the author was awarded a premium of \$50.00 and a gold medal by the Massachusetts Agricultural Society. The second was published in England in 1797 and was entitled "The Natural History of the Rarer Lepidopterous insects of Georgia," by F. Abbot and Sir J. E. Smith and comprised two folio volumes with 105 colored plates.

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Thus it will be seen that, whatever collections had been made in America, these were in foreign hands, and the descriptions published in foreign literature, and it was under these conditions that the present century found the science of entomology. But, two events had transpired which, though giving no indication of their future effect, were to start the science, both pure and applied, in that forward movement that has resulted in its present condition.

On July 27th, 1787, there was born in Philadelphia, to Benjamin Say and wife, a son, who was afterwards named Thomas. On November 12th, 1795, in Dorchester, Massachusetts, there was born to Thaddeus Mason Harris and wife, a son, who was afterwards named Thaddeus William. The first of these was the son of a Quaker physician and apothecary, and the other the son of a Congregational minister. With these two lads, who at that time gave little indication of their future greatness, and the state of affairs that I have indicated in the foregoing, began what might well be termed the first century of American entomology.

Ere the present century had been ushered in, there had been serious depredations of insects, and now, with the establishment of an agricultural press there came communications and discussions regarding the nature of the insects implicated in these ravages. These contributions came from both the north and the south, and westward from beyond the Allegheny Mountains, but there was none to throw scientific light upon any of the problems involved. No one to identify the species of insects that were engaged in depredations, or to furnish the information that would enable the people to understand their habits, or to determine whether there were one or several kinds engaged in the work of destruction. There was chaos. Who was there that would from out of this bring system and order?

The boy, Thomas Say, had proved an indifferent pupil; had been taken from school and placed in his father's shop; then started in business and ended in bankruptcy. From boyhood he had taken the greatest delight in collecting insects and he now turned his back as it were on business and began the work that was to make his name familiar throughout the world where natural science was studied, and give him the well-earned title of "The Father of American Entomology." About 1817 he began to publish the results of his studies and continued up to the time of his death in 1834. Though his work was incomplete and has been in some cases criticised for its want of accuracy, yet it was the foundation of the technical branch of the science in America.

The boy Thaddeus W. Harris, on the contrary, seems to have been studious but not at all inclined towards natural science. While at Harvard, from 1811 to 1815, he seems to have developed a taste for entomology which appears to have been stimulated by his friend and instructor, Professor Peck. It is interesting to note that his studies, even at an early date, began to take a somewhat different course from those of Thomas Say in that he became interested in the habits of the insects which he studied. He began to collect insects as early as 1820 and, as he tells us, soon became impressed with the great need of a manual of American entomology. This was doubtless the primitive idea that later led up to his work that has become classical, viz., his "Insects Injurious to Vegetation," published in 1841 and reprinted in 1842, and again in a revised form in 1852. Though this embodied the results of long years of patient labor under the most discouraging circumstances, the author received from the State for his labor the munificent sum of \$175.00. This work was to the applied science what Say's American Entomology was to the pure, viz., the foundation; and if Thomas Say was the "Father of Technical Entomology," then T. W. Harris is fully entitled to the honor of being called the "Father of Applied Entomology" in America. To these two men we owe the inspiration that has induced many an entomologist to commence his studies and encouraged him and sustained him in his later work. They were the pioneers of that period extending from 1800 to the death of Say in 1834, and and in the case of Harris this period continued up to 1855, his last paper on the Rose Bug (*Macrodactylus subspinosus*) appearing in the Boston Cultivator on September 8 of that year. It was Dr. Asa Gray, I believe, that wrote of Harris: "Of other genuine naturalists I have read but he is the only one I ever saw."

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While Thomas Say has come to be honored by the title of "Father of American Entomology," he had already himself bestowed that or a similar title upon Rev. F. V. Melsheimer, and in his "American Entomology" he calls him the "parent of entomology in this country." In 1806, so far as I am able to determine, Rev. F. V. Melsheimer published the first general catalogue of North American coleoptera. In 1842 the Entomological Society of Pennsylvania was formed for the purpose of giving an impulse to the study of entomology by bringing together the cultivators of the science and preparing a catalogue of the coleoptera of the country. Owing to the fact that many species of coleoptera had been described in England and Europe, as well as in this country, and many species were to be found in the cabinets of American collectors without names, there was almost utter confusion and it was thought that a catalogue of all described species would, in a measure at least, reduce this chaos to system and facilitate the further study of this interesting order of insects. Accordingly the preparation of this catalogue was assigned to Dr. F. E. Melsheimer, son of Rev. F. V. Melsheimer, author of the first catalogue. This was prepared for publication and afterwards revised and enlarged by Dr. J. L. LeConte and S. S. Haldeman, and published in 1853 by the Smithsonian Institution. And from this has evolved our check lists of North American Coleoptera.

After the death of Thomas Say in 1834 several gentlemen took up the work and as there had been several scientific bodies organized, and the publications of these offered facilities for printing the results of their labors, a considerable impulse was offered to the advancement of the science. Among these workers was Maj. LeConte and later his son, Dr. John L. LeConte, who afterwards did so much for American coleopterology; Dr. S. S. Haldeman, Professor N. M. Hentz, Dr. Christian Zimmerman and Edward C. Herrick. Among the work of foreign entomologists as related to American species we note especially that of Rev. Wm. Kirby, who was the author of that portion of Sir John Richardson's "Fauna Boreali-Americana" which treats of insects. This contained descriptions of no less than 447 species of Canadian insects, especially coleoptera, and was published in 1837, having since been revised and republished in the "Canadian Entomologist" by Dr. Bethune. In 1840 Mr. P. H. Gosse published in England a list of 26 butterflies, 43 moths and a number of other orders, 14 of which were figured. It was with these advances and in this condition that the beginning of the last half of the present century found the science of entomology in America. There was great confusion in regard to species and this seemed to prevent any rapid progress, both in the pure as well as the applied science, for the latter must always await the advance of the former. As I have stated, the Smithsonian Institution, by the publication of Melsheimer's Catalogue of the Coleoptera, greatly assisted workers in that order of insects but the good work stopped there and it was nearly five years before other orders were similarly treated in the publications of this institution.

The new and beautifully illustrated edition of Harris's *Insects Injurious to Vegetation* gave this work a renewed value and popularity, especially among the agricultural classes. In 1854 there appeared a series of volumes illustrating the agricultural and natural history of New York. Volume V. of the series was devoted to the more common and injurious species of insects. It is a large quarto volume profusely and brilliantly illustrated, but one for which entomologists have not been able to find any particular use.

In 1855 Dr. Asa Fitch received the appointment of entomologist to the New York State Agricultural Society, the Legislature having made provision for the establishment of the office which was synonymous with that of State Entomologist. The selection of Dr. Fitch was a wise one, and he promptly began to take up the work so well begun in Massachusetts by Dr. Harris, and for fourteen years his annual reports went out not only to aid the farmer to cope with injurious species, but also to aid the more technical entomologist, as a considerable number of the original descriptions of our insects are to be found therein. In 1856 the Canadian Bureau of Agriculture and Statistics offered prizes of £40, £25 and £15 for the best essays, respectively, on the "origin, nature and habits, and the history of the progress from time to time,—and the cause of the progress—of the weevil, Hessian fly, midge and other insects as have made ravages on the wheat crops of Canada; and on such diseases as the wheat crops have been subject to, and on

the best means of evading or guarding against them." The first prize was awarded to Professor H. Y. Hind of Trinity College, Toronto, and his Essay on the Insects and Diseases of Wheat appeared in 1857, being the first publication relating to applied entomology, issued by the Canadian Government. In the meantime, the United States Department of Agriculture had secured the services of Mr. Townend Glover, an Englishman, born in Rio de Janeiro, South America, in 1813, and who, after much wandering about, had finally settled in the United States, about 1836. June 14, 1854, Mr. Glover received his appointment "For Collecting statistics and other information on seeds, fruits and insects in the United States." This was just about the time that the new Bureau of Agriculture was established, and attached to the United States Patent Office, and the Report of the latter for the year 1854 contains the first of a series of reports, on various insects injurious and beneficial to vegetation, though this was the exact title of the first only. The reports for 1854 and 1855 are fully illustrated. In the winter of 1856-57, Mr. Glover was ordered to British Guiana and Venezuela, and there is nothing from him in the Patent Office report for 1856; but in 1857 he again appears, though his articles are also signed by the Chief Clerk, D. J. Brown, by initials only, and this is true of the reports of the Patent Office for the years 1858 and 1859. The entomological paper for the year 1860 was prepared by Mr. P. R. Uhler of Baltimore, Md. Although Mr. Glover was not in evidence in these documents at this time, he was not idle, as will appear later. But the Government had now taken the initiatory step and recognized economic entomology. In the meantime Dr. William LeBaron of Illinois, afterwards State Entomologist of that State, began the publication of contributions on Injurious and Beneficial insects, in the "Prairie Farmer" in 1850, and continued to do so until 1874, two years prior to his death. Miss Margaretta Hare Morris, who began to study the habits of injurious insects in 1841, continued her work and publications up to 1860. Thus it will be seen that the applied science was making rapid strides, not alone as to the study of insects themselves, but in the diffusion of the knowledge gained by these studies, among the horticultural and agricultural masses, and the literature of these industries at this period is even now very interesting to economic entomologists. One can scarcely prepare a paper on many of our common insects without referring back to the volumes of the *Prairie Farmer*, *The Country Gentleman*, *The Canadian Journal*, *The Canadian Naturalist and Geologist*, and others of that character.

But how about the pure science? Has that branch been allowed to fall behind and the workers therein become discouraged? Though discouraged they probably were, many times, yet there does not appear to have been any lagging behind or giving over to despair. Dr. John L. LeConte did not terminate his labors with the preparation of Melsheimer's Catalogue of the Coleoptera; but the volumes of the Proceedings of the Philadelphia Academy of Science from 1852 to 1865 are filled with his descriptions, and, besides, there were many papers published in the Transactions of the American Philosophical Society, and other similar publications. In 1857, Baron R. Osten Sacken, of the Russian Legation at Washington, having been interested in the Diptera, at the solicitation of the Smithsonian Institution, prepared for publication a Catalogue of the described Diptera of North America, and including the West Indies, Central America and Mexico. In his preface to this Catalogue, which was published by the Smithsonian Institution, in 1858, Baron Osten Sacken expresses the hope that it will encourage the study of the Diptera, as rapidly as Melsheimer's Catalogue of the Coleoptera had furthered the study of that order of insects. In continuation of this work on the Diptera, there appeared, from the same Institution, in 1862, Part I, of the Monographs of the Diptera of North America, by H. Loew, edited, with additions, by Baron Osten Sacken. Part II, of the same series, appeared in 1864; Part III, by Dr. Loew alone, in 1873, and Part IV, by Osten Sacken alone, in 1869. Dr. John G. Morris, an entomologist of Baltimore, had been gathering materials, and in 1860 the Smithsonian Institution published a Catalogue of North American Lepidoptera, and a Synopsis of American Lepidoptera to accompany this, in 1862, though Part I only was published. In 1861, a synopsis of the Neuroptera of North America, by Dr. H. Hagen, LeConte's Coleoptera of Kansas in 1859, his Classification of Coleoptera of North America in 1862, his List of the Coleoptera of North

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America, Part I, in 1866, his *New Species of North American Coleoptera*, in the same year, and Part II of both of these, published in 1873., together with the *Catalogue of Orthoptera of North America*, by S. H. Scudder in 1868, all printed by the Smithsonian Institution, show an amazing amount of activity among entomologists, during a decade when there was supposed to be little time for science, except that of war. Dr. LeConte himself dropped his studies, and went to the front to care for the sick and wounded, and give to the country his professional services. Dr. Breckenridge Clemens had published his admirable *Synopsis of North American Sphingidæ* in 1859, in the *Journal of the Academy of Sciences of Philadelphia*, and also during the same year a paper on the *Arctiidæ* in the *Proceedings of the same institution*. Others had published papers in the publications of the *American Philosophical Society*, the *Boston Society of Natural History*, and the *New York Lyceum of Natural History*. The various *Explorations and Surveys*, carried forward by the United States Government, for various purposes, furnished opportunities for making collections in the newer portions of the country, and the folio volumes dealing with the results of these expeditions are filled with valuable entomological papers.

In 1861 the Entomological Society of Philadelphia began the publication of its proceedings, the Society itself having been chartered in 1862, and six volumes of these were issued prior to 1866, when it was changed to the American Entomological Society, the transactions of which have been published quarterly up to date. In the first series, as above indicated, are found exhaustive papers by all of the most prominent entomologists of the times. In the first volume will be found the name of William Couper, and in the second that of William Saunders, among the contributors. Surely it cannot be said that there was any lack of activity during the fifth and sixth decades of the present century, among technical workers in entomology. But this is by no means all that had been accomplished. In 1862 there appeared, in the *Canadian Naturalist and Geologist*, a list of thirty-six persons, resident of Canada, who were interested in entomology, the list having been prepared by Dr. Bethune and Mr. William Saunders. On September 26th, 1862, ten of the gentlemen, whose names appeared in the above mentioned list, met in Toronto to consider the matter of a definite organization. This, however, was not accomplished until April 16th, 1863, when the Entomological Society of Canada was organized. The September meeting in Toronto was the first meeting of entomologists to be held in Canada, and you will pardon me the digression if I call attention to the fact that on August 30th, 1889, there was also in Toronto another entomological society born, viz, the Association of Economic Entomologists, a body that was destined to include in its membership, not only every American economic entomologist, but every foreign worker in the applied science. No other society or organization has done so much to bring the workers in the world, in the science of applied entomology, together, in influence and effort, as has this one. No similar organization of the kind exists, and it has been of immense advantage to workers in the applied science in almost every country where entomology is known as a science. To Toronto then, must go the honor of being the birthplace of two of the most important entomological organizations in America. The Canadian Entomological Society, after seven years, was incorporated in 1871, under the name of "The Entomological Society of Ontario," and I esteem it a high honor to be allowed to address you at this its thirty-sixth annual meeting. The Quebec and London branches were established in 1864, and that of Montreal in 1873. In 1864 the newly organized Society published a list of 144 species of Canadian lepidoptera, followed in 1865 by a list of 350 additional species. In 1867, a list of 1231 species of coleoptera was issued, being ten times the number enumerated by Mr. Couper twelve years previously. In August, 1868, was issued the first number of "The Canadian Entomologist." Other similar periodicals have come and gone, with but two exceptions, viz, "Psyche" and "Entomological News," the first of which appeared in 1874, published in Cambridge, Massachusetts, and the second in 1890, and published in Philadelphia, Pennsylvania. Thus, the Canadian Entomologist spans almost one-third of the century of which I am speaking, and its columns have, from the first, been filled with original matter by almost every American entomologist of note living during this entire period. Its pages have

been open alike to the technical and applied science, and the series of volumes constitute a history of entomology in America, during this period. The first editor, Dr. Bethune, had had an eight year's training as entomological editor of the *Canada Farmer*, and was all the more fitted for the difficult task of editing an economic and at the same time technical entomological journal, and the result has been so satisfactory that I do not remember having heard of a single significant criticism being offered against either the publication itself or the nature of its contents. The entomologists of America owe to both Dr. Bethune and Dr. William Saunders a debt of gratitude for their faithful editorial labors. The twenty-nine annual reports of this Society are of great value, though not so free from compiled articles as is the "*Canadian Entomologist*." In 1865, the Entomological Society of Philadelphia began the publication of the "*Practical Entomologist*," with Mr. Benjamin D. Walsh, of Rock Island, Illinois, as associate editor at first, and later as editor. The publication was a very useful and valuable one, being, as the title implies, a strictly practical journal, but it was short lived as but two annual volumes were published. In 1868, that exceedingly valuable publication, the *American Entomologist*, was begun under the editorship of Benjamin D. Walsh and C. V. Riley, the former being killed by an accident soon after the close of the first volume. Unfortunately, this too was suspended at the end of the second volume, to be resumed again in 1880, when another volume was issued by Dr. Riley, and then it expired for good. In 1878, the *Bulletin* of the Brooklyn Entomological Society, was started, and six valuable though rather small volumes were published, when this, too, ceased to exist, being, with "*Papilio*," a magazine devoted exclusively to lepidoptera, and published in New York City, and comprising four volumes extending from 1881 to 1885, merged into "*Entomologica Americana*." But this last, at the end of the sixth volume, after the fashion of the others, gave up the ghost. There is much that is valuable to be found in all of these publications, and they mark the growth of the science during the period of their existence. Not a few of the younger of our entomologists sent to them their maiden communications though there are no lack of papers by the oldest workers to be found among them. All of these entomological periodicals, including the "*Canadian Entomologist*," had their influence in encouraging the study of insects especially among young men, in much the same way that the entomologist's contributions to the agricultural and horticultural press have resulted in a closer attention to and a better knowledge of the common destructive insects by our intelligent up-to-date husbandmen.

The activity in the pure science has not been greater than in the applied. Valuable entomological papers by Uhler and S. S. Rathvon are to be found in the reports of the United States Department of Agriculture for 1860, 1861 and 1862, when Mr. Glover was re-employed, this time as Government entomologist, and up to 1878, each annual volume of the Departmental reports contains instructive papers on insects. The author himself derived much aid and encouragement from the paper on "The Food and Habits of Beetles" in the report for 1868. I can only call attention to that other immense work of Mr. Glover, viz., "Manuscript Notes from my Journal, or Illustrations of Insects," with the complete set of illustrations comprising 273 quarto plates, with 6,179 figures engraved on copper. A few institutions in the country have been able to secure a full set of these plates, colored by a competent artist. In 1867, a bill was passed by the Legislature of Illinois authorizing the Governor to appoint a State Entomologist. Through some technicalities he was not appointed, though the Governor recommended Mr. B. D. Walsh for the position; this gentleman would have been made State Entomologist in 1870, but for the terrible accident, on November 12th, 1869, that cost him his life. As it was, he was acting state entomologist at the time of his death, and in that capacity issued his first report. In 1870, Dr. William LeBaron was appointed state entomologist and held the office for four years, issuing in this time four annual reports. In 1875, Dr. LeBaron was followed by Dr. Cyrus Thomas, who held office until 1882, issuing in the meantime, six annual reports, when he was succeeded by Dr. S. A. Forbes, the present incumbent, whose reports contain the results of original work almost exclusively. In 1868 Mr. C. V. Riley was appointed State Entomologist of Missouri, serving in this capacity until 1877, when the office was abolished. The nine annual reports pub-

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lished during this period, by Dr. Riley, are classics in American literature of applied entomology. In 1880, Dr. J. A. Lintner was appointed State Entomologist of New York, in place of Dr. Asa Fitch, resigned, and held the office until his death in 1898. While Dr. Lintner could hardly be termed an investigator, his series of carefully compiled reports, relating to the insects to which his attention had been called from time to time, afford a veritable encyclopedia of entomological information, for which more than one worker has felt devoutly thankful. In 1869, Dr. A. S. Packard, who had previously sent out some excellent entomological literature, issued his "Guide to the Study of Insects," the first work of its nature to be issued in America. In 1876, came his big folio volume, "A Monograph of the Geometrid Moths," from the United States Geological Survey, and lately we have had his "Bombycine Moths" and his "Text-book on Entomology," both of which are masterpieces. In 1877, the United States Entomological Commission was organized by an act of Congress, and placed under the authority of the Secretary of the Interior, afterwards being transferred to the Agricultural Department, its members comprising Drs. C. V. Riley, A. S. Packard and Cyrus Thomas. The object in creating this commission was to study the Rocky Mountain locust, but the members did not confine their investigations to these, by any means, and, as a result, we have several bulletins and five octavo reports, the latter containing over 3,200 pages, with 165 full page plates and a great number of smaller illustrations, and 10 large maps. The fifth and last volume was prepared by Dr. Packard, and relates to forest insects exclusively. In 1878 Dr. Riley was appointed United States Entomologist, but held the position for only one year, when he resigned, having in the meantime issued one report. The following year, Prof. J. H. Comstock was appointed to the office which he held three years, issuing two valuable reports and a special report on cotton insects. Since that time Prof. Comstock has given us some most excellent publications. His work on the Coccidæ is known universally among specialists of that group, while his later works "Insect Life" and "Manual for the Study of Insects," have been of great value to students and amateurs. In 1881, Dr. Riley was a second time called to the office of United States Entomologist, serving in that capacity until 1894, organizing a corps of original investigators, the like of which had not before been known in the history of the science. During these years the annual reports, bulletins and the serial "Insect Life" almost constitute in themselves an entomological library. The influence and zest that was thus given to the study of the applied science, and especially in the case of Experiment Station entomologists, can hardly be calculated. On the death of Dr. Riley the office of United States Entomologist very properly and deservedly fell to his long time first assistant, Dr. L. O. Howard, who has not only held the office creditably, but in some respects improved upon his predecessor. At the time of his death Dr. Riley was Honorary Curator of the Department of Insects, in the National Museum of Washington. Dr. Howard also succeeded his superior here, as in the Division of Entomology, but instead of a single aid, as under Dr. Riley, there is now a corps of conscientious, hard-working specialists, whose labors cannot prove other than creditable to American entomology.

In 1888 came the establishment of Experiment Stations, under the Hatch Act, and the office of Station Entomologist has been created in the majority of these institutions, which office is similar to that of State Entomologist, except that, in many cases, the entomologist is called upon to assume the duties of other departments of science, like botany or horticulture, or else devote a larger proportion of his energies to teaching in the Agricultural Colleges. This condition of entomological interests, in the Stations, has necessitated much hurried compilation and attempts towards popularization of old and well-known facts, so that the entomological bulletins of Experiment Stations do not stand as high in the estimation of scientific men as they otherwise would. Nevertheless, this is hardly the fault of the entomologists, but in the management of these institutions themselves, and besides, when we come to sift out the chaff, there remains much in the results of their work that is new and valuable. The workers themselves are too numerous for me to mention here. Theirs is current history, and their works will speak more for them than any words of mine possibly could. In Canada, Dr. Saunders's "Insects Injurious to Fruits," issued in 1883, with a second edition in 1892, has been a wonderful

public educator, in applied entomology, and the working entomologist will find that a copy at his elbow will be of the greatest service. It is one of the very best of its class that has ever gone out from the hand of an American entomologist. In 1887 Dr. James Fletcher was appointed Dominion Entomologist and Botanist and his work has been a herculean one. While he has given out annual reports, we all know full well that these but poorly represent his labor. What can one mind and one pair of hands do in such a sea of work as there is in Canada? It is like attempting to lower Niagara River by dipping the water out of Lake Erie with a teaspoon. You ought to have Dr. Fletcher, and a corps of at least half a dozen well-trained and experienced entomologists, and God speed the day when you may have them.

But I must go back and mention a few others whose work has helped to make American entomology what it is to-day. As long as our Noctuidæ are known and studied, the name of A. R. Grote will be associated therewith, just as will the name of that gray-haired hero (if heroes there be among entomologists, and if not, why should there not be?), William H. Edwards, whose monumental work on the butterflies we may well be proud of, and which, except for Scudder's "Butterflies of the Eastern United States," is unique in our entomological literature. Then there is the work of Clemens, Chambers, French, Fernald and Robinson, as well as others that I have not time to even mention, but who have made their reputations among us. In the Coleoptera there was Dr. Horn, who, either associated with Dr. Le Conte or independently, has done as much or more for American coleopterology than anyone else, although there are others whom I might mention. The life-work of Mr. S. H. Scudder is a good example of American activity, as, besides his work on the insects of the present age, he has given the world as well as America such monographs on fossil insects as have never been done before. But time will not allow me to say more, except to mention the industrious labors of Abbé Léon Provancher, and his "Le Naturaliste Canadien," a work that was carried out under discouragements that the most of us cannot appreciate or understand.

In looking back over the field, then, there appear several conspicuous achievements in applied entomology that rise up, like the cloud-capped eminences of huge mountains, from the comparatively level plain. The spraying of fruit trees, bushes and vines to destroy insect pests is an innovation that has saved America millions of dollars annually. The work of the Massachusetts Gypsy Moth Commission is a revelation to those who have never investigated its wonders and merits. The introduction of beneficial insects, both as a means of destroying the destructive ones, and for the purpose of fertilizing the bloom of exotic fruits or plants, is another modern innovation. It will be remembered that, ten years ago, the orange groves of California were threatened with destruction from the Cottony-Oushion Scale, *Icerya Purchasi*; Maskell. After much correspondence with Mr. Frazer S. Crawford, of South Australia, one of the kindest and most lovable men that it has been my good fortune to meet, and who, except Dr. Riley himself, did more than anyone else to further and bring about the introduction of the natural enemies of the *Icerya* into California, Mr. Albert Keobebe was sent to Australia in order to introduce the insect enemies of this pest into this country. How this was accomplished and the results that were obtained has been told again and again, and covered with glory, not only the United States Department of Agriculture and the State Board of Horticulture of California, but quite properly Mr. Keobebe as well. It is, however, but just to say that Mr. Crawford not only was very influential in furnishing the information necessary to the undertaking, but himself forwarded the first *Dipterous* parasites *Lestophonus iceryæ* to this country, and did everything possible to assist the entomologists that afterwards visited South Australia; and for American entomologists to forget for a moment, his connection with the undertaking would be most deplorable. As you know, this introduction of Mr. Keobebe's was successful, and similar experiments in sending the *Novius cardinalis* to other countries has also been crowned with success. But another achievement came from the studies of this scale, viz., the application of hydrocyanic acid gas to destroy scale insects. This last honor falls to Mr. D. W. Coquillett, now of the National Museum. Although in a sense forestalled by the introduction of the humble

bee into New Zealand to fertilize the bloom of red clover, *Trifolium pratense*, yet the recent success in introducing and establishing *Blastophaga psenes* into California to fertilize the Smyrna fig adds a well-deserved honor to the office of United States Entomologist at present so creditably filled by Dr. L. O. Howard.

Although important from an educational rather than an economic or technical standpoint, nevertheless I cannot forego calling attention to Dr. W. J. Holland's "Butterfly Book" as paving the way for a better method of presenting the science of entomology to the young or inexperienced. That it should be possible to place such a superb book as this in the hands of our young people, and withal so entertaining, at the price of \$3.00, is an innovation in teaching our beloved science.

And now, standing as we do on the threshold of a new century, it does seem as though we might look back over the last with honest pride. From almost nothing we have become the leaders of the world in applied entomology, and we are certainly not exasperatingly far behind in the pure science. International questions of the technical sort have, many of them, yet to be settled, and we may find, after all, that we are not less in error than our fellows in other lands. At any rate, we have accomplished enough to give us the best possible encouragement for future labors, and it is to be hoped that the white-haired veterans that are still with us, and have done so much to make this condition of affairs possible, will live many long years to watch and enjoy our further progress.

As to the future, it seems to me that the work of the entomologist will differ somewhat from that of the past. Except in some groups most of the descriptive work is done, and all that remains is to prove the validity of species, for we have learned one other thing in the past, and that is, that the Almighty can make a better species than the entomologist, though probably nowhere near as many of them. Canada will probably offer a more fruitful field for the collector, for some time to come, than the United States, because it has been less worked, but you also have problems in distribution, variation, development and inter-relations with other organisms, and it is in these directions that I expect to see the science making the greatest progress. If we have a world conquered behind us, there are others in front us to conquer. There is something and enough for everyone to do, and do well. May the Entomological Society of Ontario and its members live long and continue to work faithfully, for the fields are crying out for workers, and the prospects encouraging, and as I have stated before, entomology knows no political lines, but is as boundless as the ocean and as free as the air. So may it ever be.

At the close of Prof. Webster's paper, which was listened to with great attention, another address illustrated with lantern pictures, was given by Prof. Lochhead.

LECTURE ON SOME COMMON INSECTS OF THE ORCHARD, GARDEN AND FARM.

The speaker first dealt with the Scale insects which occur in many orchards, and do a vast amount of harm. The San Jose Scale, the Oyster-shell bark-louse, the Scurfy bark-louse, and the plum Lecanium were each in turn described from the lantern illustrations. The general adoption of spraying with whale-oil soap (2 lbs. to 1 gallon of water) during the dormant season would soon keep the majority of these small scale insects in check. To insure further immunity the speaker advised the use of dilute kerosene emulsion spray during June when the young forms (if any survive) are moving about.

The Codling worm and the Bud worm were next discussed. Their habits and life histories were concisely described, as well as the remedies which were used against them. The insect pests which make webs or tents, viz.: the fall web-worm, and the two species of tent caterpillars, were described, and remedies given, which, if applied properly, would certainly diminish the damage done by these very injurious moths. The use of Paris green spray is recommended while the worms are small, but much might be done by hand-picking the egg-masses of the tent-caterpillars during fall and winter.

The borers, the flat-headed and the round-headed forms could be controlled by the application of a tar wash to the trunks of the trees after many of the worms had been killed by probing the tunnel with a stout wire.

The pea-weevil was described as a very serious pest, for probably one-half of the pea crop of Ontario was destroyed by its ravages. Its life-history was sketched and the carbon-bisulphide remedy was mentioned as probably the most effective.

Among garden insects the Colorado potato beetle, the cabbage-worm, the white grub, and the wireworms were illustrated, and remedies given for their control.

Finally, the speaker dealt somewhat fully upon a few beneficial insects which are too often killed by the farmer and gardener, named, the *lady-birds*, which prey upon plant lice and scale insects, and the *ground beetles* which feed upon grubs in the soil, and even climb trees in search of food. The speaker spoke strongly of the necessity of recognizing the beneficial from the harmful insects, if the best results are to be attained in the warfare against insect pests.

The proceedings were brought to a close by a few remarks from Dr. Bethune, who expressed the thanks of all present to those who had furnished them with such an agreeable and instructive evening. The majority of the audience then visited the Society's room in another part of the building where they were much delighted with the exhibition provided by Mr. Moffat, of many drawers from the Society's cabinets, filled with wonderful and beautiful insects of various orders. The success of the illustrated lectures was largely due to Mr. R. W. Rennie, who fitted up the lantern and manipulated the slides.

THURSDAY, OCTOBER 12th.

The session of the Society was resumed at 10 o'clock a.m., Dr. Fyles occupying the chair at the request of the President. The minutes of last year's meeting were adopted as printed in the annual report. The chairman then called upon the various officers of the Society and its Branches and Sections to read their respective reports upon the transactions of the past year. The first in order was that of the Council, which was read by Dr. Bethune, as follows:

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to submit its annual report for the year 1898-99.

The thirty-fifth annual meeting was held in Montreal in November last in order that we might join in the celebration of the twenty-fifth anniversary of the Montreal branch. It was well attended by members from a distance as well as by those resident in the city, and the proceedings were of a highly interesting and useful character. A full account has already been published, rendering it unnecessary to enter into details. The branches in Toronto and Quebec are also in a prosperous condition, and have been the means of largely increasing the membership of the Society.

The twenty-ninth annual report on economic and general Entomology was presented to the Minister of Agriculture for Ontario early in February last, and was printed and distributed at the beginning of May. It contained one hundred and twenty pages, and was illustrated with sixty seven wood cuts and two plates, portraits of Messrs. W. H. Harrington and J. Dearness, who have recently held the office of President of the Society. In addition to an account of the proceedings at the last annual meeting the report contains the address of the President, Mr. Henry H. Lyman and the following valuable and interesting papers: "Some economic features of international Entomology" and "The collector and his relation to pure and applied Entomology," by Prof. Webster; "The farmer's garden and its insect foes," by Rev. Dr. Fyles; "Entomology in Schools," by Prof. Lochhead; "The cotton boll worm in Canadian corn" and "Two avian parasites," by Messrs. R.

Elliott and J. Dearness; "A bit of history" and "Random recollections in Natural History," by J. A. Moffat; "The Noctuidæ occurring at Toronto," and "Muskoka as a collecting ground," by Mr. Arthur Gibson; "Notes on *Papilio brevicauda*," by Mr. A. F. Winn; "The Gypsy Moth," by Mr. E. H. Forbush; "The preparation of specimens for the exhibition of life histories in the cabinet," by Mr. Dwight Brainerd; "The brown-tail Moth" and "Injurious Insects in 1898," by Dr. Fletcher; and "Notes on Insects of the Year," by Messrs. Harrington, Evans, Kilman, Rennie, Hutt and Moffat. In the excellence of the papers and their generally practical character, the volume has well maintained its high standard of usefulness.

The *Canadian Entomologist*, the monthly magazine published by the Society, completed its thirtieth volume in December last. It consisted of 335 pages and was illustrated with six plates and twenty one original wood-cuts; the contributors numbered fifty-three. It was filled with original papers of a high order of merit, and may justly be considered one of the most valuable and interesting volumes since the inauguration of the magazine. Of the thirty-first volume ten numbers have now been issued, containing 304 pages, five plates and thirty-six wood cuts. Among the large number of valuable papers may be mentioned a series of articles on the "Classification of the Entomophilous Wasps," by Mr. William H. Ashmead; and numerous papers on Coccidæ, by Profs. Cockerell, and Tinsley, Messrs. King, Fowler, Parrott and others; a List of Manitoba Moths, by Mr. A. W. Hanham; a continuation of a series of papers by Prof. Wickham, on the Coleoptera of Canada, and Mr. E. M. Walker, on the Acridiidae of Ontario; life histories of Lepidoptera, by Dr. Dyar; Descriptions of new genera and species in various orders by Messrs. Scudder, Quaintance, Coquillett, Skinner, Smith, Banks and others; and papers on a great variety of subjects of a technical or practical character by leading Entomologists of America and several distant countries.

The council have learned with much satisfaction that an Entomological Society has been successfully organized in the North-West Territories of Canada, under the presidency of Mr. Percy B. Gregson, of Waghorn, Alberta. They desire to express their heartiest wishes for its success and prosperity and to assure its members of their readiness to co-operate with them in any way in their power. The field is a vast one and its scientific resources are as yet unexplored and almost unknown.

At the meetings of the Association of Economic Entomologists and the American Association for the Advancement of Science, held at Columbus, Ohio, in August last, the Society was represented by Dr. William Saunders, Director of the Experimental Farms of the Dominion.

The Council has watched with interest the vigorous efforts made by the Government of Ontario to prevent the spread of that dread pest of the fruit-grower, the San Jose Scale, and is pleased to learn of the success which has attended the experiments made by Prof. Loehhead in fumigating with hydrocyanic acid gas. It was gratified to learn that one of its members, Mr. J. Dearness, formerly President of the Society, was appointed by the Hon. the Minister of Agriculture, one of the Commissioners for the investigation of the ravages of the Scale in Ontario.

The members of the council are pleased to note the appointment of Mr. Arthur Gibson, President of the Toronto Branch of the Society, to the position of assistant in the Division of Entomology of the Dominion Experimental Farms.

As will be seen from the report of the Librarian and Curator some valuable additions have been made to the collections both of books and specimens.

All of which is respectfully submitted.

HENRY H. LYMAN, President.

REPORT OF THE LIBRARIAN AND CURATOR.

FOR THE YEAR ENDING 31ST OF AUGUST, 1899.

An important addition was made to the library during the past year, by the purchase of some of the more recent works in the various departments of the Natural Sciences, numbering 28 volumes; which will give the members of the different sections associated with the society an opportunity of consulting the latest and best authors in the particular branches of science to which their attention is being directed.

Twenty bound volumes were received from Governments, Public Institutions and Societies during the year.

Of the proceedings and transactions of Societies, Magazines and Pamphlets, there were made up and bound 25 volumes; 1 volume was donated to the library by Mr. Goodburn; making a total of 74 volumes added during the year. The full number on the Register is now 1,627. Books issued to local members numbered 50.

A few specimens of local interest, new to the collection, have been added during the year. An opportunity presented itself of obtaining some Manitoba Lepidoptera, correctly determined, which was secured, and will be—and has already been—of service in identifying other material.

Some interesting additions to the collection of exotics have been made at different times by Mr. C. T. Ramsden of Santiago de Cuba; one of our members at present resident there.

Respectfully submitted,

J. ALSTON MOFFAT.

Mr. J. A. Balkwill presented his financial statement as Treasurer of the Society and stated that the balance on hand would all be required to meet the ordinary expenditure during the remainder of the year.

AUDITORS REPORT.

Receipts and expenditures of the Entomological Society of Ontario for the year ending August 31st, 1899.

RECEIPTS.		EXPENDITURES.	
Balance on hand Sept. 1st, 1898.....	\$ 739 25	Pins, Cork, etc.....	\$ 91 04
Members' Fees	390 90	Annual Meeting and Report.....	285 25
Sales of Pins, Cork, etc.....	89 23	Library	126 48
Government grant.	1000 00	Printing	597 21
Advertising	13 00	Expense Account, (postage, etc.)....	108 94
Interest	17 73	Salaries	300 00
Sales of Entomologist.....	34 11	Rent	200 00
	\$ 2284 22	Balance on hand, August 31st, 1899..	576 30
			\$ 2284 22

We the Auditors of the Entomological Society of Ontario hereby certify, that we have examined the books and vouchers of the Treasurer and find them well kept and correct and the above is a true statement of the accounts of the Society.

London, Sept. 15th, 1899.

W. H. HAMILTON, }
 JAMES H. BOWMAN, } Auditors.

A discussion on the subject of the purchase of a Magic Lantern was introduced by Mr. John Law, who thought that the Society ought to have one for exhibition purposes. Prof. Lochhead gave some information regarding the cost of a lantern and slides. After remarks by Messrs Dearness, Fletcher, Bethune and Bowman, it was resolved that "The consideration of the question of purchasing a Magic Lantern be referred to the library committee to obtain all the information possible about it during the year, and that they be authorized to purchase slides and to rent a lantern at such times as may seem advisable."

The next business of the meeting was the election of officers for the ensuing year, which resulted as on page 2.

HONORARY MEMBERS.—The following gentlemen were unanimously elected Honorary Members of the Society:—Dr. L. O. Howard, United States Entomologist, Washington, D. C.; Professor John B. Smith, Sc. D., Rutgers College, New Brunswick, N. J.; Professor F. M. Webster, Wooster, Ohio; Professor H. F. Wickham, Iowa City, Iowa.

REPORT OF THE GEOLOGICAL SECTION.

The Geological Section of the Entomological Society of Ontario begs leave to present the following report:

The meetings of the section were held weekly as usual, and a gratifying amount of interest in the study of geological science was evinced.

The noteworthy features of the year's study were the following: (a) An examination of local geology, including discussions respecting the origin of the flowing sulphur springs; (b) an investigation of the extent of local peat beds; (c) visits to Kettle Point; (d) visits to Western Ontario oil fields; (e) and a very interesting account of a visit to the Parry Sound district. Besides these visits Mr. Percival revisited the Strontium cave at Put-in Bay Island, Ohio. Mr. Goodburn also visited the Lake Superior copper region, and will report on it.

LOCAL GEOLOGY.

London is situated in a wide valley eroded by the river, whose two main branches unite at this point. It is probable that the course of the river has been changed here more than once, and that at one time the north branch flowed east by way of Carling's Creek and joined the east branch on the eastern limits of the city, and that the channel of the east branch is now several hundred feet south of its ancient location. The boulder clay is here deeply overlaid by clean water-washed sand, with quicksand in many places. The distance to bedrock is about 120 feet in the lower parts of the city. On the highlands surrounding it is much more. At Mt. Brydges, 20 miles west, it is 300 feet. Thus the depth of the drift and boulder clay is a feature of the locality. In the eastern part of the city pure water is obtained abundantly in the drift, but lower down than the boulder clay no water suitable for domestic use in quantity has been found until great depths are reached. On the other hand, at the Forks, and generally in the western portion of the city, sulphur springs are found in the upper rock strata. A sulphur spring, flowing 40 cubic feet per minute, struck about thirty years ago, continues to flow in undiminished volume. The water rises to a height of 24 feet above the surface, and formerly was utilized to turn a wheel and made to do useful work at street watering until the sulphuretted hydrogen created a nuisance on the streets and in the shops where iron goods were sold. Analysis of the water shows it to be highly mineralized, and it is reputed to be valuable as a remedy in cases of certain skin diseases, particularly eczema. Facilities for bathing have been provided, and are patronized by the general public. The quantity of sulph. hydrogen is not large, though from its offensive odour it would appear to be exceedingly abundant. The gas probably has its origin in the decomposition of the gypsum beds of the Onondaga group, and coming from higher levels to the eastward flows as before noted. The temperature of the water is 48°, and in summer seems icy cold. It is scarcely possible that it comes from any great depth, as if it did so its temperature would be considerably higher.

Dr. Woolverton, chairman of the Section, revisited Kettle Point and its vicinity during the summer. In addition to the rocks noticed last year he traced an outcrop of Corniferous limestones, distant about two miles from the present shore of Lake Huron and parallel to it. A species of large spirifer (*Spirifer increbescens*) was abundant. The specimens collected were much larger than *S. mucronatus*, abundant near Thedford. The rocks are lower than those of Thedford and Arkona. They form an old shore line, and between them and the lake are extensive sand dunes. Economically they furnish a coarse lime for rough building purposes, but contain too much iron for use in buildings of the better class. An old Indian trail crosses this lime bed. The Indians throughout Lambton County have a general tradition that a silver lead mine exists somewhere in the vicinity. Among other places No. 4 hill in Bosanquet, three miles from Arkona, is pointed as the location of the mine, but the Doctor was unable to find any trace of it. Another locality pointed out is a bluff on Black Creek, near Oil Springs, where it is said the Indians formerly made their own bullets. Like the Indian idea that a seam of coal exists under water at Kettle Point, the notion that a galena vein exists in Lambton is not generally believed.

STRONTIUM CAVES.

Mr. Percival paid a second visit to the Strontium sulphate cave at Put-in-Bay Island. Another cave of large size, named Dossard's, has been discovered on an adjoining lot. It contains some crystals of Strontium, and has stalactites and stalagmites. It is in the form of a crescent, and is said to be 700 feet in length. Like Perry's cave in the same vicinity, it is in limestone rock.

PEAT BEDS.

A number of the members of the section visited a peat bed, situated about 3 miles west of London at Redmond's farm. It lies in a low spot bordered by high hills on the east and north. Towards the south a barrier not more than a few feet in height isolates it from the River Thames. In the centre is a pond of clear spring water over 60 feet in depth. This spring is capable of furnishing one million gallons per day of excellent water, and as it is only about $\frac{1}{2}$ mile from Springbank it will probably in time become valuable. This water finds its way through gravel beds into the river. The surface of the pond is 109 feet above the river. Around the margin of the bed is a tangled growth of firs, willows or other shrubs. Farther in are cranberry and other low bushes, while thickly covering every available spot is a feathery moss called Sphagnum, with occasionally pitcher and other aquatic plants. This peat bed covers about 48 acres, and is quite deep over most of the surface. A depth of 60 feet has been measured during the winter season when the pond is frozen over. Members of our Section measured it where practicable, and found from 8 to 20 feet of good peat in its outer zone. Mr. Kirk and others have tested its quality as a fuel, and have found it to be of a high standard. Some of it is remarkably dense for peat, and when air-dried for a few days it requires considerable force to break it. The specific gravity of one sample was but little below 1, which is about four times as dense as peat usually is. It is easily kindled, burns with a bright flame, gives off great heat, and burns almost entirely away. Only an insignificant amount of ash remains. The ash is light and flaky, and is entirely free from slag or clinkers.

As Ontario possesses at a moderate estimate 1,000,000 acres of peat, the economic value of this hitherto neglected fuel is very apparent. It will soon be appreciated on this continent as it has been for so long in the Old World. Coal contains from 1 to $1\frac{1}{2}$ per cent. of sulphur, and this forty to sixty pounds of sulphur per ton has a most damaging effect on the iron smelted by its agency. Peat contains no sulphur, and is to be used in our new iron furnaces at Orillia. For domestic use it is soon to be put on the market at Stratford and elsewhere. A company is now being formed to develop our local beds. Sphagnum is the best material for paper-making, and a cloth for making antiseptic bandages is being now made from it. For steam raising peat is an ideal fuel, filling the firebox with flame, while it is without the disadvantage of the sulphur which corrodes the firebox and tubes of the boiler. Being almost smokeless it would be most welcome as a domestic fuel, and for factory use. When destructively distilled peat yields besides vari-

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ous useful compounds obtained from coal, about 10,000 cubic feet of gas. Peat gas is more easily purified than gas made from coal, and it leaves no vile-smelling lime compounds to be got rid of as is the case with coal. About 100,000 cubic feet of water gas can be obtained from one ton of peat, and this gas without enriching can now be used for lighting through the discovery of the incandescent mantle. As a fuel gas it would be very cheap and of great heating power, as it is largely composed of hydrogen, whose heating capacity is more than four times that of an equal weight of coal gas. For heating it would be nearly as cheap as natural gas, and next in convenience and cleanliness to electricity, used for that purpose, and at a hundredth part of the cost of the latter.

Other peat beds are known to exist in the neighborhood. A majority of the members of the section paid visits to the peat beds among whom may be mentioned Dr. Woolverton, Mr. Percival, Mr. Sangster and Mr. Kirk.

OIL WELLS.

Dr. Woolverton reported on the developments in the Dutton oil district. During the year several wells, producing at first 25 bbl. a day, were struck. The production diminished in a short time to 1 to 2 bbl. The Standard Oil Company is actively developing in that district.

Mr. Kirk visited the Sarnia oil district where the Standard Co'y is also developing a new oil territory. A well which produced 40 bbl. a day was struck there during the month of July last. It continued to produce at that rate for about 3 weeks after which it gradually fell off to about 10 bbl. a day. The average production of the wells in the Sarnia district is about 1 barrel a day.

PARRY SOUND DISTRICT.

Dr. Woolverton spent several weeks in the Parry Sound district and made a most interesting report on its rock formations, characteristic minerals and its prospects as a mining region. 'The Huronian rocks,' he said, 'are much disturbed throughout the whole region, and dip in every direction, while intrusive rocks are very common. Most of the surface rocks were metamorphic, the capping being usually gneiss. The boulder-strewn surface is covered with a dense carpet of lichens. Among other samples collected here are marbles, pure quartz of various shades from white to quite dark, jasper conglomerates, mica, Bornite, Chalcopyrite and Copper pyrites. These garnets were obtained from Parry Harbor. The mica specimens, of excellent colour and of merchantable size, are found about seven miles from Parry Sound. A strongly mineralized zone extends from Parry Sound to the Muskoka lakes, a distance of about 20 miles south east, while far to the north the region is well mineralized. A number of companies with sufficient capital are actively pushing the development of copper prospects and properties have changed hands at high prices. Mention may be made of the development work being done by The McGown Mining Co., The Wilcox Co'y., The Le Fex Co'y., The Parry Sound Co'y., C. Copper Co'y. and The Bornite, the latter being a local concern. Not much nickel has yet been found. The Bornite is found in rich pockets. A sample lot of six carloads netted the owners about \$5000. Copper pyrites is extensively found and is quite rich in copper.'

S. WOOLVERTON, Chairman.

REPORT OF THE MICROSCOPICAL SECTION.

The section was organized on Oct. 22, 1898, with the following officers:—J. A. Balkwill, Chairman; S. Silcox, Secretary, J. H. Bowman and W. H. Rennie, committee.

Eight meetings were held during the winter, beginning Nov. 12th and on each 2nd and 4th Saturday thereafter. At several of these the subject of Ecology was taken up, following notes obtained at Chicago University by W. T. McClement, M. A. of the

Armour Institute, Chicago. Many interesting sections of plants from various sources, microscopical plants and organic salts were presented for examination at the meetings.

Papers were read on the Agaricinae by J. H. Bowman; Starch by J. Dearness; microscopical examination of crystals by J. H. Bowman, and these papers were reviewed: "Staining Algae" by J. Chamberlain, Chicago; "Histology of plants in relation to their environment" by W. T. McClement, Chicago.

J. A. BALKWILL, Chairman.

S. SILCOX, Secretary.

REPORT OF THE MONTREAL BRANCH.

The 216th* regular and 26th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held at 74 McTavish St. on 9th May, 1899.

The members present comprised Messrs. Henry H. Lyman (President), A. F. Winn (Vice-President), Dwight Brainerd, J. B. Williams, A. E. Norris, M. W. Davis, Rev. W. A. Fyles, G. A. Moore, G. Chagnon, and L. Gibb; visitor Rev. E. C. Trenholme.

The chair was taken by the President and the minutes of the previous meeting were read and confirmed and the minutes of the last annual meeting were also read.

The President then submitted the following report of the Council for the past year:

REPORT OF THE COUNCIL.

In presenting their twenty-sixth annual report the Council have much pleasure in referring to the fact that the season just closing has been the most memorable in the history of the Branch, owing to the highly successful celebration of the 25th anniversary of its formation, which was held on the 8th of November.

Special mention should also be made of the holding, in connection therewith, of the annual meeting of the parent society which gave our members an opportunity of meeting such pioneers in Canadian Entomology as Dr. Bethune and Dr. Saunders and of taking part, as members, in an annual meeting of the parent society.

Since our last annual meeting three new members have been added to our roll, one being transferred from the parent society. During the year eight meetings have been held, at one of which we had the pleasure of the attendance of Rev. Dr. Fyles and at another of Dr. Fletcher, and the following papers were read and addresses given:—

Annual address of the President, H. H. Lyman.

Notes on ovoposition of a clothes moth when in a dying condition, E. T. Chambers.

Life history of *Xylina Bethunei*, H. H. Lyman.

Notes on collecting in British Columbia, D. Brainerd.

On arranging Lepidoptera to illustrate family groups, J. B. Williams.

The early days of the Montreal Branch, sent by Mrs. A. L. Jack.

Notes on a few moths, H. H. Lyman.

The basket worm, *Thyridopteryx Ephemeraformis*, A. F. Winn.

Observations on the emergence of the imago of *Papilio Breviceuda*, A. F. Winn.

Notes on the Genus *Grapta*, H. H. Lyman.

Address on his ascent of Mt. Cheam, Dr. James Fletcher.

Address on the medico legal aspects of entomology, Dr. Wyatt Johnston.

*Last year's annual meeting was supposed to be the 215th, but it was found that in 1899 a mistake had been made in the count which has now been corrected.

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On the protection of Lepidoptera from mites and other pests, A. E. Norris.

Notes on *Danais Archippus*, H. H. Lyman.

The President also attended a meeting of the Toronto Branch and read a paper before it. The annual course of half-hour lectures to young people at the Natural History Society again received the assistance of several of our members.

The average attendance at the meetings has been a fraction over 10, being the highest average in the history of the Branch.

The Treasurer's report shows that the finances of the Branch are in a satisfactory condition, and the Council would suggest that some provision be now made for the care of such books as the Branch possesses, that they may be readily available for the use of the members.

A number of our members took part in the annual field day of the Natural History Society at Rigaud, on 4th June, and another field excursion was made to St. Rose and St. Therese on the 1st July, in which four of our members participated.

Respectfully submitted on behalf of the Council.

HENRY H. LYMAN.
President.

The Treasurer then submitted his report, which showed an accumulated balance in hand of \$45.26.

Upon the motion of Mr. M. W. Davis, seconded by Mr. A. E. Norris, the reports of the Council and Treasurer were received and adopted.

The President then read his annual address, making it his valedictory upon retiring from the presidency, reviewing the past history of the Branch, and giving many interesting details of the early years.

A vote of thanks to the President for his address was carried, and the Secretary was instructed to copy the address in full in the minutes.

The following officers were then elected for the ensuing year :

President, Albert F. Winn ; Vice-President, Dwight Brainerd ; Secretary-Treasurer, Lachlan Gibb ; Council, Henry H. Lyman, G. O. Dunlop, A. E. Norris,

The retiring President then vacated the chair, which was taken by the new President, who read an interesting paper on "Collecting at Electric Light."

After discussion and the examination of specimens brought by the members the meeting adjourned.

LACHLAN GIBB,
Secretary-Treasurer.

REPORT OF THE TORONTO BRANCH.

The third annual meeting of the Toronto Branch of the Entomological Society of Ontario was held in the Education Department (Normal School) on Friday evening, the 7th April, 1899.

The following members were present : Messrs. Cherry, Stewart, Walker, Fenwick, Wilby, Austen, Kinghorn, Gibson (Secy.-Treas.), Carter and Tyers ; visitor : Mr. Wm. Watkins.

In the absence of the President and Vice-President, the Secretary was requested to act as Chairman.

The minutes of the previous regular meeting were read and approved.

The Secretary read the following report of the Council for the year ending 31st March, 1899 :

REPORT OF COUNCIL.

The Council of the Toronto Branch of the Entomological Society of Ontario take pleasure in presenting the third annual report of the proceedings of the Branch for the year ending 31st March, 1899.

They have much gratification in stating that, since the last annual meeting, four new names have been added to the roll of membership, viz, Messrs. E. M. Walker, G. M. Stewart, Allan Kinghorn and Donald Wilby, and the hope is expressed that all the members will endeavor to obtain other new additions in the near future.

During the past year twenty regular meetings have been held, the following papers being contributed from time to time :

"Relations existing between plants and insects," by Mr. S. R. Carter.

"Muskoka as a collecting ground," by Mr. A. Gibson.

"Notes on the collection and preservation of Botanical specimens," by Mr. S. R. Carter.

"The life history of *Xylina Bethunei*," by Mr. H. H. Lyman, of Montreal.

"The evolution of the insect," by Mr. E. M. Walker.

"What value is to be derived from a study of Entomology?" by Mr. A. Gibson.

"Head appendages of the Orthoptera," by Mr. G. M. Stewart.

During the collecting season three field days were held, viz., on the 24th May to Silver Creek, on the 11th June to High Park, and on the 18th July to High Park.

In December last, certain of the members being interested in plant life, the suggestion was made that a Botanical Section be formed, and the following motion was made by Mr. Carter, seconded by Mr. Walker, and duly carried: "That in view of certain members of the Society being interested in the study of Botany, a section be formed with the object of encouraging this branch of Natural Science, with the hope of securing new additions to the roll of membership, and also in view of the close relationship existing between the entomologist and the botanist, particularly from the entomological standpoint."

The report of the Librarian-Curator shows that the library and collection of insects is steadily increasing. Quite a large number of Government publications and other valuable books have been added to the library during the year.

The Treasurer's report shows a satisfactory balance on hand of \$9.43.

All of which is respectfully submitted.

R. J. CREW,

President

The report of the Treasurer was presented as also that of the Librarian-Curator, submitted by Mr. Gibson. On motion of Mr. Austen, seconded by Mr. Cherry, the reports of the Council, Treasurer and Librarian-Curator were adopted as read.

The election of officers for the ensuing year resulted as follows: President, Mr. Arthur Gibson; Vice-President, Mr. E. M. Walker; Sec'y-Treas., Mr. G. M. Stewart; Librarian, Mr. H. C. Austen; Members of Council, Messrs. R. J. Crew and S. R. Carter.

In the absence of the President the Secretary then read Mr. Crew's address, which was listened to with much interest and which contained many valuable suggestions. He mentioned that it was gratifying to know that the branch had enrolled four new members during the year, which strengthened it a good deal and hoped the members would encourage others to join and take an interest in the work. Among other things Mr. Crew suggested that during the following winter certain of the meetings be set aside for certain subjects, all the members bringing as much information as they can about these subjects to the meeting in order that all may take part in the discussion and get the full

benefit of the remarks. In this way he thought much interesting work could be accomplished. And if certain evenings were also set aside for dissecting and studying the anatomy of certain insects much useful information would thus be available. He also touched upon the newly formed Botanical Section, which as yet has not taken much shape, but the hope was expressed that other botanists might be induced to become members and thereby strengthen the branch. Mr. Crew, in conclusion, thanked the members for the honor they conferred upon him in electing him as their President for the year just closed.

The meeting then adjourned.

ARTHUR GIBSON,
Secretary.

REPORT OF THE QUEBEC BRANCH.

The annual meeting of the Quebec Branch of the Entomological Society of Ontario was held on the 15th April, 1899, fourteen members being present; the President, Rev. Dr. Fyles, occupying the chair.

PRESIDENT'S REPORT.

The Quebec Branch of the Entomological Society has commenced the third year of its existence. It was formed on the 24th March, 1897, and the time since has been marked by steady growth and increased usefulness.

The annual meeting of 1898 was held at the house of the Secretary-Treasurer of the Association and was a happy and successful gathering. During the year following three very pleasant meetings were held at the homes of members: Mr. Thos. Poston, Levis; Mr. J. E. Treffry, Quebec; Mr. James Geggie, Beauport, and seven were held at Morrin College.

Field days were also pleasantly spent at Bergerville (June 5th), the Island (June 18th and August 4th), and at Levis Forts (July 21st). On these occasions many interesting captures of insects were made and much information concerning them imparted.

In the course of the year papers were read or addresses given on the following subjects:

The destruction of the forests, the Apidae, the Coleoptera, Garden Pests, Silk-worm moths, Arsenical spraying and Honey Bees, the Book of Nature, Spiders, Orickets, Wasps.

At one of the meetings beautifully illustrated Entomological works were exhibited by Miss Bowen, and a most interesting history of the Entomological Society of Ontario, written by Rev. Dr. Bethune, one of the founders of that society, was read by Miss Palmer, B.A.

The captures made during the year included the rarities: *Catocala bianca*, *Platartia parthenos*, *Spilosoma congrua*, *Lophopteryx elegans*, besides several undescribed species.

Of destructive pests, the only noteworthy appearances in this Province in 1898 were those of the Tent Caterpillars, *Oligocampa Americana* and *Oligocampa distria*. These were so numerous last summer in parts of the counties of Drummond and Shefford that they stripped the second growth trees bare. Should the coming season prove favorable to their increase they will probably do much harm. A forked stick thrust into the webs in the early morning or late in the evening when the caterpillars are "at home", and twisted round, will entangle the creatures in their habitations, which can then be drawn from the tree and trodden under foot.

On the 8th of November, the Montreal Branch celebrated its 25th anniversary, in the Natural History Society's Rooms, University Street. On this occasion eminent entomologists from London, Toronto, Ottawa and other places were present. The Quebec Association was represented by its president, who was specially deputed by its members to convey their congratulations to their Montreal *confreeres*.

It is gratifying to see the spread of interest in Entomological pursuits. The past year has been marked by the formation of "The North West Entomological Society." It numbers among its members the Right Reverend the Bishop of Calgary and Saskatchewan; John A. Simpson, M.L.A.; A. G. Wolly Dod, Esq., Secretary of the Fish Creek Agricultural Society; Dr. H. George, Vice-President of the Innisfail Agricultural Society; Wm. Posthill, Esq., J.P., Vice-President of the Red Deer Agricultural Society; John Y. Young, Esq., editor of the "Calgary Herald". The membership of this society exceeds forty already.

It is to be hoped that our own association will continue to flourish and will spread information concerning our insect friends and insect foes, and the right method of dealing with both. One of our leading botanists, while seeking to advance agricultural interests, truly said: "A good knowledge of Entomology is good for the farmer—*There is money in it.*"

REPORT OF COUNCIL.

Your Council has pride in producing this report for the approval of the branch as we have nothing but pleasure to note as to its working.

The branch now includes forty-two members; 28 adults and 14 juniors. The Treasurer's report gives a most satisfactory showing.

Several excursions were made, and the capture of many specimens—some of them rare—has rewarded the efforts of the members. As was remarked in a former report these excursions tend to bring about a good feeling of comradeship and are beneficial in every way. The younger members of our branch have been extremely keen in hunting for and acquiring specimens and their efforts have been highly successful.

The largely increasing membership affords much reason for congratulation.

Our thanks are due to the authorities of Morrin College for their kindness in placing a room at the disposal of the branch for its meetings.

JOSEPH EVELEIGH TREFFRY,
on behalf of the Council.

The following officers were elected:

President, Rev. Thomas W. Fyles, D. C. L.; *Vice-President*, Miss Macdonald; *Council*, Hon. Richard Turner, Mr. J. Eveleigh Treffry, Prof. H. Walters, Mrs. R. Turner, Miss Bickell, Miss B. Winfield; *Secretary-Treasurer*, Lt. Col. Crawford Lindsay; *Curator*, Prof. H. Walters.

Since the annual meeting in April the Branch has held four regular meetings and four field days.

The Branch now numbers thirty-two adults and fifteen junior members.

CRAWFORD LINDSAY,
Secretary-Treasurer.

Quebec, October 7th, 1899.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

BY REV. THOMAS W. FYLES, D.C.L., F.L.S., DELEGATE.

The Entomological Society of Ontario held its 35th annual meeting in Montreal on the 8th and 9th days of November last. The Society is gaining ground—is lengthening its cords and strengthening its stakes, or, to use another figure, is rooting itself more firmly in public estimation, while its ramifications are vigorous and fruitful.

Originated in 1863, through the efforts of a very few earnest men, who were impressed with a sense of the practical value of Entomological pursuits, the Society has

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steadily progressed till it has attained a degree of importance that insures for it the respect of scientific men "all the wide world over." Its publications are now circulated in 22 countries, in the four quarters of the world. On this continent, not only are they distributed throughout our own dominion, they are sent also to no less than 40 of the states and territories of the great Republic to the south of us.

At 429 Wellington Street, London, Ont., the Society has its headquarters—a large, convenient and well appointed room, with a valuable library of 1,600 volumes, and cabinets containing many thousands of choice specimens, contributed by its members or obtained by purchase or donation. Among its treasures are special collections, such as the Pettit collection of Coleoptera, the Loomis collection of Japanese butterflies, the Moffat collection of Canadian Lepidoptera, acquisitions gained through years of research by skilful, scientific men.

The Society's librarian and curator is Mr. J. Alston Moffat, a man devoted to his work, well acquainted with the objects under his care, and most kind and obliging to those who seek information from him. The room is open at all convenient hours; and an examination of its contents will well repay the naturalist who will take the time to visit it.

The various sections of the Society are working zealously. The Botanical section reports the discovery of three plants new to the district of London. It also draws attention to a species of wild lettuce (*Lactuca scœvola*) that is rapidly spreading, and becoming troublesome to the agriculturists of Middlesex County, and to a species of dodder (*Cuscuta epithymum*) that flourishes upon clover. The Microscopical section has held 9 meetings in the course of the year. Papers on "Shine Moulds," Bacteria, Radiolaria, Diatoms, and Marine Algae, were read before it. The Geological section met weekly throughout the year. Its report describes the bituminous shales of Kettle Point, the "Crystal Cave" at Put-in-Bay, and the strontium found in it. The Alvinston shales; the dolomite rocks at Galt, and the new oil-field in Sarnia Township.

Notes on the "Insects of the Year" have been sent in by the Society's divisional directors:—Messrs. W. Hague Harrington, Ottawa; J. D. Evans, Trenton; Arthur Gibson, Toronto; A. H. Kilman, Ridgway; R. W. Rennie, London. These notes appear in the Society's annual report.

Flourishing branches of the Society exist in Toronto, Montreal, and Quebec. That of Montreal is particularly deserving of notice, forasmuch as it has recently celebrated the 25th anniversary of its formation. To do honor to the occasion the parent society held its annual meeting in Montreal, and the Natural History Society and the Microscopical Society of that city gave their aid and support. The proceedings were of a most interesting and enjoyable character.

The Society's monthly organ, "The Canadian Entomologist," completed its 30th volume in December last. In this volume articles from 53 contributors may be found. Some of the authors wrote from such distant places as Cape Town, Africa; Hildesheim, Germany; Mesilla, New Mexico; Massett, Queen Charlotte Islands. The volume contains, amongst other important matter, descriptions of 35 new genera, and 190 new species of insects, and it is illustrated with six plates, one of which is beautifully coloured. Among the more important articles are:—

A generic revision of the Lachneidæ, by Harrison G. Dyar, Washington, D. O.

On the history and habits of the "Wood Engraver" Ambrosia Beetle, by A. D. Hopkins, Entomologist, West Virginia Agricultural Station.

The Coleoptera of Canada, by H. F. Wickham, Iowa City.

"New and little known bees," by T. D. A. Cockerell, N. M. Experiment Station.

"Some Indiana Acrididæ," by W. S. Blatchley, Indianapolis, Ind.

"New species of Chionaspis, and notes on previously known species," by R. A. Cooley, B. S., Amherst, Mass.

"New species of North American Myrmelionidæ," by Rolla P. Currie, Washington, D. C.

"Metallic species of Basilodes and new species of allied genera," by R. Ottolengui, New York.

"Descriptions of new genera and species of the Geometrina of North America," by Geo. D. Hulst, Brooklyn, New York.

"Notes on some Ontario Acridiidae," by E. M. Walker, Toronto.

"Classification of the Horntails and Saw-flies, or the sub-order Phytophaga," by William H. Ashmead, assistant curator Dep. of Insects, U. S. National Museum.

"Additions to my Synopsis of the Tachinidae," by D. W. Coquillett, Washington, D. C.

The twenty-ninth annual report of the Society "(published by the Ontario Department of Agriculture, Toronto), printed by order of the Legislative Assembly of Ontario," has just been issued. It is embellished with portraits of William Hague Harrington, F. R. S. C., president of the Entomological Society of Ontario, 1893-5, and John Dearness, I. P. S., president of the Entomological Society of Ontario, 1895-7, and also with 67 figures of insects. It contains a full account of the annual meeting, reports from the officers and the various divisions and branches of the Society, the President's address, articles entitled:

"Some economic features of International Entomology," by F. M. Webster.

"The farmer's garden and its insect foes," by the Rev. Thomas W. Fyles.

"Entomology in schools," by Wm. Lochhead, Ont. Agr. College, Guelph.

"Injurious insects in 1898," by Dr. James Fletcher, Ottawa.

And a number of short papers of great value.

In the president's address attention is drawn to some remarkable experiments, of interest to biologists, made by Mr. Henry E. Crampton, jr., of the Department of Zoology of Columbia University. Mr. Crampton succeeded, in a number of instances, in grafting one insect in the pupal stage upon another in the same condition. For instance, he cut off the head portion of one chrysalis and several segments of the abdomen from another, and then joined the main portions of the two by means of a ring of paraffin. Coalescence was completed and, after a time, a living, eight-winged monstrosity was produced.

The disposition evinced by some, in the present day, to tamper unnecessarily with the nomenclature and classification of insects, now accepted, is also spoken of. Our systems are not perfect, but the day for a thorough revision of them has not yet come, and will not till the life histories of the various species, and the literature respecting them are better known. The late Dr. Lintner did excellent work in tracing such histories, and in heading his remarks with names and synonyms and references to authors. His work in these respects as in others is a model for entomologists.

In connection with this subject, the paper by Mr. Dwight Brainerd, in this same report, on "The preparation of specimens for the exhibition of life histories in the cabinet" will be found valuable. The plate that accompanies it shows groups of insects in all stages. There are the eggs, the larva, the pupa, the perfect insects (both types and varieties), the wings denuded of scales to show the venation, and the parasites that assail the species. From an educational point of view, a complete collection on Mr. Brainerd's plan would indeed be accounted a treasure. The article is the more valuable because the author describes his methods of preparing specimens for the cabinet.

Another important paper in the report is Prof. Wm. Lochhead's "Entomology in the Schools", showing *Why? How? and When?* the subject should be brought before the rising generation.

It is hoped that sufficient has been said to show that the society's publications are of value. Prepared chiefly for the agricultural community, its reports deal largely with troublesome insects and the methods of destroying them; but the beautiful and beneficial species are not overlooked in them; and even, as regards the less attractive kinds, so much that is wonderful in their structure and life histories is made known to us—so clearly is it shown that through and beyond the trouble they may give to man, destructive insects have important parts to play in the economy of nature, that our admiration is excited, and we feel the truth so quaintly expressed by the Rev. George Herbert:

"Nothing we see but means our good,
As our delight, or as our treasure;
The whole is either our cupboard of food
Or cabinet of pleasure.

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THE NATIVE HOME OF THE SAN JOSE SCALE.

By F. M. WEBSTER, WOOSTER, O.

In the July, 1898, number of the Canadian Entomologist, I published a short discussion on this subject, giving the results of some, then recent, examinations of nursery stock, coming directly from Japan. I there also referred to a short note by Prof. T.D.A. Cockerell, in Entomological News, Vol 9, pages 95 and 96, to the effect that Mr. Alexander Crow, Quarantine officer at San Francisco, California, had two or three times found this insect on trees from Japan, and notably on a plum tree that arrived Jan. 25th, 1898. After this note of mine had been published, Mr. F. A. Sirine, one of the entomologists of the New York Experiment Station, located at Jamaica, N.Y., wrote me that there was some pretty good evidence in his possession indicating that the San José Scale had been established on Long Island a much greater length of time than was supposed; that its occurrence there possibly antedated its appearance in New Jersey. When I prepared my paper for the 1898 meeting of the Entomological Society of Ontario, entitled "Some International Problems in Applied Entomology," and, on again going over my notes, it appeared to me that, with the amount of material in my possession and its appearance, I had sufficient evidence not only to verify all that had been stated or written, but that I had almost the conclusive evidence wanted to prove that Japan was the original home of the scale, and that it was, as with the Gypsy moth, being kept reduced and in subjection by its natural enemies. I did not, at the time, have in my possession a paper published in the June, 1898, Massachusetts Crop Report by Mr. A. H. Kirkland, in which he makes the following statements:

"While it is generally conceded that 1887 marks the date of the first importation of the scale to the east, a case has recently come to the writer's attention that would indicate the possibility of the occurrence of the San José Scale in a Long Island nursery at a date somewhat earlier than that of the New Jersey infestation, and possibly as a result of the direct importation of trees from Japan. The facts are these:

In the vicinity of Boston there is an educational institution where particular attention is given to the study of trees and shrubs. On the grounds of this institution, there is a colony of the San José Scale which is confined in great measure to a plot of perhaps thirty Japanese quince bushes. These bushes, according to the testimony of those in charge of the grounds, "have been infested for many years." Careful records of all trees planted are kept by the authorities of the institution, and in this case the records show that the bushes in question were purchased from three sources: the firm of James Veitch & Sons, London, England, in 1881; Louis Spath, Rixdorf, Berlin, Germany, in 1888; and the Parsons & Sons Company, Flushing, Long Island, in 1884. The greater part of the bushes were obtained from the latter source, and these are infested to the greatest extent, although the scale occurs on all of them. The infestation of this nursery for many years past is a matter of common knowledge among entomologists and nurserymen; also the fact that this nursery has paid especial attention to the importation and distribution of Japanese stock. Unfortunately, all these Japanese quinces were grown for one season in a very compact plot and their infestation is so general that it is impossible to decide which were the ones originally infested. From an inspection of the grounds, it is evident that these bushes are the centre of infestation in this colony; and, unless it is shown that the English and German nurseries are infested, of which there is no evidence at present, the natural inference is that the Long Island nursery is the source from which the infested stock was obtained, thus antedating the New Jersey occurrence by about three years. Again, the conclusion that the Long Island stock was the source of the scale at this particular locality may be placed the length of time elapsing since its purchase,—some fourteen years. The time required for the killing of trees by the scale is placed by Messrs. Howard and Marlatt at from two to three years. In the south, where the active season of the insect is longer than it is here, and the warmer climate more favorable to its multiplication, undoubtedly this may be the case. It is also prob-

able that a longer time is required for the destruction of trees from this cause in this region ; for we have records of an apple orchard at Scituate, Mass., planted in 1892 with infested trees two or three years old, of which about 90 per cent., although very badly affected, were alive in 1897, at which time remedial measures were applied. Since a Japanese quince with vigorous roots will throw out an abundance of new shoots year after year as the old wood dies off, the continued infestation since 1884 of the bushes previously mentioned does not seem beyond the limits of possibility."

Quite recently, some exceptions have been taken to the statement that I made in my paper last year, presented to the Entomological Society of Ontario, in which I used these words, "I have been able to prove almost conclusively that Japan is the original home of the San Jose Scale." The arguments against this are that Mr. Koebele and some of the Japanese entomologists searched for San Jose Scale in Japan, but did not find it. If this means anything at all, it might mean that the scale was present but kept thoroughly in subjection by its natural enemies, and perhaps some other resistant elements of which we are, as yet, unacquainted. Another argument is that the scale may have been introduced into Japan, from California, and was now, for the first time, being received back again from that country. At present, we have no record of any very old introductions of nursery stock from California into Japan, and if there were, it would be difficult to prove, or even to show evidence that these were infested with the San Jose Scale. The nursery stock that I have myself examined came direct from Japan, and gave every possible indication of its having been quite numerous where the stock was grown ; and the occurrence differed very materially in appearance from the ordinary occurrence upon nursery stock, as witnessed in this country. Up to the present time, I see no reason whatever for modifying the statements that I have made. I do not claim that there is, as yet, conclusive proof that the scale came to us originally from Japan, but that the evidence points almost conclusively in that direction, I feel as confident as I did when I prepared my previous statements. Of course, there is nothing left to do but trust to time and future investigations to solve the problem. Entomologists in Japan can certainly throw a great deal of light upon this problem, and if the question can be settled, finally, either in the affirmative or negative, I shall be entirely satisfied. I do not care a straw whether the San Jose Scale is, originally, a native of Japan or not, but I do care a great deal as an entomologist, to know just the fact in the case, not as a matter of self-interest but as a scientific fact.

SOME NOTES ON THE LARVAL HABITS OF THE GRAY HAIR-STREAK BUTTERFLY.

(*Uranotes melinus*, Hubn.)

BY F. M. WEBSTER, WOOSTER, OHIO.

The larvæ of the Gray Hair-streak have long been known to injure beans by eating their way into the pods and devouring the young growing beans therein. In *Insect Life*, Vol. VII, p. 354, the statement is made that these larvæ, though long known as injurious to the hop, had also been known to injure young beans in New Jersey, District of Columbia and California. †

On July 3, 1899, a correspondent of mine, Mr. Henry Hurd, Carthagenis, Ohio, sent me a pea pod in which he had found a worm of some sort, eating the peas. The pod reached me in good condition, and clearly indicated the seriousness of the attack, but the predator had eaten out of the box and through the wrapper, and doubtless was lost in the mail sack. On July 10, Mr. Hurd sent a second larva, which reached me alive, but it never developed. Mr. Hurd stated the first one sent, ate three grown peas and gnawed into a second pod within the space of a few minutes.

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On July 7, the Station janitor brought me some larvæ which he stated were eating into the pods of his garden beans. These larvæ were placed on a hill of beans and covered with a breeding cage. On August 8, a single adult *Uranotes (Thecla) melinus*, Hübn, was found dead in the cage.

On August 14, a correspondent, Mr. Fred. Ruth, Clifford, Ohio, sent two larvæ which he had found in the silk in the tips of the ears of corn in the field. As he had found adults of *Diabrotica longicornis* in the same situation, Mr. Ruth supposed that they were the adult insect from these larvæ. As soon as they were received they were at once recognized and placed upon young bean pods, upon which they at once began to feed. On August 22, both pupated, and from one of these pupæ an adult issued on September 1, while the other has up to this date, October 4, remained undeveloped.*

While we lost the first larva sent by Mr. Hurd, the second was recognized, and if it was not of the species under consideration, it certainly belonged to a species closely allied to this. Thus we have the pea as a probably new food plant, and the silk of corn on the ear as an undoubted additional new food plant for the species, and certainly rather a unique locality for the larvæ to be found in.

According to the article referred to in the beginning, which by the way is illustrated, the habitat of the species is given as Canada (rarely); and south to Indian River, Florida, and quite to the Mexican border, Mexico, Central America, Venezuela and the Antilles. The present is the first year that my attention has ever been called to the work of the larvæ.

SAN JOSE SCALE.

The meeting was called to order at 2.30 o'clock, the Vice-President, Rev. Dr. Fyles, occupying the chair. After a number of papers (which are given in subsequent pages of this report) had been read and discussed, the consideration of the San Jose Scale insect was again taken up. The Secretary reported that the Special Committee had been unable to arrange any time for a meeting. Mr. Dearness said that as the whole of the previous afternoon had been spent in a conference upon this insect, it would be a pity if no action were taken by the Society; he accordingly moved that the meeting be considered as a committee of the whole, which was adopted.

At the request of the members present Mr. Dearness read a synopsis of the report of the Commissioners appointed by the Hon. the Minister of Agriculture to investigate the San Jose Scale last summer, and explained various points in connection with it.

Dr. FLETCHER said that one of the great difficulties in the way of carrying out the recommendations of the Commissioners was the liability of the orchard owners to evade the law as far as possible, and to neglect the means recommended for checking the pest. The feature of the report which would probably be most objected to was the boarding of the men sent by the Government to perform the work, but this might be overcome by sending them to the nearest hotel for the short time that they would be in the neighbourhood. He thought that the Minister of Agriculture had acted very wisely throughout this matter, and that great care had been exercised in the selection of inspectors; if any were found inefficient their services were at once dispensed with.

After some further discussion the following resolution, moved by Dr. FLETCHER and seconded by Dr. BETHUNE, was unanimously adopted:

"This Society has watched with keen interest and wishes to express its hearty approval of the measures adopted by the Hon. the Minister of Agriculture and Arts for Ontario for the suppression of the San Jose Scale, and the wise and judicious manner in which he has endeavoured to carry them out."

* From this pupa the butterfly emerged on January 4th, 1900, thus shewing that of two larvæ, probably from the same brood and same mother, one may develop to the adult in September, and the other go over until the following spring.—F.M.W.

Several other papers were read and discussed, including the reports of the Directors on the noteworthy insects of the year in their respective divisions.

Dr. Fletcher exhibited some rare or otherwise interesting specimens, several of which he presented to the Society.

Hemileuca Maia var *Lucina*. This is the form of the species which occurs in Manitoba, the specimens presented had been taken by Mr. Norman Criddle, at Aweme, in Manitoba. In July, 1898, Dr. Fletcher had taken two nearly full grown larvae feeding on aspen at Bird's Hill a few miles from Winnipeg, and had bred the moths the same autumn. Variety *Lucina* differs from the species in the much greater area of white on the wings.

Colias Emilia—A fine pair presented which had been taken by Mr. C. de B. Green at Osoyoos. The eggs of this species are laid on *Astragalus frigidus*. It is a larger species than *Colias Christina*, some forms of which it resembles, particularly in the female sex. The eggs of *C Christina* Dr. Fletcher had seen deposited by the females on *Salix desertorum* at Olds, N.W.T.

Colias Edwardsii exhibited, which had been collected and seen in some numbers at Arcols, Glen Adelaide, Clare, Alameda, Carnduff and Gainsboro, in the south eastern part of the N.W.T. Females were seen ovipositing and eggs were collected on the Prairie Bean, *Thermopsis rhombifolia*. This species resembles closely *C. Alexandra*, but is smaller and has the margins partly fringed with pink.

Pamphila Manitoba, var *Assiniboia*, specimens of both sexes presented which had been taken at Regina in 1886.

Chrysophanus Helloides, var *Florus* (female) presented, taken at Vernon, B.O.

Argynnis Chariclea presented, taken at Mount Cheam, B.O.

Coenonympha inornata, presented, taken in large numbers in the N.W.T. this year.

Vanessa Californica, presented, one of the first specimens taken in Canada, caught in Victoria, B.O., 1885.

Carterocephalus Mandan, presented, a large form taken at Laggan in the Rocky Mountains which has been written about in the Canadian Entomologist by Mr. T. E. Bean in 1893 as *C. Palæmon*.

Lyda multisignata, a new pest of the raspberry. The specimens presented were bred from larvae, which had been sent from St. John, N.B., where they had been injurious for three years.

Crioceris asparagi and *C. 12-punctata*, the two asparagus beetles; first recorded as injuring asparagus in Canada this year. Both forms were abundant at Queenstown and other places in the Niagara peninsula.

Gonioctena pallida, specimens were presented. This beetle has been very abundant in many parts of the Northwest and Manitoba for three seasons. Aspen poplars have been entirely defoliated over large areas. They were less numerous last summer.

The following were exhibited :—

Lepisesia ulalume, a very rare species representing on the Pacific coast the eastern *L. flavofasciata*. The specimens were taken at New Westminster by Mr. Dashwood-Jones. The flight of *L. flavofasciata* was described and its close resemblance to a bumble bee when flying referred to.

Thecla strigosa bred from larvae found attacking green plums by Mr. W. M. Orr. at Fruitland, Ont.

Thecla Iroides, bred from larvae eating green apples at B.C., found by Mr. E. A. Carew-Gibson. The habit of boring into their food had also been noticed with the young larvae of *Thecla Nippon* which feeds on the young shoots of white pine.

Erebia Epipsodea. This species had been bred again this year from eggs received from Mr. N. B. Sanson, of Banff, Alta. There were only three moults as had been

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previously recorded by Mr. Lyman, but the mode of pupation was slightly different from that described by Messrs. Lyman and W. H. Edwards, the chrysalis being surrounded by several spans of silk in the same way as had been observed by the speaker in the case of *E. Discoidalis*. *E. Epipsodea* is an abundant species on the prairie from the western borders of Manitoba through the Rocky Mountains to the interior plateau of British Columbia. It was seen in hundreds on the prairies in the early part of last July.

Heliothis armiger. A specimen bred from a green larva found feeding upon geraniums in a greenhouse, late in the autumn of 1898, the moth of which had emerged in the summer of 1899.

Chinobas Macounii, eggs were shown which were laid by a female among the thorns on the dead twigs of a wild rose, at Nepigon. The bush standing in full sunlight on a sandy bank and no plant of *Carex* or grass could be found within 10 feet. The female was seen to lay three eggs all on the dead twigs. These hatched in the ordinary time of 15 days.

Chrysophanus Thoe. Full grown living larvæ were shown, reared from eggs laid in confinement late in August. Of about 40 eggs half had hatched, but in nature it was thought by the speaker that as a rule the eggs did not hatch until the following spring. He had discovered that the females laid their eggs not on the seed pods of the dock, as had been previously thought, but low down on the root leaves and at the base of the stem, where they would be covered up with snow during the winter. Many eggs were found on plants growing in the water, and within an inch of the surface. The larvæ during the three moults, as well as the beautiful green and pink pupæ, were shown, also brown pupæ and a dipterous parasite (*Exorista confinis*). Larvæ and eggs had been found on *Rumex orbiculatus*, but larvæ fed readily on all docks offered except *Rumex obtusifolius*.

A beautiful collection of inflated larvæ, prepared by Mr. C. H. Young, of Ottawa, was exhibited, and, the value of this method of preserving a permanent record of larvæ for study was urged. Mr. Arthur Gibson, Assistant in the Division of Entomology, had also prepared some nice specimens, which were exhibited.

Lycana Anna—A fine series of this rare species was exhibited with the larvæ and pupæ. Almost full grown larvæ had been found on the 8th of August last at a height of 7,000 feet on Mount Che-am, B. C. The larvæ are green, and feed on the leaves of lupins. The interesting discovery was made that the larvæ when full grown crawl down the stem and burrow down to pupate, from an inch to two inches beneath the surface of the ground, as a rule following the stem and remaining attached to it. Five females and three males were exhibited. These showed considerable difference in the markings of the lower side.

Benacus griseus—A specimen of this large water bug, taken at Toronto, was shown, and the difference between this species and *Belostoma Americana* pointed out. The members were asked to examine all large water bugs seen beneath electric lights, so that the range of the two species might be ascertained. Although sought for carefully at Ottawa, *Benacus* had never been detected there. In *Benacus* there is no deep groove down the middle of the cushion-like area on the front raptorial claws.

The Pea Aphis, *Nectarophora destructor* Jnsn. (n. sp.) Specimens of the Destructive Pea Aphis, together with three parasites, were shown, and a statement made as to the injuries inflicted by this pest during the past summer. Colonies had appeared in various places from the Maritime Provinces to the western portions of Ontario.

On motion of Mr. W. E. SAUNDERS, seconded by Mr. BALKWILL, it was resolved that the thanks of the Society are due and are hereby offered to Dr. Fletcher for his kindness this year, and on many previous occasions, in presenting a number of valuable insects to the Society's collection.

The meeting adjourned at 4.30 p.m. in order to enable the members from a distance to catch their respective trains. It was the unanimous opinion of all present that this was the most useful, interesting, and also entertaining, meeting that the Society has ever held.

NOTES ON SOME INSECTS OF CONIFEROUS SHADE TREES.

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Chermes Abietis (Spruce Gall Louse). Many complaints were made in May about an insect which was attacking spruce trees. The terminal, young shoots were first attacked, then the immature leaves of the buds became enlarged at their base, and the tissues were gradually killed, so that the twigs curled up and died. Conspicuous woolly

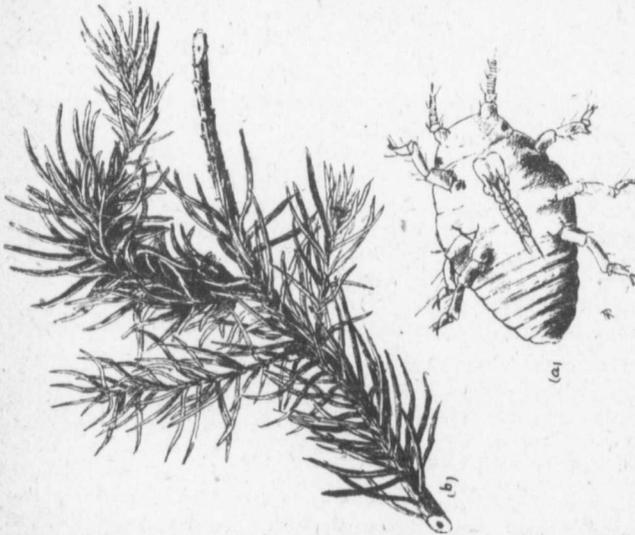


Fig. 8. Spruce Gall Louse. (a) Summer form of nymph. (b) A sprig of White Spruce, with one twig affected by galls produced by the young lice.

secretions were observed on the leaves of the spruce about the first week in May. These secretions enveloped masses of yellowish eggs (200 to 300 in number). About a week later the eggs hatched, and the young lice moved to the bases of the young leaves of the shoots, when enlargements began to form. A fine spruce hedge at the Agricultural College was infested so badly that it was feared that the fine trees would be permanently disfigured, and even destroyed. An examination of the new leaves revealed a louse at the base of nearly every new leaf, and the deformation of the twig were becoming quite evident. A later examination showed the presence of several fat syrphus larvæ, which had taken up their quarters at the bases of the leaves, and were feeding quite greedily on the lice. Many other buds were examined from different parts of the hedge, and in every case syrphus larvæ were found. To spray this tall hedge with whale oil soap and tobacco solution appeared a gigantic task, and to clip off the infested twigs was not to be thought of, as such an operation would be a life's task. Just at this juncture, when there seemed no other expedient but to leave the control of the lice to the syrphids, Dr. Howard, of Washington, who had been consulted in the matter, wrote as follows:

"Your best hope of relief seems to be in the probable ultimate appearance of some parasitic or predaceous enemy; and, when the gall louse is as abundant as you describe, I think relief in this direction will shortly be forthcoming."

Accordingly the lice were left to the tender mercies of the syrphids.

Observations during the remainder of the season were made rather intermittently on account of absence from College for several weeks; but, on August 19th, another examination of the galls and twigs was made. Woolly secretions were again observed which contained masses of eggs (30 to 40 in number). A few adult winged forms and many young lice were seen but in numbers not to be compared with those seen in May. Many syrphus larvæ were again found. On August 31st some of the infested twigs were again examined, but there were very few lice, no eggs and no adults, while the syrphids were quite numerous, and occupied tunnels in the leaf bases between the galls.

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That Nature has done her work well, it is sufficient to state that the hedge never looked better than at present. Later shoots have appeared, and a stranger could scarcely tell that an insidious pest had started to work there in the spring.

Professors Fernald and Cooley, of Amherst, issued a bulletin on *Chermes abietis* during the winter. As the observations of the life-history of the Spruce Gall Louse at Guelph correspond very closely with those of Fernald and Cooley, a synopsis of the life-history is here given :

Summer Brood :

- 1.—In early spring—white woolly mass containing about 300 eggs, on new shoots.
- 2.—Eggs hatch in about one week, and nymphs settle in bases of young shoots.
- 3.—Three moults ; antennae of 3 segments.
- 4.—About Aug. 10, winged adults—females—appear, antennae of 5 segments.
- 5.—Two days later eggs (40) are laid covered with a woolly secretion near tip of leaf.
- 6.—Eggs hatch in two weeks.

Winter Brood :

- 7.—Nymphs, antennae of 3 segments, spread over limbs near by, some attaching themselves to leaves, some at axils.
- 8.—Pass winter at base of buds, nearly all killed.
- 9.—About April 20, moulting begins, and nymphs grow very rapidly, secreting a copious woolly coating.
- 10.—Eggs are laid about May 1-10, and females soon die.

References :

1844. Ratzeburg—Forest Insects—p. 200.
 1869. Packard—Guide to the Study of Insects—p. 522.
 1876. Thomas—Transactions Illinois Hort. Soc.—p. 198.
 1881. Ormerod—Manual of Injurious Insects—p.p. 240-244.
 1888. Comstock—Introduction to Entomology—p. 160.
 1890. Packard—Forest Insects—p. 853.
 Buckton—British Aphides, vol. IV.—p. 31.
 1896. Ohlodkowski—Zoolog. anzeig, Jan. 1896—p. 37.
 1898. Brodie—Bureau of Forestry, Ont. Dep. Ag.—The Spruce Gall-Louse.
 1898. Fernald and Cooley—The Spruce Gall-Louse.

Lygæonematus (Nematus) Erichsonii (Larch Saw Fly.) On June 1st many adult females were observed ovipositing on the underside of the stems of the terminal shoots of the larch or tamarack.

During oviposition the female hangs head downwards, and the eggs are laid in incisions on the under side of the axis of the terminal shoots. (Fig. 9, c.).

The slits in which the eggs were placed very closely were made in two rows. The eggs were of a glassy white color and spindle-shaped.

On June 5th but few females were found. The axis of the shoots on which the eggs had been laid were turning brown, and were bending, owing to the death of the tissues in the region of the slits.

Three days later (June 8th) minute larvæ varying from $\frac{1}{4}$ to $\frac{1}{3}$ of an inch in length were found. Their heads and the six true legs were shining jet-black. The larvæ have the habit of curling their tails over their backs whenever disturbed.

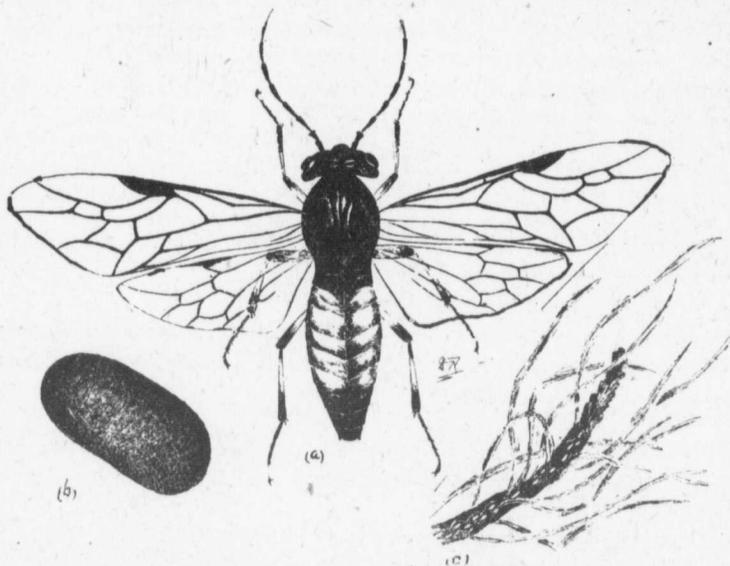


Fig. 9. Larch Saw-Fly. (a), the saw-fly with wings outspread; (b), the brown pupa case; (c) terminal twig of larch showing eggs in slits made by the female saw-fly.

On June 10th the larch grove was sprayed with Paris Green ($\frac{1}{2}$ lb. to the barrel) but as this solution was rather weak, and as many of the trees towards the centre of the grove could not be thoroughly sprayed, or even sprayed at all, the trees were found to be still infested three weeks later.

The larvæ grow rapidly, and at maturity are nearly one inch in length. The defoliation of the larger trees near the centre of the grove was almost complete.

On July 20th no larvæ could be found; those that had survived the Paris Green had descended to the ground, and pupated. The oval, spindle-shaped pupæ (Fig. 9 b) could be found quite abundantly under the trees among the litter of leaves. These remain in the ground all winter, and the adults will emerge about the end of May.

References:

1844. Ratzeburg—Forest Insects—p. 121.
 1881. Hagen—Can. Ent.—p. 37.
 1883. Fyles—An. Rep. Ent. Soc. Ont.—p. 17.
 1884. Fletcher—An. Rep. Ent. Soc. Ont.—pp. 72, 77.
 " Harrington— " p. 68.
 " Fletcher—Can. Ent., Nov.
 " Fyles—Can. Ent., Nov.
 1885. Fyles—An. Rep. Ent. Soc. Ont.—p. 12.
 1886. Jack— " p. 16.
 1887. Lintner— " p. 32.
 1888. Saunders— " p. 31.
 1889. Howard— " p. 26.
 " Fletcher— " p. 38.

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1889. Lintner—Fifth Rep. N. Y. State—pp. 164-173.
 1890. Packard—U. S. Ent. Com. V. Rep., Forest Insects—p. 879.
 1891. Fyles—Am. Rep. Ent. Soc. Ont.—pp. 28, 30.
 1893. Harrington— “ —pp. 19, 21.
 “ Lintner—Eighth Rep. N. Y. State—pp. 168, 169.
 1894. Fyles—Am. Rep. Ent. Soc. Ont.—pp. 4, 5.
 1896. Marlatt—Revision of the Nematinae of North America—pp. 111, 112.
 1898. Hutt—Am. Rep. Ent. Soc. Ont.—p. 94.

Lyda sp.; (Colorado Spruce Saw-Fly.) On May 30th several black saw-flies were observed resting on the leaves of an ornamental spruce, the Colorado spruce (*Picea*



FIG. 10.

fulgens), on the College grounds. These saw-flies had a wing expanse of one inch and a quarter, while the body was nearly three-quarters of an inch in length. On several of the branches were large masses of castings which were over two inches in diameter. These masses of castings were never situated at the ends of the branches, but about midway on the branches. The leaves in the neighborhood of the castings had been eaten by the large greenish-black larvæ which occupied silk-lined tunnels within the mass. (Fig. 10.)

No eggs could be found at the time the adults were seen. A good spraying of Paris Green was given, since which operation no larvæ have been found. It is evident that the *Lyda* saw fly is a very destructive insect to this spruce, and should conditions ever arise when the larvæ were numerous, the damage would be very considerable

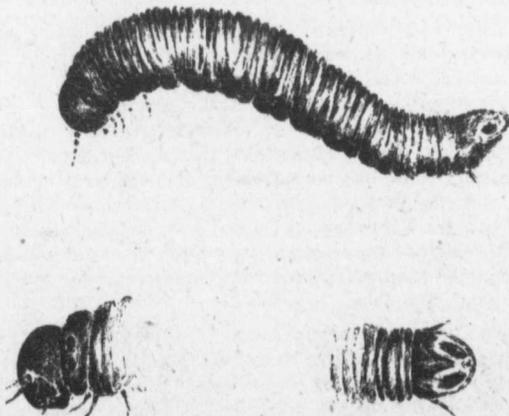


FIG. 11.

The adults are larger than the adults of the larch saw-fly. Their abdomen is depressed and flattened. Their front wings are about as long as the thorax and abdomen

together, and across the middle of each wing is a cloudy band. Their feelers or antennae, composed of many joints, are long and setaceous.

Their legs are light yellow in color, as are also the basal joints of the antennae and the mandibles. The tarsi of all the legs have five segments.

The caterpillars (Fig. 11) when full-grown are about an inch and quarter long. The head, the dorsal portion of the first segment of the thorax, and under surface of the whole thorax are black. The body is dull olive-green in color, and very much wrinkled. There is a prominent zig-zag lateral line on each side at the junction of sternite and pleurite. There is also a prominent V-shaped ridge on the upper surface of last segment, and the depressed areas between this ridge and the elevated lateral ridge are black, as is also the lower surface of the last segment. The antennae are short and 7-jointed; the last pair of legs are 3-jointed.

Curiously enough the larva corresponds very closely with an undetermined larva, figured and described by Packard in his *Forest Insects*, page 852. Dr. Packard does not appear to have seen the adult.

THE ELECTRIC LIGHT AS AN ATTRACTION TO MOTHS.

By ARTHUR GIBSON, ASSISTANT-ENTOMOLOGIST, CENTRAL EXPERIMENTAL FARM, OTTAWA.

A good deal has been written of late years on the many beautiful and rare moths which have been captured while collecting around the electric lights of cities and towns. The attraction that these lights have for moths, especially in situations on the outskirts of a locality, is really astonishing, and the number of different species secured in a single season from a few visits to these lights is very considerable. Much useful work can in this way be accomplished, and many species which are seldom met with otherwise are quite often taken at the electric lights.

On warm, close, rainy-like nights especially, particularly in the month of June, swarms of insects of almost all kinds congregate around the electric lights, varying in size from the large *Attacus Cecropia* emperor moth, down to the tiniest of species. On cool, raw nights also moths are to be found fluttering around the lights, these conditions seemingly making little difference to them, and on nights when it is even pouring rain many species of moths are observable. Even this does not apparently lessen the attraction which the electric lights have for these insects, and on a visit on almost any night during the collecting season, moths of some kind are sure to be found.

I have often noticed and wondered at the abundance of males, and the scarcity of females around the electric lights. I have taken many males, of numbers of species, but have yet to take females of these, and even amongst our commonest species the males predominate to a large extent. Of course, it must be remembered that the females do not move around or fly such distances as the males do, generally staying near their food plant on which they lay their eggs. The males, on the other hand, being much stronger fly quite long distances, no doubt one reason being their endeavor to search for and locate the females, and in this way they come in contact more readily with the electric lights. Unless, therefore, the electric lights are so situated as to be in close proximity to the food plants, near where the females have emerged, it is likely that the collector would find but few of them. This may be one, and an important, reason for the scarcity of the females around the electric lights.

Many moths have a habit of circling around the electric light, and in a short time alighting on the telegraph pole, where, in numerous cases, they generally rest a long time, in fact, often until daybreak, and I have even found them there at all hours of the day. Specimens which have alighted on the poles are, of course, mostly easily captured, but those which circle round for half an hour, and even longer, tend considerably to try the collector's patience, but in the end he is often rewarded by either netting the specimen after it has circled lower, or else capturing it when with a sudden dart it descends,

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striking the ground. Quickness, however, is needed in the latter case, as quite frequently the specimen ascends again with as much rapidity as it descended. Sphingidae are particularly quick in this respect, and the collector has to be on the alert, and capture the specimen as soon as it descends. On the other hand, numbers of other moths are quite within reach and easy to catch, as they fly anywhere within the rays of the electric lights, not always flying close to the globe. Geometers are especially noticeable in this regard, and can be taken without much trouble. The large emperor moths have a habit of flapping near the ground, and are then generally easily caught.

The brilliant illumination from the arc lights seems to have a dazzling effect on many species, as after fluttering around for a time they often seek the dark, or shady, side of the telegraph pole, where they are often found resting. This I have noticed among many of the sphingidae, and more often among the arctiidae, the tiger moths being especially conspicuous in this respect. Many of the noctuids also are apparently dazzled, and hide from the light.

I have found that where another pole is within a few feet of the pole from which the electric light is suspended, numbers of "good things" seek a resting place thereon, and these are generally within easy capture. Those out of reach I have often dislodged by throwing up a piece of sod, or else a handful of caked mud. Some collectors use long rods with a net on the end for this purpose, but for my part I have found this a needless trouble, and the appliance is not always easy to handle, and it is difficult and often impossible to place the net just where it is wanted. In Ottawa the electric light poles have iron attachments, which are used by the electric linemen to climb the poles when the carbons require replacing in the globes, or the lamps repairing. It is therefore not much trouble for us to secure specimens which are resting on the poles. In Toronto, where I collected for a number of years, the globes have all to be lowered by the linemen for repairs, etc., and the poles do not have these iron attachments, consequently we had to devise other means whereby to secure the specimens. We first of all tried these long rods with the net on the end, and of course, with this aid secured many moths, but on the other hand many were still out of reach, so we afterwards discarded the long rods and generally secured any specimens we desired by simply throwing a piece of old sod, or caked mud at the moths, dislodging them from their place of rest, when they generally fell to the ground and were quickly bottled. At the entrance to the Experimental Farm at Ottawa is one of the best electric lights that I have ever collected at; within a few feet of this stands a telegraph pole, and during the past summer we took quite a large number of beautiful and rare moths while they were resting upon this pole, a much larger number of specimens being taken off this pole than off the one from which the light is suspended.

The best hours I have experienced for collecting at electric light are from 9 o'clock to about half past 10 o'clock, and after 12 o'clock to about 2 o'clock. I have never stayed later than this but I have been told by collectors who have stopped around the lights all night, that they took very few specimens after the latter hour. The earlier part of the evening until half past 10 o'clock or so seems to be the most productive.

If the collector is interested in breeding moths from the egg to the imago, the electric light furnishes a great help toward this end, as when a female is captured if it is desirable to obtain eggs, all that is necessary to do is to enclose her in a box, when she will, as a rule, deposit at least a portion of her eggs, provided she has not laid them before capture. I have often secured specimens in this way and had the pleasure of breeding the specimens to maturity. As an example I might cite that during the past summer I took a female of *Euprepia caja*, while collecting at the electric light, putting her in a box alive where she remained the whole night. By the next morning she had laid nine eggs, five of which hatched. I have succeeded in getting two of these larvæ past the sixth moult, and both, on the 9th inst. started to spin a slight cocoon. This occurrence is very remarkable as the larvæ of *Euprepia caja* are known to hibernate through the winter, but the reason mine have passed through all their stages and spun a cocoon, is probably no doubt due to the fact that they were kept very clean in doors and given

fresh food plant generally twice a day. I have taken descriptions of the different stages and will probably later on publish my notes in the Canadian Entomologist. Dr. Packard in his "Study of Insects" says that the larvæ of *Euprepia caja* moult from five to ten times. At the electric light females of moths are thus secured which might be hard to get otherwise.

While at the electric light, however, the collector has not everything his own way as there is another competitor, whose nature it is to also visit the lights for the purpose of catching moths and other insects. I refer to the bats which frequent the electric lights securing many a desirable species, the wings of which are often found, the bat being seemingly contented with the body portion. The size of the moth does not in the least seem to frighten the bat as I have seen him catch and fly away with as large a species as *Telea polyphemus*. The moths when chased by the bat make a desperate effort to get away, but in the end they are generally captured. Some, however succeed in evading the bat by flying straight up in the air just at the time the bat makes a swoop upon them. Many a specimen which looks to be a "nice thing" has been caught by these bats, much to the collector's regret. Sparrows also pick many specimens from off the poles in early morning, the moths having rested there until that time. Constant visitors to the electric lights are the toads which hop nimbly along the ground and snap up many a treasure that might otherwise have graced the entomologist's cabinet.

I have brought to the meeting some of the captures which we have been fortunate enough to make at the electric lights during the past summer. These no doubt may be of interest to the members present.

INJURIOUS INSECTS OF THE ORCHARD, GARDEN AND FARM FOR THE SEASON OF 1899.

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

The unusual severity of the past winter led many persons to anticipate a reduction in the numbers of injurious insects on account of the probable freezing of many of the forms which hibernate as pupæ or adults, but such an anticipation has not been realized, as most of the pests of past seasons have been quite as numerous and injurious this season.

THE ORCHARD.

The Codling-Worm has again

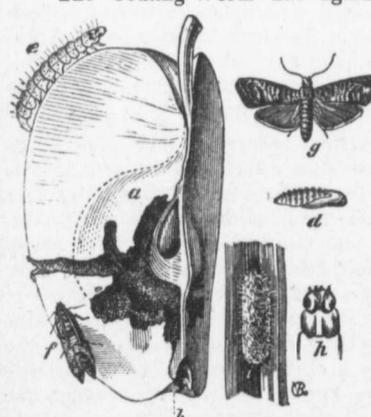


FIG. 12.

been active, and the damage done to the apple has been very considerable (Fig. 12). In the Guelph section the prolonged showery season during spraying time washed away the Paris Green from the calyx cups, so that the first meals of the young grubs were not poisonous. As there are two broods in the south-west part of the Province the orchardist should see that the first brood is exterminated, for if not, the second brood will do much damage to late apples. Last year many shippers lost heavily on account of the work done by the second brood, which is very hard to combat,



FIG. 13.

from the fact that the members appear at very irregular intervals from August to October.

The work of the *Bud Moth* (*Tmetocera ocellana*) on the young buds was very noticeable in some localities where early applications

of Paris Green were not made (Fig. 13). Experience has shown that one or two applica-

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FIG. 16.

tions of a mixture of Paris Green and Bordeaux before the blossoms open are of great service not only in preventing the entrance of fungi, but also in killing young canker-worms and young bud-worms. The bud-worms, when they emerge from their silken cases in the spring, have shining black heads and the first segment behind the head also black.

Both species of *Tent Caterpillars* (*Clisiocampa Americana* (Fig. 15) and *C. distria* (Fig. 14) were exceedingly numerous during the early spring, and did much harm in many sections. The farmers of the Province require to be aroused in this matter; they appear to make no effort to kill them during the most assailable period, viz., during the winter when the egg-masses (Fig. 15c) can be readily seen and destroyed, and during early spring when the caterpillars are small. Applications of Paris Green are very effective on the young caterpillar, but ineffective on the full-grown.

Many persons are under the impression that some plague comes over the full grown caterpillars when they suddenly disappear. It is true the caterpillars no longer exist as such, but it ought to be borne in mind that they have simply changed into pupæ within white cocoons (Fig. 15d), from which the moths will emerge about July to lay the bracelet of eggs on the twigs and branches.

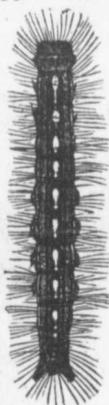


FIG. 14.

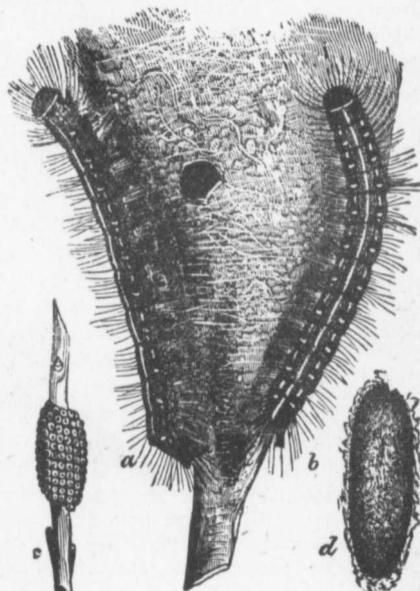


FIG. 15.

Bonuses might be given to the children for all egg-masses destroyed, or all nests burned.

The *Scale Insects* have perhaps become the most serious pests in many districts. The San Jose Scale, which has become quite abundant in two or three localities, as well as remedies for its suppression, will be found fully treated in another part of this Report.



FIG. 16.

In some localities, chiefly in the San Jose infected areas, is found a scale *Aspidiotus ostreae-formis*, which is very like the San Jose Scale, but apparently not nearly so destructive. Occasionally trees have been found which were quite badly infested, in which cases much harm was being done. Applications of whale-oil soap (2 lbs. to 1 gallon of water) during the winter will prevent the spread of this scale.

The *Oyster-Shell Bark Louse* (*Mytilaspis pomorum*) is doing much harm in many orchards which have been neglected (Fig. 16). Frequently specimens of branches were received, which were literally covered with this scale, yet the owners had overlooked its presence, and not until several trees had been killed was expert opinion invited. Applications of whale oil soap (2 lbs. to 1 gallon of water) during the winter, and dilute kerosene emulsion, about the end of May when the young lice are moving, will rid the trees of these pests, and in most cases give a new lease of life to the previously neglected trees.

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The Scurfy Bark Louse (*Chionaspis furfurus*) is another scale which is too prevalent in many localities (Fig. 17). It can be treated in the same way as the Oyster-Shell Bark Louse.

The Woolly Aphis (*Schizoneura lanigera*). This insect is readily recognized by its woolly

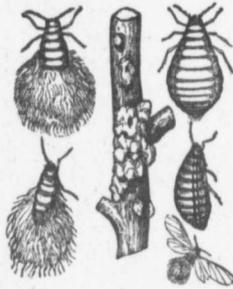


FIG. 18.

covering (Fig. 18). It can be readily treated with applications of kerosene emulsion or tobacco water. It infests apple trees.

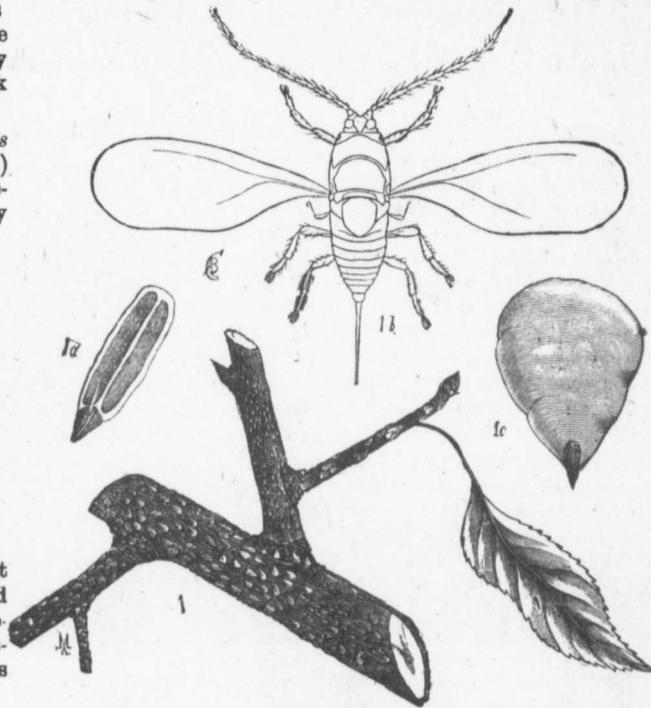


FIG. 17.

THE GARDEN.

Slugs have been unusually plentiful, and those infesting the raspberry and strawberry were extremely troublesome. These are more dreaded than the other insects infesting these plants, inasmuch as they continue their depredations through the fruiting season, when it would be unsafe to use poison for their destruction.

Plant Lice or *Aphids* were quite troublesome on currants and gooseberries. They cause the leaves of the currant to wrinkle; in gooseberries rosettes or tufts at the tips of the branches are formed. Within these tufts can be found Aphids of all ages, and with these are the lady-birds trying their best to subdue them. The figures represent two common forms, Fig. 19 the 9-spotted, and Fig. 20 the 13-spotted.



FIG. 19.



FIG. 20.

The Raspberry Fruit Worm (*Byturus unicolor*) was more prevalent than usual this year. This small white worm about $\frac{1}{4}$ inch in length feeds on the flesh of the berry close to the receptacle. Their presence is often overlooked in the preparation of the fruit for the table.

At the College both the raspberry and the blackberry were slightly damaged by the presence of galls on many of their roots, produced by a cynipid (*Rhodites radicum*). Wherever the galls were present the canes were found to be lying prostrate on the ground and a few died from the effects.

The Colorado Beetle (*Doryphora decemlineata*) was just as abundant as ever at the College this year, but it has been frequently reported that the severe cold of last winter killed many hibernating adults, and that the supply was much below the normal.

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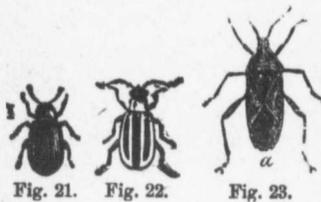
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Much annoyance was caused by the presence of a very small black flea-beetle (*Epitrix cucumeris*) Fig. 21, on both the potato and the tomato plants. This beetle about 1-16 inch in length, is black with a whitish pubescence. This insect works upon the upper side of the leaf and makes perforations. It is easily overcome with Paris Green.



The Cucumber Beetle (*Diabrotica vittata*) Fig. 22, was as usual a great nuisance on the cucumber, melon, squash, and pumpkin vines. Many inquiries were made as to the best mode of dealing with these beetles. The remedy we found to be most effective was Paris Green with considerable lime added, applied with a knap-sack pump. The rod had an elbow so that the under sides of the leaves were thoroughly sprayed. This year applications of Paris Green were made whenever new leaves

appeared.

The Squash Bug (*Anasa tristis*) Fig. 23, seemed to thrive this year in spite of every precaution. Decoy crops are generally very valuable, but were quite ineffective in most cases this year. Hand-picking of the leaves containing the clusters of eggs or nymphs was found very effective.

The Cabbage Worm (*Pieris rapæ*) was very plentiful this season, and did much damage to cabbage, turnip, and rape plants. In the case of cabbages the worms can be very successfully treated either by Paris Green and lime spray, or by dusting the leaves with insect powder, mixed with flower or ashes.

The Cabbage Aphis (*Aphis brassicæ*) did not appear in such numbers as they did last year, but the application of kerosene emulsion, diluted with 15 parts of water, to the under side of the leaves will practically exterminate them.

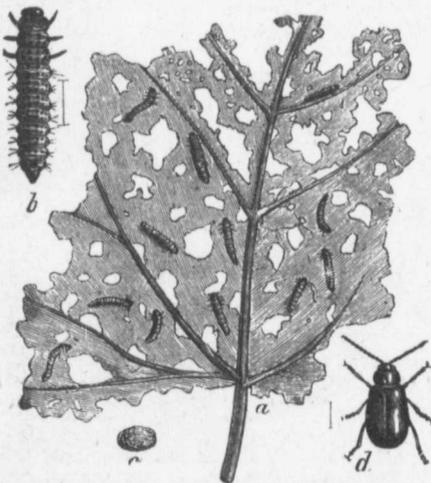


Fig. 24, a. larvæ on leaf, b. larvæ, c. egg, d. beetle (magnified).

The grape-vine had its usual enemies, but so far as my knowledge goes, the *Flea-beetle* (*Haltica Chalybea*) Fig. 24, was not so troublesome this year as usual, but it is still considered a bad pest. The best method of controlling it is, (1) to spray with Paris Green the buds which are just opening, and (2) again in June, when the larvæ are active, to spray with dilute kerosene. Many vineyardists go among the vines and hand-pick the beetles, or jar the beetles into a cloth



Fig. 25, Grape-vine Thrips (the hair-lines show natural size).

saturated with kerosene.

The Thrips or *Grape-Vine Leaf Hopper* (*Erythroneura vitis*), Fig. 25, was perhaps more injurious than the flea-beetle. It was especially troublesome to the Virginia Creeper during late summer. If the nymphs which appear in June are then sprayed with dilute Kerosene Emulsion, and an elbow used so that the spray will reach the underside of the leaves, little harm need be expected for the remainder of the season.

A new and somewhat alarming pest has arrived in the Niagara peninsula. Last year Mr. Kilman noted the arrival of the *Asparagus Beetle* (*Crioceris asparagi*) at the

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Niagara River. This year it has made itself quite destructive in Lincoln and Welland Counties. Two species preying upon the asparagus have arrived simultaneously, *Crioceris Asparagi* and *Crioceris duodecimpunctata*. The latter has a reddish body with black spots, the former steel blue with white spots. W. N. Hutt, B.S.A. has at my suggestion kept a record of the work and life history of the beetles, and has prepared a short paper, which I have pleasure in presenting to this meeting. These beetles were first noticed by Mr. Hutt about May 8th, on the second or third cutting of the asparagus. The larvæ hatch from the eggs in about a week, and change into pupæ in two weeks, and in about ten days later the adult beetle emerges from the ground. There are probably several broods in the season and Mr. Hutt remarks: "The broods of the insects seem to be very numerous and to overlap one another, so that eggs, larvæ and beetles may be found any time during the summer." The same observer states that the best remedial measures would be:

1. Frequent cultivation of the ground to disturb or destroy the insect in the pupa state.
2. The removal of all spindling stalks on which eggs might be deposited.
3. Thorough spraying after cutting has ceased.

The *C. 12-punctata* was by far the more common form in the Niagara district.

THE FARM.

My experience leads me to the conclusion that the insects which usually trouble farm crops were not serious pests in many portions of the Province.

The *Wheat Stem Maggot* (*Meromyza Americana*) did some damage in some localities. (Fig. 26.) The "White Head" can be readily discerned among the other uninjured stems. Like the Hessian Fly the adult is a four-winged fly which lays its eggs about

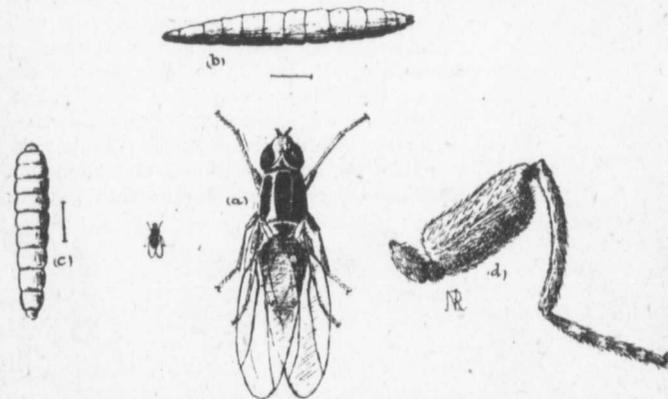


Fig. 26. The wheat-stem Maggot. a. The fly. b. The maggot. c. The pupa. d. Hind leg of fly, with large femur.

May 15th, upon the stalk near the top point. The larva burrows into the stalk, and when mature is a worm about $\frac{1}{4}$ inch long. The flies emerge in July, to lay eggs for a second brood. Dr. Fletcher has determined three broods at Ottawa.

The pea crop still suffers very heavily from two very important pests, the *pea-weevil*, (*Bruchus pisorum*) and the *pea-moth* (*Semasia nigricana*). In Ontario the ravages of the pea-moth appear to be limited chiefly to the Counties of Dufferin, Grey, Bruce and Huron. From a study of its life history it is very probable that the early varieties will not suffer much from the pest, as the larvæ do not appear before the middle of July.



Fig. 27. The clover root borer. a. a. a. Excavations made by borer. b. grub. c. pupa. d. beetle.

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As to the pea-weevil, its ravages are of such great importance that the general adoption of fumigation by carbon bisulphide after harvesting might with much good reason be insisted upon by the Government.

The Clover Root Borer (*Hylesinus trifolii*), Fig. 27, destroyed many clover crops this year in the vicinity of Belleville. F. R. Marshall, a recent graduate of the College, writes thus: "In early and middle June it was apparent that the red clover was not blossoming properly. Many plants did not blossom at all; many others produced imperfect heads. In fields where the clover was two years old, every plant was affected. In one year old clover a smaller proportion of the plants was injured, but since then the effects of the insect are noticeable all over the field.

I have not found any alsike clover affected. There were some Lucerne plants in the field, but they are not at all damaged.

Until July 12th, I found nothing but adults. On that date I found several larvæ, some well grown which were all in the lower portions of the root, and the beetles up near the crown. There were from 2 to 7 larvæ in a single root and 2 to 4 beetles.

On Aug. 8th, there were still many larvæ; some pupæ, and few adults.

On Sept. 5th, there were some larvae and many adults; the adults being in the lower portions of the root and very inactive.

Stored Grain frequently suffer from the depredations of certain moths and beetles, of which the *Granary Beetle* (*Oelandra granaria*) is perhaps the most troublesome. It is a small brown snout beetle which punctures the outer shell in which she deposits her eggs. The young footless grubs eat the inside of the kernel, and in about six weeks from the time the eggs are deposited the adults appear.

The Saw-Toothed Grain Beetle (*Silvanus surinamensis*) is occasionally quite a pest. Just lately I received a package of wheat, from a farm near Waterdown, which had been stored, and which was very badly infested with both this beetle and the *Cadelle* (*Tenebroides mauritanicus*). According to some authorities it is supposed that the *Cadelle* is beneficial rather than harmful, as it preys upon the other pests.

ASPARAGUS BEETLES.

By W. N. HUNT, B.S.A., SOUTHEND.

Beetles were first noticed May 8th on the second or third cutting of asparagus (two species—one red with dark spots, the other steel blue with light spots). Little attention was given to the insects as they were not numerous and did not seem to eat the stalks at all. The red species was most commonly seen, the blue beetles being comparatively scarce. In a few days the dark elongated eggs were found in scattered patches on the small spindling stalks which were not cut. There were about 12 to 20 eggs in a patch. In a few days the eggs hatched and small dark larvæ resembling the pear slug appeared. They grew rapidly, eating the soft tissue just back of the growing points. On approaching them the larvæ have a peculiar habit of raising their heads and excreting a dark viscid fluid.

At the ends of the plantation adjoining a sod headland, the beetles were found to be much more numerous, owing undoubtedly to the fact that in the sod their pupæ had been undisturbed by cultivation. Here the larvæ attacked the large and marketable shoots and rendered them worthless by eating off the green portions behind the growing point and smearing them over with slimy castings.

After this the beetles were, during each cutting of asparagus, picked off and destroyed and all small and spindling stalks cut away so as to leave no harbor for the larvæ. In this way the larvæ were kept in check but the beetles, in spite of the most careful hand-picking seemed rather to increase.

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About the middle of June cutting was discontinued and the whole bed, rows and all, cultivated up deeply with a large field cultivator. All stalks were then allowed to grow and in a couple of weeks there was a growth of between three and four feet in height. No attention was given to the insects as it was thought their time of doing damage had passed and that the plantation had top enough to suffer no injury. In the third week of July however it was found that a new brood of larvæ had developed and was working vigorously at the tops of nearly all the plants. They worked from the growing point downward, eating all the green portions as they went. On July 31st the whole plantation was thoroughly sprayed, using 4 oz. Paris green to 50 gallons of water, with 2 or 3 lbs. of lime to act as a fixative. For a few days after many slugs could be found and it was thought that the spraying had not been very successful. However, in a week or so as the insects worked down they came in contact with the poison and were killed. As the summer was very dry this mixture stayed on all season and further damage from the insects was entirely stopped.

In some unsprayed plantations which I observed, the insects stripped the plants till they looked as white and bleached as they would in the depths of winter. I heard some gardeners remarking how the droughth had withered up the asparagus and they could not believe that it had been eaten off by an insect. Some plantations where the insects were at work showed a distinct line of demarcation between the deadened tops eaten off by the slugs and the green portion below that was not yet reached.

The broods of the insect seem to be very numerous and to overlap one another so that eggs, larvæ and beetles may be found any time during the summer. The pupæ I have not found but I expect they are in the ground.

The destruction by the insect is very general owing to the gardeners not knowing the insect or seeing its destruction till their plantations had been stripped. A few odd beds, however, can be found where the beetles seem to have missed them.

I should judge that owing to the destruction of the green stalks and leaves the elaboration and storing up of nutriment in the crown for next year's crop would be seriously interfered with, and that next spring the owners of unsprayed plantations might expect a reduced crop and one composed of rather spindling stalks.

From my experience I think that the best remedial measures would be :

1. Frequent cultivation of the ground to disturb or destroy the insect in the pupa state.
2. The removal of all spindling stalks on which eggs might be deposited.
3. Thorough spraying after cutting has ceased.

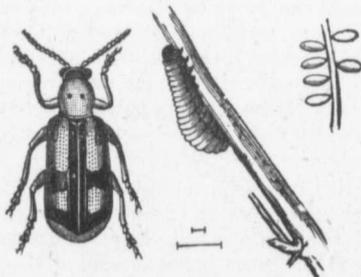


Fig. 28 (much magnified).



Fig. 29 (greatly magnified.)

These asparagus beetles are new to Canada and proved to be *Crioceris asparagi*, Linn. (Fig. 28), and *C. 12 punctatus*, Linn. (Fig. 29). The latter species was the most numerous.

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PROF. WEBSTER said that it was remarkable that this insect, the twelve-spotted beetle, should have overtaken *C. asparagi*, which started for the east on its march across the country many years earlier, both being emigrants from Europe. He had observed that insects of this kind spread more rapidly westward south of the lakes than farther north. The asparagus beetle had been found in south-west Michigan by Mr. Pettit, but he had not been able to trace it west of Sandusky in Ohio. The twelve spotted species had reached Buffalo. He mentioned also the almost total disappearance of the Harlequin Cabbage Bug (*Strachia histrionica*) in Ohio this year. Last year it was very abundant but its numbers had apparently been greatly reduced by the severe winter.

FATAL BITE OF AN INSECT.

BY REV. C. J. S. BETHUNE, LONDON.

During the past summer paragraphs appeared repeatedly in newspapers all over North America giving alarming accounts of the attacks of some marvellous insect upon the human person. The creature was called "the Kissing Bug" in consequence of its alleged habit of biting or stinging the lips of its sleeping victim and causing very painful if not fatal results. Much distress was caused among timid and nervous people and every unfamiliar insect, especially if large or ugly, was regarded as a specimen of the dreaded creature. Specimens of perfectly harmless insects (a *Cicada* for instance) were sent to the writer from various parts of Ontario with the expectation that they were veritable "kissing bugs" and he was enabled to allay these groundless fears in several quarters. Every entomologist had a similar experience and a list of the insects sent in on the supposition that they were representatives of the foe would be a long and amusing one.

On the first of September the following paragraph appeared in some Toronto papers and was speedily copied by a number of newspapers throughout Ontario:

"KISSING BUG'S BITE FATAL.—Uxbridge, Aug. 31.—Roy Stevenson, the four-year-old son of Mr. George Stevenson, carpenter, of Udora, was bitten on the calf of the leg by a kissing bug on Thursday last. Dr. McDermott was called, but despite his best efforts blood-poisoning set in and the child died last night."

Here at last was a definite case with locality, names and date. I accordingly wrote to Dr. McDermott, whose address is Sunderland, Ont., asking whether the statements in the paragraph were correct, and if so, for a loan of the specimen in order that it might be identified. He very kindly replied as follows: "I will pack and send the insect as requested for identification. The boy died five days after being bitten. The part bitten was very painful from the first and the symptoms all through his illness were those of profound blood-poisoning. The little fellow was in good health when bitten and killed the insect immediately after it stung or bit him. His mother kept it rolled up in paper and gave it to me. It was bruised and damaged badly; you will notice that the legs are broken and most of them gone and one wing is in the bottom of the box. It was over five-eighths of an inch in length but has dried and shrunk greatly. I may say the case is clear against the insect, whatever it is, as its bite was the direct cause of the boy's death." Some days later the doctor sent me the specimen and added: "We have not pronounced it 'the Kissing Bug,' and do not know what it is. It bit the boy under the left knee and the leg became very painful and swollen. He died from profound blood-poisoning on the fifth day. He was in good health previously."



Fig. 30

With the assistance of Mr. Moffatt and the Society's collection, the insect though somewhat damaged, was identified as a specimen of *Sinea diadema*, Fab., which is the same as *Sinea multispinosa*, Am. and Serv. and *Reduvius raptatorius*, Say, who figures it in his "Entomology" (Le Conte's edition, vol. 1, plate 31; description p. 72, and vol. II, p. 249). It is a true bug of the order Hemiptera and family Reduviidæ, called "Assassin bugs" by Prof. Comstock from their habit of preying upon other insects. (Fig. 30.)

The specimen before us is a long narrow insect, dull brown in colour; the head is very long in proportion to the body, and much narrower, with a series of spines above; there are also numerous short blunt spines on the thorax, and a double series of sharp spines on the underside of the front pair of legs; the beak, with which it punctures its victims and sucks their blood, is long, three-jointed, and when not in use bent under the head, its tip resting in a groove between the fore-legs; these legs are very long, and adapted for seizing and holding its prey.

This Reduvius is a well-known insect, and is usually classed among the beneficial species from its habit of preying upon other insects, for the most part of an injurious character. It requires to be carefully handled, however, as it is quite ready to defend itself and inflict painful stings with its beak. Mr. J. Alston Moffat relates that on one occasion, some years ago, he captured a specimen, and held it between his finger and thumb, while with the other hand he searched for a pin. During the interval the bug took the opportunity of doing what it could in its own defence. Throwing its head well back it released its beak from the socket, and then forced it into Mr. Moffat's finger; not content with one puncture, it continued to draw back its head, and then force the beak down again into the wound, causing intense pain, until its human victim was able to get rid of it. He says that it was the severest sting he ever experienced during his many years of collecting; the pain extended up his arm, which became swollen to the elbow, and continued to be painful all night, while the wound on the finger did not disappear for several weeks. It is not likely that the insect injects any poison through its beak, as is done by the fang of a venomous serpent, but probably there remains adhering to it some of the juices of its previous victim—grub, caterpillar or what not—which have become decomposed, and thus poisonous to the blood. In this way we may account for the fatal effects of the puncture in the case of the child at Udora. As this is a rare, if not a unique, instance, the public generally need not feel any uneasiness regarding the so-called "kissing bug," and may rest assured that they are not liable to any new attacks upon their persons by venomous insects of a novel and malignant kind.

DR. FLETCHER said that the scratch of a pin has been known to induce blood-poisoning under certain circumstances, and it might well be that this bug's bite would only be serious after it had been feeding on some decomposed animal matter. Some years ago it was reported that a man was stung by an insect when working in nightsoil, and died from blood-poisoning shortly afterwards.

MR. MOFFAT understood that the use of poison by insects was for the purpose of stupefying their prey so that they might feed in safety. He had observed these insects in contest with flies as large as a bumblebee, which could not be controlled unless stupefied.

PROF. WEBSTER said that the bite of one Hemipteron, *Melanolestes picipes*, was very severe. He had experienced it once from a bug that he held in his hand, and was not likely to forget it, the pain was so great.

DR. BETHUNE mentioned that Dr. Cowdry, one of the original members of the Society, told him that many years ago in England he had been hastily summoned to attend a brewer's carter, who had been stung on the lip by a large hornet. The patient

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was a very stout man, who had evidently lived largely upon beer; blood-poisoning set in, and the man died the same night. A few years ago at the famous Johns Hopkins hospital, Baltimore, a boy was brought in suffering from the effects of a mosquito bite; every effort was made for his relief, but without success and he died shortly afterwards. These cases serve to show that the condition of the patient must often have much to do with the effects of the stings or bites of insects.

REMARKS UPON SOME CUBAN INSECTS.

BY J. ALSTON MOFFAT, LONDON, ONT.

On May 3rd, 1899, I received the following letter, which proved to be the introduction to a much valued correspondence; and the package containing the wasps referred to in it, was but the first of a series from the same source, containing numerous interesting examples of Cuban entomology, which have formed quite a valuable addition to the Society's exotic collection.

SANTIAGO DE CUBA, MARCH 17TH, 1899.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

GENTLEMEN:—I am sending you under separate cover a few specimens of wasps, which have a kind of root growing from them. I send you these to tell you of the belief here among the natives that the "Llana" a bush full of thorns has its origin from dead wasps. This affair was explained to me by Dr. Gundlach as being simply a fungus growth; it is quite a common thing to find in the dry season, about February, a whole nest of these insects on the ground, all of which have these roots. I have also seen them with the leaf—always dry—on the roots. The specimens I send you are not very good, they only having one root each, but I have not at present any better ones, and as the rains have already begun I shall not be able to get any more till next dry season.

I might also mention that the Tarantula or "Arana Peluda" as it is called here, is supposed to give birth to the "Sarza" a vine with some very sharp thorns.

It is rather interesting to notice how the natives connect the sting of these insects with the thorns of the plants, and they will not be convinced that they are wrong.

I hope this may be of interest to you. I have never seen the Tarantula with the roots, but shall keep a lookout for them next season, and may be able to send you a specimen.

Yours truly,

CHAS. T. RAMSDEN.

A few days later the box came to hand with the specimens in fairly good condition; the fungus growths projecting from them conspicuously. The wasps are of medium size, exquisitely formed and beautifully ornamented in brown, black and yellow, but the colors lose much of their brightness when the insects are dried.

My first consideration was to obtain the name of the species, and for that purpose I sent an example to Prof. W. H. Ashmead, of the United States National Museum, Washington, D. C., who kindly and promptly forwarded to me the following letter in reply to my inquiry:

SMITHSONIAN INSTITUTION, UNITED STATES NATIONAL MUSEUM.

May 18th, 1899.

DEAR SIR:—Your favor of the 8th inst., together with the wasp came promptly to hand. The specimen you sent me is the male of *Polistes lineatus* Fabr. a species widely distributed throughout the West Indies and South America. By some it is considered only a variety of *erinitus* Felton, but so far as I can see it is a good species and ought to be kept separated.

Yours very truly,

WM. H. ASHMEAD.

Vegetal parasitism, in one form or another is not an unusual occurrence in insect life. The Silk Industry of France was at one time threatened with complete destruction, by a form of it attacking the Mulberry Silk-worm, *Bombyx mori*. Illustrations of the effect of one form may be seen in specimens of our common housefly. Another form is known as the white-grub fungus; this white grub being the larval stage of the common May-beetle, *Lachnosterna* Sp. An interesting account of that form is given in the "American Entomologist," Vol. 1, page 92. In a letter from Mr. S. H. Y. Early given there, I quote the following particulars. "In the spring of 1842 I observed in what is called "New Ground" in Virginia a great quantity of these mushrooms, and in reply to some remarks I made about them, some of my father's negroes who were then making hills with hoes for planting tobacco, enquired of me if I knew what produced these mushrooms. On my replying in the negative, I was informed that they grew from the white grub worm (Fig. 31). I think there were some twelve or fifteen negroes present, all of whom concurred in the statement, and said it was no new thing to them. They had no difficulty in establishing the truth of what they stated, because they dug them up in all their stages of germination and growth before my eyes. In a very short time they had furnished me with a large number of the worms in their original shape, features and size, and as distinct to the eyes as if they had been alive, but having the consistency, color and smell of a mushroom; and I actually broke them up, just as a mushroom breaks in one's hands, snapping them crosswise and squarely off." At one time it was hoped that this fungus disease might be propagated at pleasure, for the destruction of the white grub in meadows, but so far it has not proved to be practical.

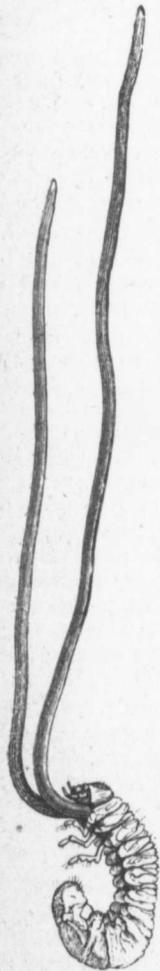


FIG. 31.—White grub fungus *Cordyceps melonthea*.

One can easily conceive of fungus spores vegetating on the soft body of a grub, but it is difficult to understand how they could obtain a foothold on the hard chitinous covering of these wasps. In another letter Mr. Ramsden informed me that they suspend their nests on a branch of a bush, so they cannot be specially exposed to contact with moisture; and yet they seem to be specially liable to this fungus attack, as shown by the following quotation from the paper previously mentioned: "According to Dr. Carpenter, it is not at all unusual in the West Indies to see wasps (genus *Polistes*) flying about with plants of their own length, projecting from their bodies." And again, in "The American Entomologist," vol. 3, page 138, when speaking of the species of fungus of the genus *Torrubia* which affects the white grub, Prof. Riley said "We have in our cabinet some interesting specimens of this stage affecting wasps of the genus *Polistes*, originating just as the White grub fungus does, from the base of the mandibles." In those received from Mr. Ramsden, the fungus had its origin in the immediate vicinity of the front pair of legs. With regard to the scientific name of the fungus affecting the wasps, Mr. Dearness did not find any of them

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in a sufficiently advanced stage to enable him to determine it, and Prof. Riley said: "It is never safe to assume the identity of a fungus of this character unless it can be studied when mature, especially as there are at least a couple of dozen species of *Torrubia* known to inhabit insects." Mr. Ramsden informed me, that as the wet season had set in, he would not be able to get any more for some time.

Amongst other material received from Mr. Ramsden, was a pair of that occasional visitor to this locality, *Dilophonota ello*, Fab. belonging to the Sphingidae. He had taken the caterpillars in large numbers, feeding on a plant familiarly known there as "Lechero." Some were of a reddish-purple color, but the majority were green. He quoted Gundlach as saying they were destructive to the yucca crops in Cuba, they are also found on the papaya (*Carica papaya*), but there is a parasite that attacks the larva, *Microgaster flaviventris*, which keeps them in check. Mr. Ramsden bred a *dipteron* from his pupa, specimens of which he sent to me, but it has not yet been determined.

Also three specimens of *Chloridea virescens*, Fab. which he had bred from larva taken on Tobacco plants. Mr. Ramsden quoted from Dr. Gundlach's "Entomologia Cubana," the following about the larva of *virescens*: "Some were placed in a cage together with some of *Danais*; *Virescens* attacked and ate the latter, also eating each other; and some he held in his hand bit him." The border of the hind wings of the moth is usually blackish, but in one of those received from Mr. Ramsden the border was beautifully tinged with red. Mr. Bice took a single specimen of this southern insect in London at light in the season of 1896.

Of things received from Cuba, and occasionally taken in Canada, were specimens of *Terias nicippe*, *Eudiotis hyalinata* and what appeared to be *Junonia coenia*.

Mr. Ramsden sent for identification and to be returned, as it was his first and only specimen of a rare insect, which he had taken at light, a most singular looking creature. At first glance it suggested a butterfly and Dragonfly combined, as if made up for the purpose of deception. It had conspicuously stout antennae, about an inch and a quarter long, and heavily knobbed at the end, resembling those of a butterfly, with the long, narrow, and clear reticulated wings of a dragonfly. Upon close examination and comparison I was convinced that it belonged to the Ant-lions, and through the good office of Dr. Bethune I was enabled to send to him the generic name of the creature. The Doctor called my attention to Westwood's Introduction to the Modern Classification of Insects, vol. 2, p. 41, on the Order Neuroptera, Family Myrmeleonidae, where there is a cut showing stages and parts of a variety of species, and amongst the parts is an antenna corresponding exactly to those of Mr. Ramsden's specimen, and on page 45, Prof. Westwood referring to the figure says: "The genus *Ascalaphus*, Fab. is remarkable for the peculiar structure of its antennae, which are very long and knobbed like those of a butterfly, (fig. 63, 21.), whence Scapoli and others described one of those insects as a *Papilio*." I see by the Eleventh Report of the N. Y. State Entomologist, page 239, that there are six species of *Ascalaphinae* listed by Banks as occurring in the United States; five are southern forms, and one is found as far north as Massachusetts. It is supposed that the larvæ of this genus do not make pitfalls. Several observations have been reported of the females depositing their eggs on twigs of trees and blades of grass, and that the young lie in wait under sticks and stones to seize their prey. An instance is given of a Ceylonese species, *Ascalaphus insimulans* that makes no pitfalls. "Some young ones were found ranged in a single row along the stem of a lily with the abdomen of each covered by the one behind it, and with their jaws widely extended: in this manner they waited for their prey to literally walk into their jaws." Reference is made to some interesting notes published by Prof. Westwood in the *Transactions of the Entomological Society of London*, 1888, concerning this genus. It was a great pleasure to have the opportunity of looking at so strange a creature, and it would be yet more gratifying to be in possession of one.

THE WING STRUCTURE OF A BUTTERFLY.

By J. ALSTON MOFFAT, LONDON, ONT.

Anosia Archippus, Fab. is, according to Dr. Buckell, of London, England, who gave much time and careful consideration to the investigation of this much disputed subject, the correct scientific name of our common milkweed butterfly, which, after several years of comparative scarcity in this locality, again appeared in great abundance during the season of 1899.

There are several questions yet unsettled by entomologists concerning the life history of this most noticeable, and usually one of the commonest of our butterflies, that require clearing up, and which tend to throw a halo of mystery around this familiar insect, which gives it special interest in the eyes of all who take delight in observing the ways and works of living objects in nature around them. Some things concerning it have been fully established; for instance, it is now a well known fact that *Anosia Archippus* cannot survive the winter, in any stage of its existence, in Ontario or northward of it. That each recurring winter sweeps our country clear of this particular species, and it has to be restocked every spring by immigrants from the south; just how far south of our Dominion it has to go before it can live through the winter has not yet been satisfactorily settled. That it migrates southward in the autumn in immense bodies, sometimes numbering millions, is well known, and has been frequently observed; therefore it must return in the spring, but by scattered individuals, to take up the territory it vacated in the fall. Dr. Scudder says it belongs to a distinctively tropical group of butterflies, and that north of Philadelphia it clearly appears like an interloper. He also claims that it is a long lived insect; that a female starting northward may travel for weeks, depositing her eggs as she goes, a few at a time, until she reaches the northern limit to the growth of its food plant *Asclepias*. Dr. Scudder also holds that no *Archippus* born northward ever lays eggs the same season.

Mr. W. H. Edwards says that there are three or more broods in the season of *A. Archippus* in Virginia, and he does not consider it to be an unusually long lived butterfly; which caused him to remark that if it had such a lengthened period of existence in the mature state as Dr. Scudder claimed for it, then instead of giving it the common name of "The Monarch," a more appropriate name for it would be the "The Patriarch." Prof. Riley's idea was that fertile females of the hibernating groups in the south started northward in the early spring, when the milkweeds were ready to receive their ova, and would travel some distance before they had finished ovipositing, when these would naturally perish; then their progeny would continue to advance and carry on the work of producing ova to stock the milkweeds as they come on in the north. Thus, there might be several broods required in a season to reach the northern limits of its food plant. I have not yet formed any decided opinion upon these different views, for as much observation and consideration as I have given to the subject, some of my observations sustaining one side, and some as strongly supporting the other.

The wonderful power for sustained flight over long distances of *Anosia Archippus* is now well substantiated; individuals having been frequently seen at sea hundreds of miles away from land. That a longer term of life in the mature state than is allotted to butterflies generally, to enable it to fulfil its seasonal functions seems to be required; for if the same individuals that leave the north about the end of August or beginning of September pass the winter in the south, and then return northward in the early spring to deposit their eggs for the summer's brood, it would give them a much longer active life in the mature state than falls to the lot of butterflies that hibernate in this region. Whether any of those passing the winter in the south, reach the far north the following season is yet open to question.

I have seen specimens arrive in the spring in a sorely faded condition, indicating age and exposure to the weather, followed by others that were comparatively fresh, as if they were younger and less travel-stained than the first. Then again, I have seen the first arrivals in fairly good condition, as if they had not been long upon the wing. Such observations start the questions: were any of these specimens hibernators from the south,

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or were they the progeny of hibernators? Then from how far south had they come? Again I have seen specimens haunting a particular locality for weeks, and as far as I could judge by their gradually fading colors they were the same individuals; had these permanently settled down in that locality, to go no further north? Again, I have seen them flying plentifully for six or eight days and then begin to pair; indicating that these particular individuals had not laid eggs before reaching that locality. I have seen fresh-looking specimens flying at the time the new brood was emerging from the chrysalis, and so fresh as to give rise to a difference of opinion, as to whether they were previous arrivals or bred on the spot? I have seen quite small caterpillars on the milkweeds when others had passed into the mature state; all of which have convinced me that there is more than one wave of migration northward during the breeding season.

These statements prove nothing, but they will help to indicate where the missing links are situated, which yet require to be forged to complete the chain of the life history of this particularly interesting creature; and will serve as a guide to those who are inclined and have the opportunity, to continue the observations, and make the evidence positive rather than presumptive.

Ever since the season of 1894, when I first discovered that the upper and under membranes of a butterfly's wing could be separated from each other, my desire has been to make further investigations in the matter, so as to prove or disprove what I thought I learned at that time. Then with the appearance in abundance of *Anosia Archippus* in the early season of 1899 I fondly hoped that my opportunity had arrived. The first one I saw was about the middle of May, in an unusually battered condition, and from that on until about the end of June they kept increasing in numbers, till they were to be met with everywhere. I requested friends to endeavour to secure for me a number of nearly full-fed caterpillars from the milk weed, so that I might have plenty of material with which to prosecute my investigations. Mr. Balkwill was the first to respond, on the 22nd of July, with a newly transformed chrysalid and several large caterpillars, which were followed by more from the janitor of the Y.M.C.A. Then I made a trip on the street car to a common in the vicinity of his residence, where *Asclepias cornuti* was growing in profusion, and I secured yet more, so that before the first had emerged I was in possession of fourteen pupæ, and Mr. Balkwill added four more to the stock subsequently, and they were all required.

The great advantage in procuring this particular species for such an investigation is not so much on account of its numbers in an abundant year, or the ease with which it can be fed up, but in the character of its chrysalid, which is a pale translucent green, whilst the butterfly is a bright brown with black veins and white spots. These colors when the pupa is approaching its crisis show through the thin transparent pupa-case, which gives one an opportunity of clearly observing the progress it is making towards maturity, when it can be arrested at any stage desired; or, with a little practice, one can tell within a few minutes of the time when it will burst its bonds, and so obtain warning to be on hand to witness its disclosure and development, and then secure it in the proper condition, for the purpose intended.

I was surprised at the amount of mortality there was amongst the caterpillars after suspension; although I had been prepared to expect something of the sort from reading the chapter on "The critical periods of its life" in Dr. Scudder's book, "The Life of a Butterfly." But there is no intimation given therein of the disease that afflicted my stock; which manifested itself by the caterpillar becoming flaccid, the skin opening and fluid escaping and forming long silky threads. If one of them hung its head straight down I knew it was doomed, and the other symptoms soon followed. It extended to some of the chrysalids. There were no indications of parasitism in my lot. The time from the formation of the pupa to the emerging of the imago was ten to fourteen days. In no instance did any that I saw emerge drop from the pupa-case to cause it to expand its wings suddenly. They came out of their case apparently with great caution and deliberation; and it took them from ten to fifteen minutes to fully expand their wings. The temperature of the weather through nearly all the period of their emergence was on the cool side, especially the nights, which would tend in some measure to restrain their energies.

It would be profitless to relate the difficulties I had to encounter in the prosecution of my investigations ; and how I had to gain my information for success through failures in my efforts to accomplish the object in view ; but it may be of use to anyone who wants to prosecute the enquiry to know what I learned during the process.

For the examination of an unexpanded wing, the chrysalid should be allowed to mature as nearly as possible to the point of emerging before it is killed, which I did by placing it in alcohol ; then it is the better to hang for twelve hours for some of the moisture to evaporate. For the comfortable handling of an expanded wing, after full development it should be allowed to obtain complete firmness, which may take an hour or two, before killing the insect and separating the wing from the thorax. The only place that I could find an entrance for a pin point between the membranes, was at the base of the wing, where the subcostal and median veins come close together ; when once the pin has entered, either in a vein or between the two, it can be moved back and forth through the entire width of the wing without encountering the slightest obstruction. The upper and under membranes of the wings are at the front and hind edges all in one piece, and must be cut to get them apart, which can be done by running the pin down through them, and so delicate are they, that this can be done without feeling that any extra pressure is required. Because of that extreme tenderness I had some difficulty in obtaining conclusive evidence as to the actual structure of the outer angle of the wings, until I thought me of getting water between the membranes. With great care, after many trials, I succeeded in inserting a fine glass tube at the base of a wing, and soon had water flowing into it. Resting the wing on the surface of a tumbler of water, it soon rounded out like a bladder ; but as soon as the water touched the outer angle the bladder collapsed, all the water having gone together, and the membranes were as before it entered. This sac will not hold water, the membranes being finished and fringed independently of each other at the outer angles.

The greatest difficulty in getting the membranes separated, and in getting them to stay apart arises from the gummy nature of the fluid that has entered between them from the thorax. If one separates a part of the wing and lets it go again, the sides are instantly as closely united as they were at first : or if a portion of the membrane folds in upon itself, one is far more likely to tear it than turn it back, in their efforts to straighten it. My available material had become reduced to three chrysalids, and I had not then obtained a perfect example, and was beginning to wonder if the effort was to prove a complete failure, when I thought of trying to separate them under water, and found it to work admirably. I could then separate the membranes without difficulty or danger ; when separated I floated each half on to a bit of oiled paper, transferred them to blotting paper with their outsides next to it, then allowed some of the superfluous moisture to evaporate before covering them and putting them under pressure to thoroughly dry, when they came out in perfect condition.

The fluid which had been stored up in the thorax of the pupa flows in between the membranes of the wings at the opening by the subcostal and median veins, passing along and expanding them as it goes until the wings have attained their full dimensions ; the fluid as it dries becomes more gummy and adhesive, and when perfectly dry the butterfly's wing with which we are all familiar is completed. The veins and nerves are situated half in one membrane and half in the other, the heaviest portion being in the upper membrane and open in the centre ; so there is every reason to believe that the fluid does pass into, and through between them as it does between the membranes, but when it dries it forms such a thin coating on their inner sides that it practically leaves them empty. Then when the fluid has quite dried it has cemented the two halves together, which form the hollow tube that has been the subject of so much discussion ; whilst at the same time it tends to stiffen and strengthen them as it does the membrane. Here I have the opportunity of correcting myself in a statement I made of what I thought I saw in an unexpanded wing. Twenty-fifth Annual Report of the Entomological Society of Ontario, page 65, where I state that "The nervures are in the upper membrane, with a groove in the lower opposite, into which they fit." That appearance I found frequently produced, by the walls of the larger veins in the upper membrane clos-

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ing together on the inner side; but their true structure can be clearly demonstrated in an unexpanded wing. And here I will express the opinion that the term "veins" is inappropriate and quite misleading as to their purpose and use.

The most recent statement upon this subject that has come under my notice is in an article by Henry Charles Lang, M.D., M.R.C.S., L.R.C.P., London, England, in the August number of *Science Gossip*, 1899, page 71, from which I will copy the paragraph headed, "The Vascular System:"

"This in butterflies is of a very simple character. The centre of the circulation is a rudimentary heart called the 'dorsal vessel,' situated on the dorsal surface of the abdomen and divided into several chambers. It is controlled by muscles attached to the abdominal walls, and by their action the blood is propelled into the aorta, which is a prolongation of the dorsal vessel, having the form of a tube passing through the thorax to the head. The blood then returns through the lacunae or interspaces of the various organs to the abdominal sinus which surrounds the dorsal vessel and thence into the vessel itself through special valvular openings. There are, in insects, neither arteries, capillaries, nor veins in the true sense of the word, and the blood is cold, colorless and not corpusculated. As above stated, it is usually held that in butterflies *the nervures of the wings convey the blood to these appendages*, until they are fully unfolded after the emergence of the insect from the pupa. Circulation through these then ceases, the texture of the wings becoming dry and nonvascular. The nervures then perform the functions of air tubes." The italics are mine, and what I desire to call attention to is, that it is now time to cease disseminating that bit of misinformation. We have now attained to a fairly clear conception of the wing structure of this particular butterfly, and the question now to be settled is, are all butterflies' wings constructed on the same principle? It seems highly probable that they are, but positive proof is wanted; and I now consider it an easy matter to get it by anyone who can obtain a specimen in the proper condition. And as an inducement for anyone inclined to follow up the subject, I would recommend it to them as a most fascinating field of observation, and one well calculated to yield profitable results.

The photograph for the plate prefixed to this volume, was taken by Mr. R. W. Rennie, London, Ont., who, amongst his other accomplishments, is an expert amateur photographer.

DESCRIPTION OF THE PLATE.

Fig. 1. Presents the inner sides of upper and lower membranes of a front and hind wing. These were separated under water and the gummy fluid washed off so the color of the outer surface shines through.

Fig. 2. The inner side of the lower membrane of a front wing.

Fig. 3. The hind wing of a male, disclosing the inside of the sexual spot.

Fig. 4. The inner side of an upper membrane of a front wing.

Fig. 5. The inner side of the lower membrane of a female's wing. These four membranes were separated as best I could before I tried it in water, the gummy fluid over the whole inner face of the membrane giving them a whitish appearance, as if they had got a thin coat of varnish.

Fig. 6. Shows the inner sides of the two membranes of an unexpanded front wing, with the basal portion of the costal membrane not separated. Its exact length is five-eighths of an inch.

Fig. 7. Gives a view of the natural size of a perfect front winglet. The opposite one is incomplete.

Fig. 8. The underside of a hind winglet. The opposite one is the upper side of another; both imperfect.

Fig. 9-10. Are the wings of one butterfly. The length of front wings from base to apex is two inches, by one and a quarter wide at the outer angle.

Upon one occasion, when engaged in separating some of the membranes, the inner sides of which, upon being exposed to view, had a reddish, raw appearance, a friend who had been intently watching the operation for a time, turned away with the remark, "Well, it's got down to a pretty fine thing now, when you've taken to skinning them!"

NATURE-STUDY LESSONS ON THE CABBAGE BUTTERFLY.

(Pieris rapae.)

BY PROF. W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

INTRODUCTORY NOTE. The purpose of the following Nature-study Lessons on the Cabbage Butterfly is to furnish information and question hints, regarding the structure and life history of one of the most common insects of our Province, to those teachers who would like to introduce Nature Study into their schools, but are prevented from doing so by a lack of knowledge of insect structure and habits.

Nearly all insects begin with the egg stage. From the egg emerges the *larva*, (called *maggot* in the case of flies, *caterpillar* in the case of moths and butterflies, *grubs* in the case of many beetles, and *nymph* in the case of grasshoppers, plant lice and half-winged insects.) The larva moults, or changes its skin, as it grows, the number of moults varying with the individual insect. The larva of the moths, butterflies, beetles, flies and wasps, on reaching its full growth transforms into a passive creature and sometimes spins a *cocoon* about itself, as in the moths; or becomes a *chrysalis*, as in the butterflies; or makes a case within which it may rest quietly as a *pupa*, as in the flies and wasps. The nymphs of the grasshoppers do not transform, but with each successive moult become more like the adult insects. The adult form is usually winged, and is known as the *imago*, in the case of the butterflies and moths.

Nature-study lessons must be very informal in their nature. Their object is to make children observe, and to draw proper conclusions from the observations; to make them see what they are looking at, and to arouse an interest in the world of nature about them.

True teachers will find that the best objects for Nature-study are the most common objects about them. For this reason the Cabbage Butterfly has been taken in this case, and it is the sincere hope of the writer of these lessons that many teachers will make at least a beginning of this work, and give these most informal studies a fair chance among the other studies of the school.

Reference is here made to an article by the writer, entitled "Entomology in Schools," published in the last annual report of the Ontario Entomological Society, 1898, in which the names of the most important works on insects are given.

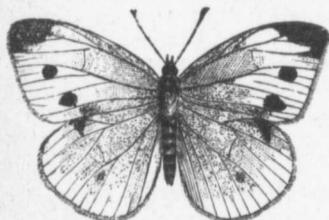


FIG. 33—The Female Cabbage Butterfly.

bright sunshine into leaving their comfortable winter quarters for the deceptive breezes of early spring. With a relapse to cold weather many a poor butterfly is frozen to death. Those that have been rendered only torpid the returning hot sun's rays bring back to life again.

From their appearance in spring till autumn there is not a month when they are entirely absent, for there are three broods during the summer, and many of the late ones of one brood will be found flying with the early ones of the succeeding brood.

Every child knows the pretty white butterflies, which are so common in September in gardens and along roadsides. These flit about from flower to flower, evidently not caring much what kind they visit. The despised dandelion, the execrable blueweed, the ubiquitous yarrow, the notorious thistle are each in turn visited for the sake of the nectar or honey they contain. But September is not the only month when these white butterflies (Figs. 32 and 33) are abroad. As soon as the snow has melted in March, many of them may be seen flying about, lured by the

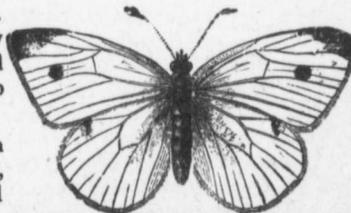


FIG. 32.—The Male Butterfly.



FIG. 34.—A Cl band by w attached to horizontal tongue are

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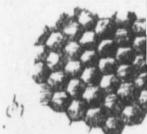


FIG. 35.—(a) A fe ing the shape in rows, and o (b) a portion showing hexag

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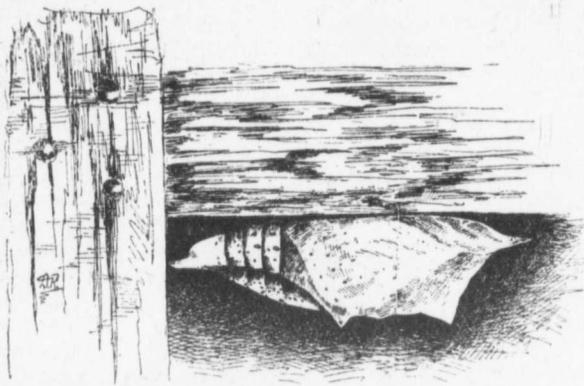


FIG. 34.—A Chrysalis of Cabbage Butterfly, showing the slender silken band by which it is slung up to the fence rail. The posterior end is attached to upright post in this case, but usually it is attached to the horizontal board. The projections of the wings, the legs and the coiled tongue are prominent.

pointed posterior end and at the middle of the body, by a silken cord that forms a band by means of which it is slung up tightly to the board or other object. The chrysalis case is quite thin and apparently brittle. The wings, coiled tongue, and legs can be fairly well recognized within the case. Every pupil should watch carefully the way the white butterflies emerge from chrysalids which have been collected.

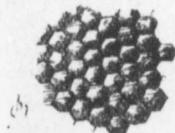
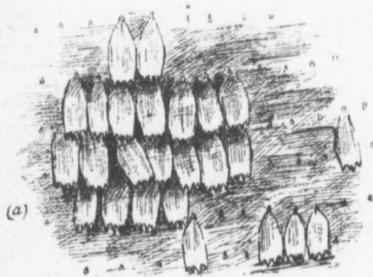


FIG. 35.—(a) A few scales on the wing, showing the shape of scales, their arrangement in rows, and overlapping, (much enlarged). (b) a portion of large eye, much enlarged, showing hexagonal facets.

number of black spots on the fore wings. The female butterfly (Fig. 33) has two black spots while the male (Fig. 32) has only one. We shall notice also that when the butterfly is resting on a flower the wings are held erect, (Fig. 36). (Find scale-winged insects which fold their wings by their sides when at rest.)

(Fig. 34.) The cabbage butterfly winters over in the chrysalis state. A little search in late autumn will reveal many of these chrysalids suspended under the covering boards or rails of fences which enclose fields of turnip or rape. It will repay one to observe carefully, and make notes of, the peculiar shape of a chrysalis. It is about four-fifths of an inch long, and is generally of a light grey, or brown color. It is suspended at two points—at its

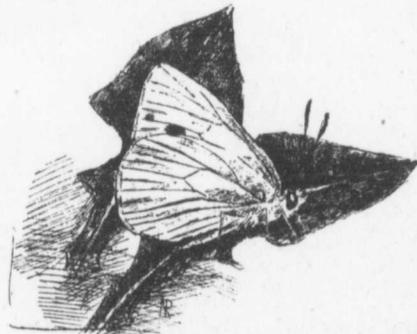


FIG. 36.—An Imago of Cabbage Butterfly at rest on a leaf, showing the wings folded over the back, the three pairs of legs, the prominent eyes, and the long club shaped antennae.

The white butterflies have six well-developed legs, and four wings covered with scales (Fig. 35, a) which brush off very readily. (Do all butterflies have six well-developed legs? Do all winged insects have scales on their wings?) If we examine several specimens we shall very likely find slight differences in the number

The antennae or feelers are thread like, and club shaped at the ends. (Have all butterflies and moth similar feelers?) The eyes are quite prominent, and if they are examined with a strong lens a large number of facets (Fig 35, b) will be seen. Such eyes are said to be compound.

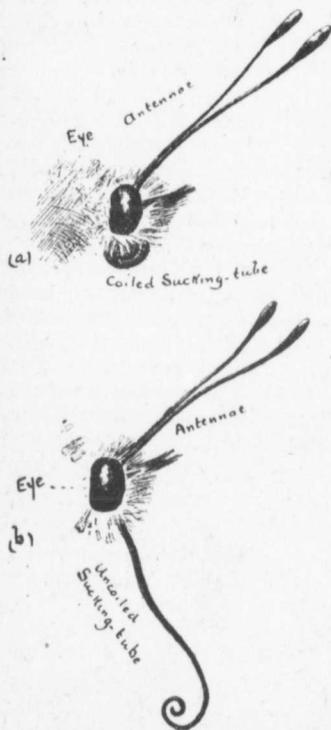


FIG. 37.—(a) Head of Cabbage butterfly, showing eye, long antennae and coiled sucking tube. (b) Head with sucking tube uncoiled.

base of the tube. The process resembles that by which water is drawn up through a straw inserted in the mouth.

The eggs are laid by the female butterfly on the plant which serves as food for the caterpillar. Pupils should look on the underside of the leaves of cabbage, turnip, rape, mignonette, and other cruciferous plants for the pale yellow, flask-shaped, erect bodies, and examine carefully with a lens to find the vertical ribs on the eggs. The teacher should direct attention to the fact that the eggs are seldom placed in clusters but are somewhat scattered.

In about a week the tiny caterpillar comes out of the egg. (Note how long it takes to become full grown, and how often it moults). The color is green like its food-plant. All should examine carefully and find the yellowish band along the top of its back, the row of yellow spots along the sides and the fine black dots on its body. When full grown the caterpillar is nearly an inch in length. (Fig. 38). Then there are indications that another change is about to take place. (What are some of these indications? Where do you generally find the chrysalids?)

Very frequently in the autumn many cabbage-worms present a distended and sickly appearance. They are sluggish and have no desire to eat. If some of these worms be put in a box and taken to the house, where they can be observed frequently,

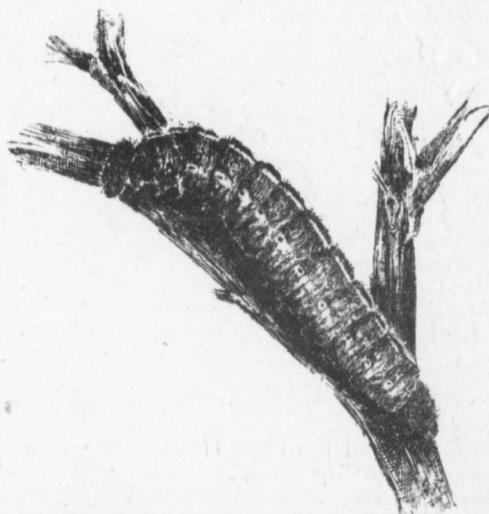


FIG. 38.—A Cabbage Worm, showing the yellowish band along the back, the breathing pores, and yellowish dots along the sides, the three pairs of true legs in front, the five pairs of pro-legs behind, and the hairs and black dots on the back. (Somewhat magnified.)

Perhaps the most interesting structure of the butterfly is the long sucking tube which is usually coiled up like a watch spring, (Fig. 37, a). If we observe a butterfly while on a visit to a flower, we shall find that the sucking-tube is uncoiled (Fig. 37, b) and thrust into the corolla, and that the nectar is sucked by means of little muscles acting on a bulb or sac at the

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the cause for the sickness will soon become apparent. Small white maggots will bore their way out through the skin and congregate about the poor caterpillar as in Fig 39, *a*; and if these maggots be watched, it will be found that they soon begin to spin silken cocoons about their bodies (see Fig. 39, *b*.) The caterpillar has sometimes sufficient vitality left to crawl away from its tormentors an inch or two; but most frequently it dies beside them, and in a day or two no trace of its body can be found. If these cocoons be placed in a tin box for a few days, minute four-winged flies (Fig. 39, *d*) will emerge through a lid-like opening at the end of the cocoons. (Fig. 39, *c*.) These flies are parasites; they lay their eggs within the body of the cabbage-worms by inserting their needle-shaped ovipositors through the skin. In a short time the eggs hatch minute maggots, which grow and feed within the body of their host until they become full-grown, when they emerge as already described. It is very likely that the majority of cabbage worms suffer death through the agency of parasites. Even the chrysalids are not immune from the attacks of these parasites; for if many be examined, the interior of the case will in some instances be found filled with small maggots. Moreover the butterfly is eaten by many birds and other animals; so we are forced to conclude that the Cabbage fly has to contend with many enemies during its life-cycle (Fig. 40); that there

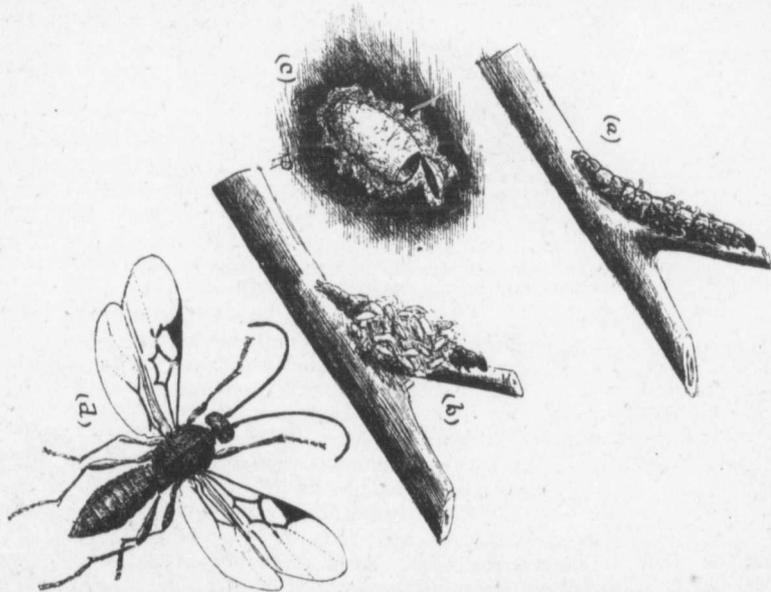


FIG. 39.—(a) Cabbage-worm with maggots escaping through the skin; (b) The maggots have transformed into pupae within cocoons; (c) One of the cream-colored cocoons with the lid-like opening; (d) The adult parasite fly which emerges from the cocoon, greatly magnified.

is a constant struggle for existence, and only a small fraction of the entire brood is left to propagate the species and to molest the farmer and gardener.

The respiratory or breathing apparatus of insects is rather peculiar. If a large Cabbage-worm be examined many openings may be seen along each side of the abdomen in the same line as the yellowish dots (Fig. 38.) These openings are the terminations of tubes which ramify through the body and supply air to the interior, so that an interchange of gases can take place, and the blood be purified.

A good practical method of killing the Cabbage-worms is to dust a mixture of one pound of insect-powder and five pounds of flour through a cheese-cloth bag upon the infested plants. The fine powder of the mixture clogs the breathing pores, and prevents the access of air to the interior of the body, so that the worm is virtually suffocated.

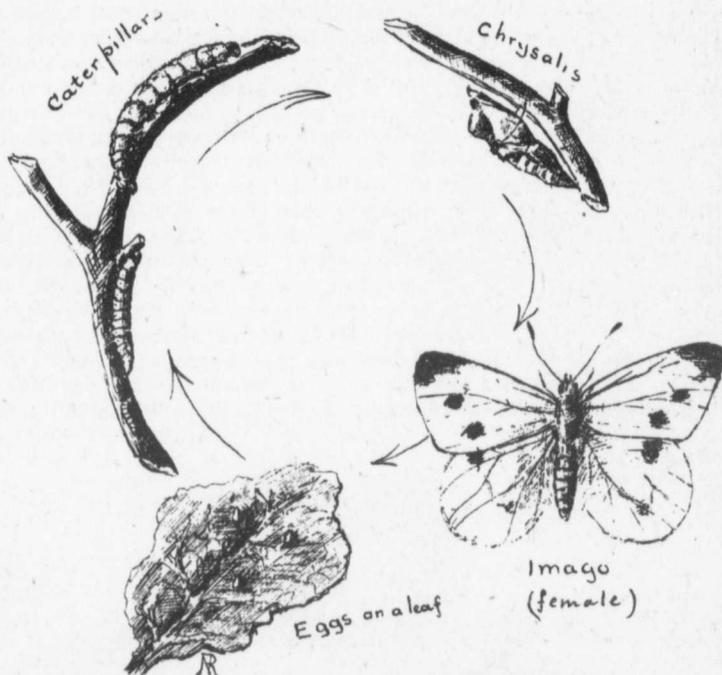


FIG. 40.—The four stages in the butterfly's life-history are represented, eggs, larvæ or caterpillars, chrysalis and imago.

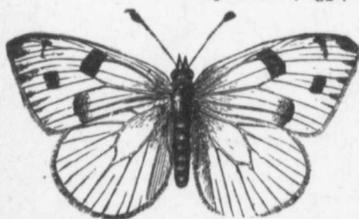


FIG. 41.

Montreal; in 1868 it spread from New York where it had been introduced from Europe; by 1881 it had spread throughout the eastern half of Continent; by 1886 the Rocky Mountains had been reached; and now it roams from the Atlantic to the Pacific. It displaced the native species (*Pieris protodice*), Figs. 41, male, 42, female, driving it before it; but after thirty-six years of occupation the same native form re-appears with renewed vigor, and gives signs of competing successfully with the intruder.

LESSON I.—THE EGGS

Leaves of cabbage, turnip, or rape with the eggs should be collected. On which side of the leaves are the eggs found? Of what advantage? What is the shape of the eggs? The color? What kind of an insect lays these eggs? What kind of creatures hatch from these eggs? Do they resemble the mother insect? How long before the eggs hatch? (It is important that the pupils should have the eggs under observation. If possible the study should be made on the objects in the fields, under natural conditions, but leaves might be brought into the class room).



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LESSON II.—THE CABBAGE-WORMS.

A supply of cabbage-worms should be on hand, and if possible a piece of half-eaten leaf with the worm at work before each pupil.

1. Why are some of the worms larger than others
2. Describe the markings.
3. How many legs has the worm? Describe their location. Are all the legs of the same structure?
4. Describe how the worms eat.
5. What method of destroying the worms would be possible?
6. Watch carefully to find out how often a worm moults.
7. Follow closely the movements of a worm which has become full grown and has become restless.
8. Watch the large worms which have become sickly and have begun to change color, for the appearance of small white maggots. Where do these maggots come from? What change comes over the maggots?
9. Describe how a caterpillar breathes.
10. What would be the result if the breathing pores were plugged or stopped up?
11. Try the effect of spraying Paris Green water on some caterpillars. What objection is there to the use of Paris Green?
12. Dust some insect powder mixed with about five times as much fine ashes, through a cheese-cloth bag on some caterpillars, notice the effect.

LESSON III.—THE CHRYSALIDS.

A collection of chrysalids should be procured from the fences surrounding cabbage, turnip, and rape fields.

1. How are the chrysalids attached to the fence rails?
2. How long does this insect remain in the chrysalid condition?
3. Which surface of the chrysalid touches the surface of rest?
4. What signs of wings, etc., are to be seen?
5. Open some chrysalids to find if all are living.
6. In the dead chrysalids what do you find? How did the maggots get inside?
7. Locate accurately 25 chrysalids in the early winter; and in late winter, determine the number left. What has happened to those that have disappeared?
8. What then are some of the enemies?

LESSON IV.—THE WHITE BUTTERFLIES.

1. In what month did the first butterfly appear? If possible watch for its appearance.
2. When did the butterfly emerge from the chrysalid kept in a box in your room? Can you account for the difference in time?
3. Number of wings? Of legs? Number of parts to each leg?
4. How does the butterfly hold its wings when at rest.
5. What is the nature of its mouth? Can it eat? For what is its mouth adapted? Watch how a butterfly feeds.
6. Are the wings of all the white butterflies spotted alike? What does this difference indicate?
7. Has this butterfly any enemies? Name some.
8. Of what use are the scales on the wings?

LESSON V.—OTHER WHITE BUTTERFLIES.

For this lesson the native Pierids should be shown the pupils. The differences should be seen. The teacher should then give the pupils a short history of the introduction of this white butterfly to America, and its subsequent spread.

1. How would you distinguish the cabbage-butterfly from the *Gray-veined White* and the *Checkered-White*?
2. Collect caterpillars of each species, and learn to distinguish them.
3. Upon what plants does the caterpillar of the *Yellow*, or *Clouded Sulphur Butterfly* feed.

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SPIDERS.

BY REV. THOMAS W. FYLES, F.L.S., LEVIS, QUEBEC.

Spiders are not generally regarded as pleasant objects. I think most people have an antipathy to them. They dislike their appearance and their ways. At an entertainment given in a village that I know, songs, recitations and tableaux were intermingled. In one of the last named a little child was seen seated upon a hillock with a bowl of curds in her lap. She had been instructed to behave prettily and to take no notice of the people before her, but one thing she had not been prepared for. Suddenly a large toy-spider with all its legs dangling was let down, by an elastic thread, before her. Her start of unaffected terror was inimitable, and was warmly applauded, but of course this representation of little Miss Muffett could not be repeated. Yes, children regard spiders with fear, and older persons regard them with disgust; and yet there is much in spiders that is worth our notice, as I hope to show in the course of this paper.

Spiders are not insects. They belong to a different order, the *Arachnida*, which includes scorpions, ticks, mites &c., as well as spiders.

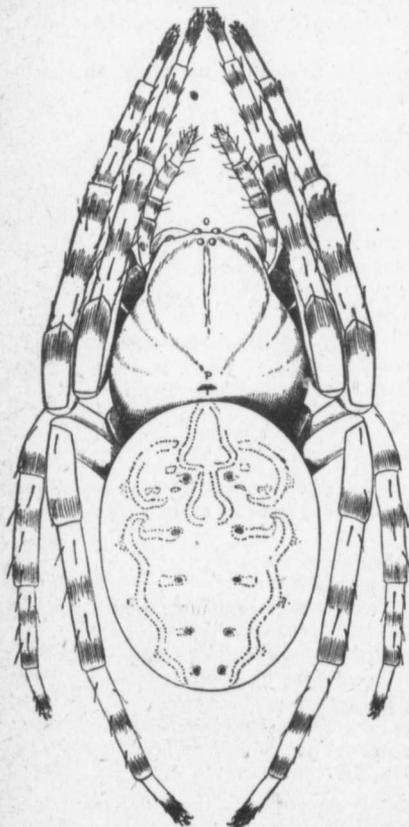


Fig. 43.

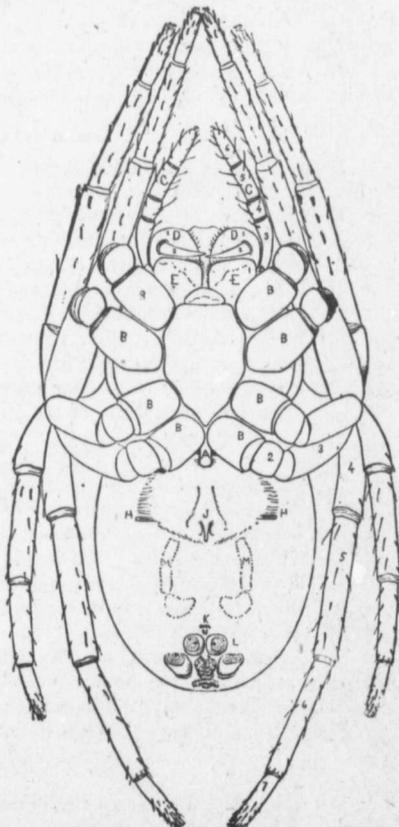


Fig. 44.

The word *Arachnidæ* is derived from the Greek Mythology. *Arachne*, as the story runs, was the daughter of *Idmon*, a Lydian. She was a skilful spinner and weaver, and was vain enough to enter into a contest with *Minerva*, who invented the arts *Arachne* practised. The ambitious mortal was defeated, and in her vexation hanged herself, but was turned by the gods into a spider.

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Fig. 45

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Spiders differ from insects in the under-mentioned, as well as in some other, respects.

(a) In the spiders the head and thorax are united in what is called a cephalo-thorax. In the insects the head and thorax are distinct. (Fig. 43, upper surface of a spider; fig. 44, lower surface—both much enlarged).

(b) Spiders have no wings.

(c) They breathe by means of lung-sacs, through tracheæ which open under the abdomen.

(d) Their eyes are simple, not compound as in the insects.

(e) They have eight legs. Insects proper, in their perfect state, have only six.

(f) Their abdomens have no segments.

(g) After leaving the egg they grow, but undergo no metamorphoses. The insect passes from larva to pupa, and from pupa to imago.

Spiders have been divided into three tribes, according to the number of their eyes :*

I. OCTONOCULINA—Eight-eyed spiders.

II. SENOCULINA—Six-eyed spiders.

III. BINOCULINA—Two-eyed spiders.

The families are named in most cases from the habits of the species they severally include.

Thus in the first tribe among others are found :—

The Salticidæ or Leapers (Fig. 45).

The Thomisidæ, or Binders (Fig. 46. The arrangement of the eyes is shown below).

The Drassidæ, or Seizers (Fig. 47).

The Linyphiidæ, or Weavers (Fig. 48), etc., etc.

The form, colour and arrangement of the eyes assist the naturalist in determining the genera of spiders, thus :

The genus *Spharus* has two large and six small eyes.

The genus *Salticus* (Fig. 45) has the eyes in three rows.

The genus *Philodromus* has them in two crescents.

The genus *Pholcus* has the eyes on prominent black spots, etc., etc.

The species are determined from peculiarities of form, colour and markings.

The spider has eight seven-jointed legs, terminated in every instance with three toothed-claws (Fig. 49), or with two such claws and a brush (Fig. 50). This may fitly be called a hand-brush, for the creature uses it for dusting its web.

Projecting from the spider's head are two six-jointed palpi, which are so large that they might almost be mistaken for another pair of legs; and between these are the for-

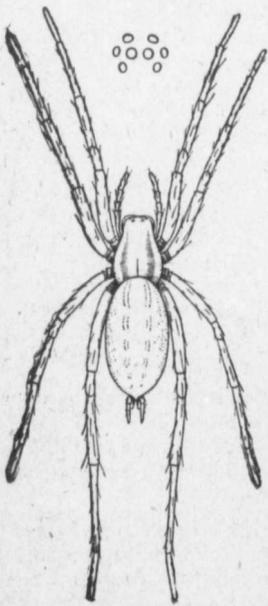


Fig. 48.

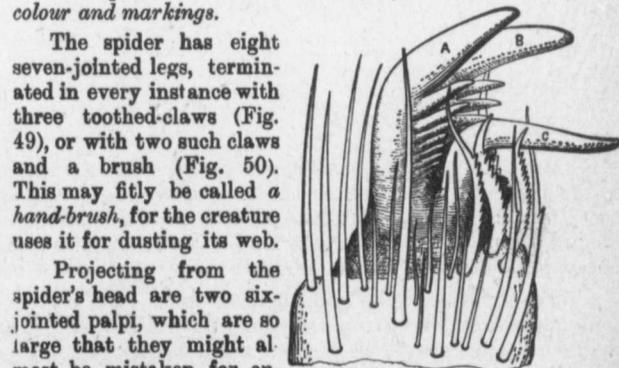
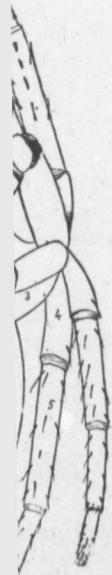


Fig. 49.

*Blackwall's "Spiders of Great Britain and Ireland."

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midable mandibles' (Fig. 51) toothed on the inner side, and furnished with fangs (*falces*) (Fig. 52) connected with a poison-gland. When the spider strikes a foe the virus is conveyed into the wound through a small opening in the fang' (Fig. 52a).



Fig. 45

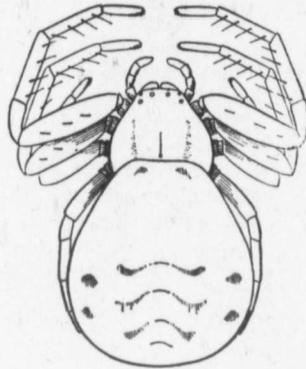


Fig. 46.

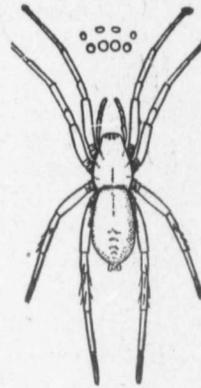


Fig. 47.

Behind the mandibles on the under side are the maxillæ or chewing organs. That the spider sometimes uses these without exercising its mandibles I know from experience.

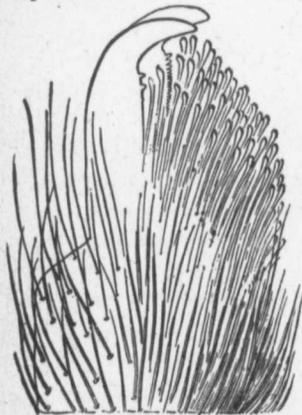


Fig. 50.



Fig. 51.

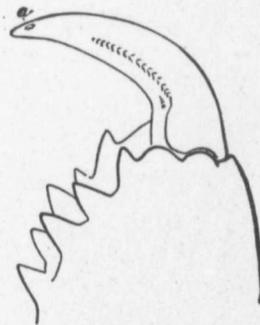


Fig 52

I was sitting one day, intent upon a book, when a tickling sensation on the back of my hand diverted my attention. I glanced down, and saw that a large spider was biting me. I shook the creature off, and found a cup shaped hollow—into which I could have dropped a mustard seed—where it had chewed away the flesh. Beyond a little passing irritation, I suffered no ill effects from the bite.

When the fangs of the spider are used upon a human being the effects may be exceedingly unpleasant. I knew a little girl who was wounded in the neck by a black spider. The flesh became greatly swollen and much discoloured, and the child was very ill. She was under the doctor's care for ten days.

The silk-bag of caterpillars is near the head; and the silken thread passes through and is controlled by the jaws of the insect. The spinning organs of spiders are near the other extremity of the body (Fig. 53). Inwardly they consisted of a number of glands,

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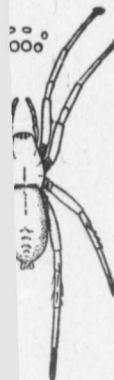


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The latter are gathered into clusters in the six outward spinnerets. The threads from all the tubes unite in the spinning, and yet that it is only one-fifth the size of a silkworm thread. It is so perfect that it has been used for marking divisions in scientific apparatus, for taking measurements of extreme delicacy and exactitude.

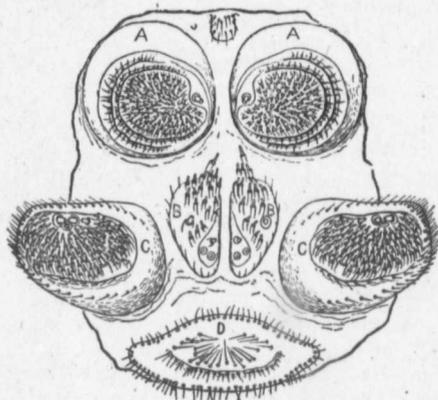


FIG. 53.

The female spider is generally much larger than the male. They do not live in the same nest, for the lady is of a capricious temper and has been known to fall upon and devour her mate. Indeed the cannibalistic tendencies of spiders are among the hindrances to rearing them with a view of employing their silk in manufactures.

There are, however, several species of spiders that frequent cellars, and that are of more peaceable dispositions than many of their kind; and these have been reared for a strange purpose. Fraudulent vintners after bottling and laying down their wine in cellars, have been ready to purchase spiders by the hundred at good prices. Set at liberty in the cellars of these men the spiders have speedily covered bins and bottles with a drapery of web that has conveyed the idea of age, and imparted a fictitious value to the wine.

The expedition with which spiders form their webs has ensued, it is said, on several occasions, the safety of fugitives. At a time of religious persecution in Europe, a man seeking a refuge crept into an oven, and a spider immediately commenced to spin its web before the door (Fig. 54). Before the pursuers arrived, its work was so far advanced that the men passed by the oven, remarking, "No one has entered there." A somewhat similar story is told by the Jews in regard to David, when he was in hiding from Saul, in the Cave of Adullam.

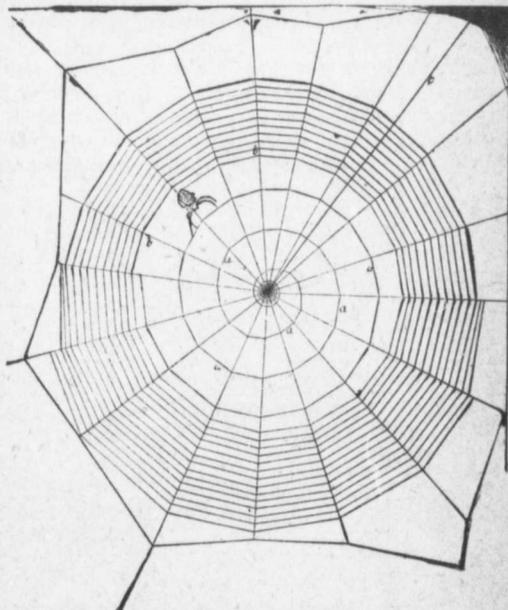


FIG. 54, web of an orb-weaver.

The perseverance of spiders in forming their webs under difficulties is remarkable. The well-known story told by Sir Walter Scott concerning Robert Bruce and the spider exemplifies this, and has thus been versified by Eliza Cook:

The perseverance of spiders in forming their webs under difficulties is remarkable. The well-known story told by Sir Walter Scott concerning Robert Bruce and the spider exemplifies this, and has thus been versified by Eliza Cook:

BRUCE AND THE SPIDER.

King Bruce of Scotland flung himself down in a lonely mood to think
 'Tis true he was monarch, and wore a crown, but his heart was beginning to sink,
 For he had been trying to do a great deed to make his people glad,
 He had tried and tried, but couldn't succeed, and so he became quite sad.

He flung himself down in low despair, as grieved as man could be ;
And after a while as he pondered there, "I'll give it all up," said he.
Now just at that moment a spider dropped, with its silken cobweb clew,
And the king in the midst of his thinking stopped to see what the spider would do.

'Twas a long way up to the ceiling dome, and it hung by a rope so fine,
That how it would get to its cobweb home, King Bruce could not divine.
It soon began to cling and crawl straight up with strong endeavour,
But down it came, with a slipping sprawl, as near the ground as ever.

Up, up, it ran, not a second it stayed, to utter the least complaint,
Till it fell still lower, and there it laid, a little dizzy, and faint.
It's head grew steady—again it went, and travelled a half yard higher,
'Twas a delicate thread it had to tread, and a road where its feet would tire.

Again it fell and swung below, but again it quickly mounted,
Till up and down, now fast, now slow, six brave attempts were counted.
"Sure," cried the king, "that foolish thing will strive no more to climb,
When it toils so hard to reach and cling, and tumbles every time."

But up the spider went once more, ah me, 'tis an anxious minute,
He's only a foot from his cobweb floor, oh say, will he lose or win it ?
Steadily, steadily, inch by inch, higher and higher he got,
And a bold little run, at the very last pinch, put him into his native spot.

"Bravo, bravo!" the king cried out, "all honor to those who try ;
The spider up there defied despair, he conquered, and why shouldn't I ?"
And Bruce of Scotland braced his mind, and gossips tell the tale,
That he tried once more as he tried before, and that time he did not fail.

Pay goodly heed, all you who read, and beware of saying "I can't,"
'Tis a cowardly word, and apt to lead to Idleness, Folly and Want.
Whenever you find your heart despair of doing some goodly thing,
Con over this strain, try bravely again, and remember the Spider and King.

§ 850 The spider's web (Fig. 54) so frequently represented in pictures is that of the Geometrical Spider, *Epëira diadema*. It is formed with great regularity and is a beautiful object. Strange to say it is made up of two kinds of silk. The long, convergent, anchoring threads are not viscid, but the cross threads are thickly set with minute gummy drops, which secure the unfortunate insects that strike upon them.

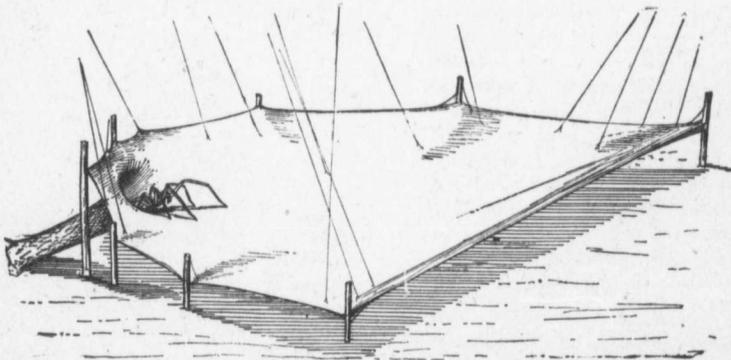


FIG. 55.

§ 851 There is a species of spider (*Agalena labyrinthica*) which forms a closely woven web spread horizontally over the surface of the ground, and having a retreat at one corner of it (Fig. 55). It has been said of this, that, in the early morning, when the webs are white with dew, one might fancy that the fairies had been having a washing-day and had spread their sheets over the meadows to dry.*

The Gossamer Spider, *Neriene vagans*, often sets a fine silken thread floating at haphazard on the air. (Fig. 56). When this becomes entangled at the further end the spider secures the nearer one, and makes use of the thread as a bridge by which to

**Mr. Mygale's Hobby*, R. T. S. p 89.

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pass to new hunting-grounds. The French call such threads *fil de la Vierge*. Sometimes the gossamer spider secures its thread and then spreads its limbs, and trusts itself to the summer air—the thread lengthening as it goes. Such spiders have been seen to alight on the topmost steeple of York Minster.*

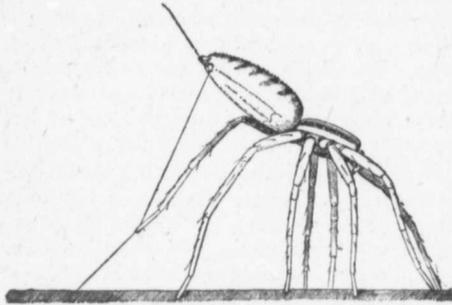


FIG. 56.

Its next task is to supply this habitation with air, and to expel the water. Its proceedings for this purpose seem almost miraculous. It rises to the surface, throws itself over with a sudden jerk, and entraps, with a film of web guided by its hindmost legs, a globule of air about the size of a buck-shot. With this it scuttles down to its habitation, and dives beneath it. It then sets free its globule of air which rises to the top of the dome, and displaces some of the water. Repeated efforts fully accomplish its work; and the spider has then an elegant, comfortable and secure dwelling-place. In it it lays its eggs, enclosing them in a cocoon or sack. Occasionally it makes an expedition for food, or to renew the air in its habitation. On the approach of winter it becomes torpid, and in this condition it remains till spring. As a boy, in one of the "Home Counties" in England, I often sat by a sluggish stream, and watched these spiders at their work.

The domestic spider (*Clubiona domestica*) is not a pleasant object. Its web is untidy, and its own appearance disgusting, but it intrudes everywhere. It "layeth hold with its hands, and is in kings' palaces."

Among remarkable spiders the Mygales or Bird-spiders hold the first place. Between thirty and forty kinds of them are known. The largest of them have a length of body of two inches and a half, and, when their legs are spread, measure eight inches from claw to claw. *Mygale fasciata* of Ceylon, *Mygale maculata* of South America and *Mygale Blondii* of the West Indies are among the giants. (Fig. 57. *Mygale Hentzii* of Texas).

Some of the Mygales are known as "Trap-door Spiders." They form tunnels in the earth several inches deep, and beautifully armed. The walls are hard and brown, but are lined with white silk, stiffened and

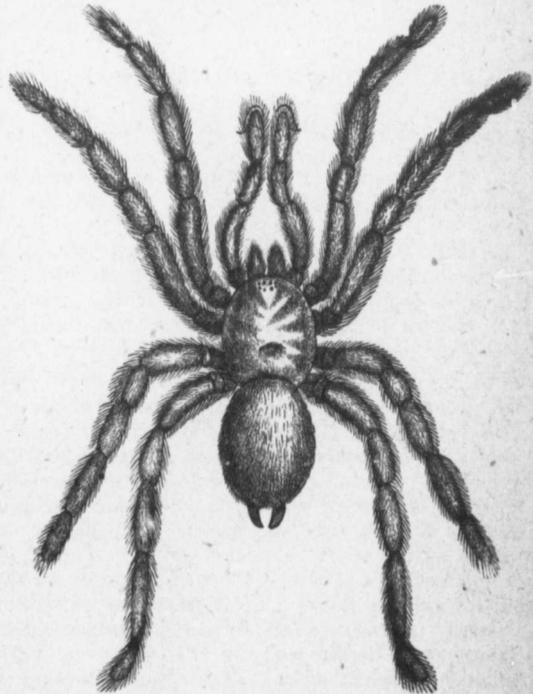


FIG. 57.

* Kirby and Spence's Entomology, letter XXIII.

smoothed with a natural cement. The doors of these habitations are wonderfully fitted and hinged, and close with their own weight.

Of the Wolf or Hunting Spiders the "Tarantula," *Lycosa tarantula apulica*, is a famous example. It abounds in the neighbourhood of Taranto (the ancient Tarentum) and Naples. In colour it is grey, and it has six angular black patches on the back of its abdomen. It is not a very large spider, being only a little over an inch in length. It hides in holes in the ground and under stones; and the bare-footed Italians are sometimes bitten by it. When a case of this sort occurs, the fiddler—not the doctor—is sent for; and the patient is kept dancing until utterly exhausted. After a brief rest he is aroused for another dance. And the exercise is renewed at intervals until the spider virus is supposed to have been eliminated.

There are some long-legged creatures that are commonly known as "Daddy Longlegs" or "Harvest Spiders." They are not true spiders—they belong to the Phalangidae. They have two eyes, one on each side of a sort of turret on the head. Their bodies are small and oval, and their eight legs are disproportionately long. They are useful creatures, feeding upon plant-lice and other insects, and, as far as I know, are quite harmless. Our commonest species are *Phalangium cinereum*, the ash-grey harvest spider and *Liobunum vittatum*, the striped harvest spider. Their eggs are laid in the ground, and the young come forth in the spring.

The naturalist who would collect spiders should carry a wide-mouthed bottle containing "whisky blanc." Into this he should drop the specimens as he finds them. He could afterwards place them separately in the same liquor, and in bottles of suitable size and form. The name of each specimen identified should be pasted on the bottom of the bottle. For classification the specimens might be placed in small racks—each family in a separate rack, and each genus in a separate row.

NOTES ON INSECTS OF THE YEAR—DIVISION I., OTTAWA DISTRICT.

By W. HAGUE HARRINGTON, F.R.S.C., OTTAWA.

My time was unfortunately so fully occupied during the season of insect depredations that my observations were very limited, and in consequence my notes are few and brief.

GRAINS AND GRASSES.—I did not hear of any insect attacks on wheat; neither was the Grain Aphis (*Siphonophora avenæ*) observed. The grasshoppers also were much less numerous than during the past year or two, possibly due to the unusual continuance of wet weather in midsummer. There was some Silver-top in old hay fields, caused probably by *Thrips poaphagus*, although Prof. Osborne has suggested that a large proportion of the injury known as Silver-top is due to the attacks of certain minute bugs.

ROOTS AND VEGETABLES.—Cutworms continue to be troublesome, the commonest species being the Red-backed Cutworm (*Carneades ochrogaster* Gn.) The ravages of these very destructive grubs could be greatly lessened by a careful use of the traps mentioned last year and which are strongly recommended by Dr. Fletcher in his valuable reports. Such traps are formed by dipping bundles of weeds, grass or clover in a strong mixture of Paris-green and water, or by slightly damping bran and mixing thoroughly with it a little of the poisonous powder. Turnips did not appear to suffer much from the Striped Flea-beetle (*Phyllotreta striolata*) usually so destructive, nor from aphides, but towards the end of August they were pretty severely attacked by the White Cabbage Butterfly (*Pieris rapæ*) and by the diamond backed moth (*Plutella cruceiferarum*). Onion, Cabbage and Radish maggots (*Phorbia*) were not quite as bad as last year, but still inflicted considerable loss. The White Cabbage Butterfly also considerably infested cabbages.

PEAS AND CLOVER.—A few peas have been found injured by the Pea Weevil (*Bruchus pisi*) but the insect is very rare in this district which is outside its usual limits

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A new pest has been observed upon Sweetpeas in gardens, viz. the Pea Aphis (*Nectarophora destructor*) which was very bad on some hedges of sweetpeas late in the season. Owing to the wet season in July injury by red spider was only complained of in a few places. Some damage was done by the Green Clover Weevil (*Phytonomus nigrirostris*) a serious attack having been noticed in the experimental plots at the Central Experimental Farm. The Black Armyworm (*Noctua fennica*) attacked both peas and clover, and was also troublesome in gardens.

FRUIT.—The Currant Aphis (*Myzus ribis*) was rather abundant, but was largely destroyed by the larvæ of various lady-birds (*Coccinellidae*)—The Currant Sawfly (*Nematus ribesii*) also continues to greatly defoliate currant and gooseberry bushes whenever prompt measures are not taken to destroy the broods. The last brood of the Cherry Slug (*Eriocampa cerasi*) was very abundant upon both plums and berries. The Oyster-shell Bark-louse (*Myrtilaspis pomorum*) has been bad in neglected orchards, but such places are naturally breeding grounds for many pests.

FOREST SHADE TREES.—The Tent Caterpillars (*Clisiocampa*) were again enormously destructive, and large areas were completely stripped, and the woods were rendered very unsightly and

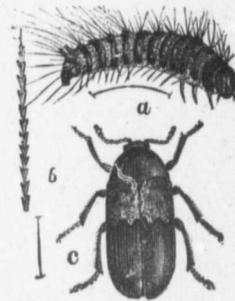


Fig. 58. *Dermestes lardarius*. A., larva; B., hair of do. magnified greatly; C., beetle.

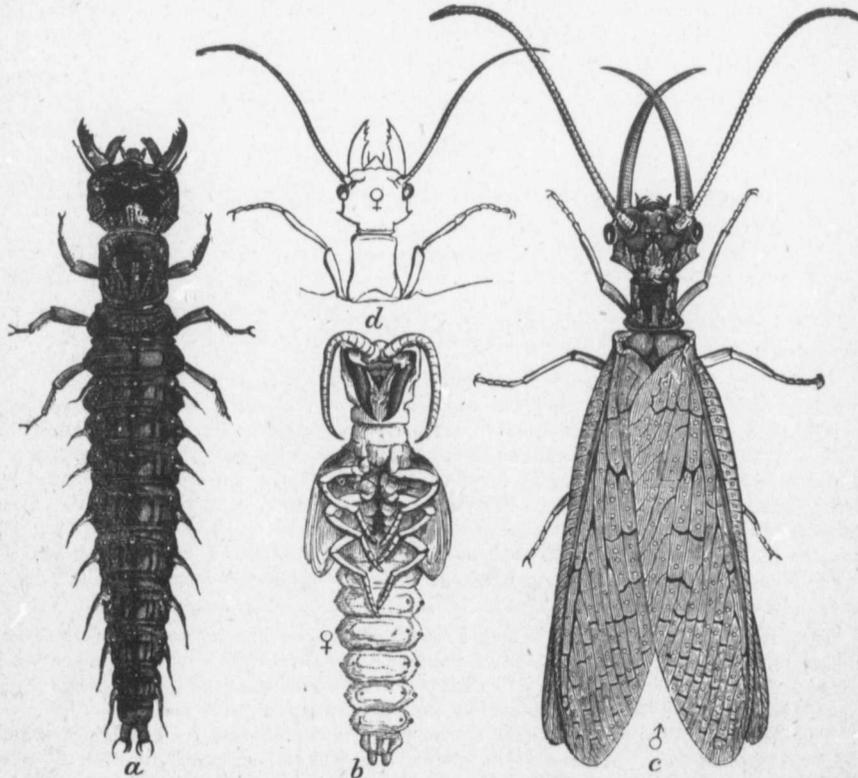


FIG. 59. *Corydalis cornutus*: A., larva; B., pupa; C., male; D., head and jaws of female.

uninviting by the quantities of webs and larvæ. Parasites, however, seem to be increasing, and many caterpillars also died from a fungus or bacterial disease.

The moths seemed less abundant around the electric lights, but in the woods there are now to be found many fresh egg-masses, so that the plague promises to continue next spring. The Yellow-necked Caterpillar (*Datana ministra*) did some damage to birches and was occasionally seen on elms. *Vanessa antiopa*, which is frequently a serious pest on our ornamental elms, seemed this year to confine itself to the willows. Elms, however, suffered very much from the attacks of plant lice, which were so numerous that the trees dripped moisture to such an extent that the sidewalks beneath them were kept quite wet for several weeks. The White Cedar Lecanium (*Lecanium Fletcheri*) was abundant upon some Arbor-vitae trees, but was severely attacked by the parasites which Dr. Howard bred from specimens which were sent to him some years ago from the Experimental Farm. *Nematus Erchsonii*, the Larch Sawfly, seemed to be more abundant there last year, although by no means in such numbers as it was several years ago, when its ravages resulted in the destruction of the greater part of our larches. The Spruce Kermes (*K. abietis*) has become more abundant and does serious damage, but the Spruce Sawfly (*Lophyrus abietis*) seemed less numerous. Canker Worms were little in evidence.

MISCELLANEOUS.—There was a remarkable abundance everywhere of *Dermestes lardarius* (Fig 58) and some houses were so infested that the beetles were a veritable plague. After the July rains mosquitoes made their appearance all through the city in great numbers and were especially troublesome in the sections where lawns and gardens are most numerous. Many of the residents on such streets kept smudges burning every evening during the period of the abundance of these irritating flies. Kissing-bugs of various orders were brought in for identification, generally on the principle that the bigger the insect the more likely it was to be dangerous; the favorite competitor seeming to be the male of *Corydalis cornutus*, (Fig. 59).

NOTES ON THE SEASON OF 1899, DIVISION NO. 2.

BY J. D. EVANS, TRENTON, ONT.

Owing to pressure of duties the writer's opportunities during the past season for observing the presence of destructive insects were extremely limited.

One insect (*Clisiocampa sylvatica*) was, however, so numerous and destructive to the foliage of forest trees that the most unobservant person could hardly avoid noticing the destruction going on. From Trenton northerly to Bannockburn, a distance of about 46 miles, but more especially from Ohisholm's Rapids northerly to the same point some 33 miles, the depredations were most severe. In many places the trees were nearly defoliated, but in some sections, blocks of woods were left without a vestige of a leaf. This caterpillar did not confine itself to forest trees, for orchards in the vicinity, although separated by many rods of cultivated land, were badly attacked, and one case can be recalled in the Township of Rawdon where an orchard consisting of from 100 to 200 trees was completely defoliated.

The caterpillars were in such immense numbers that on the 1st day of June, on the railway track, at a point about two miles north of Marmora station, the passenger train became stalled, and it was necessary to sweep the rails and use sand to enable the train to proceed. Three-quarters of an hour was consumed in making 300 yards.

The defoliated trees, relieved later in the season with diminutive leaves, in many cases however with large trees only the lower limbs showed signs of life. In sections where the insects had been prevalent in former years it was noticed that the tops of large trees were generally dead.

The Tent Caterpillars (*C. Americana*) were prevalent in neglected orchards; they were also observed to attack the mountain ash, their nests being seen on the trees.

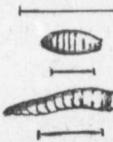
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NOTES ON INSECTS OF THE YEAR—DIVISION No. 3, TORONTO DISTRICT.

BY ARTHUR GIBSON, ASSISTANT ENTOMOLOGIST, CENTRAL EXPERIMENTAL FARM, OTTAWA.

Toronto and its vicinity have not, so far as I have been able to learn, suffered very seriously from the attacks of injurious insects during the past year.

The Tussock Moth (*Orgyia leucostigma*) caused some damage to shade trees, mostly horse chestnut, along many of the streets in Toronto during the past summer, but was not nearly so abundant as in the previous few years. One locality especially, however, suffered seriously, namely, the St. James's Cathedral property. The horse chestnut trees around the Cathedral were attacked and the foliage entirely destroyed in some cases. In 1896, the year Toronto was visited to such an alarming extent by this pest, many of these trees, were perfectly stripped of leaves. The Toronto civic authorities ever since 1896 have been painting the shade tree on a large number of streets, with a mixture, which I think is called "Caterpillarine," but this apparently has not been much of a protection. No doubt many of these caterpillars which had fallen to the ground were prevented by this sticky substance from climbing up the trees, but of course, it did not have any effect on the great majority which were up in the trees and which were doing the damage. I think if the civic authorities had taken this matter up at the proper time and sprayed the trees sufficiently, before the caterpillars got too large, with one of the standard arsenical mixtures, such as Paris green, or arsenate of lead, much of the foliage would have been saved, and the pest to a much greater extent stamped out. Much good work, however, was done by the destruction of large numbers of egg masses, which were collected from the trees by school boys and others, at a small outlay by the City Council.

The Tent Caterpillars, as in many parts of Canada, caused considerable damage to forest and fruit trees in the vicinity of Toronto. In early spring I noticed dozens and dozens of "tents" on wild cherry trees close to the Humber River. Many of the fruit trees in neighboring farms were also badly infected.

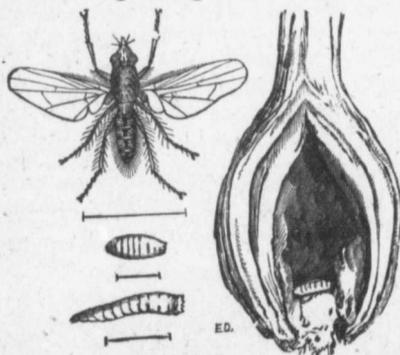


Fig. 60.

ments can be obtained from his reports.

The Onion Maggot (*Phorbia ceparum*) Fig. 60, was troublesome in certain market gardens. Mr. Crew, in a conversation, mentioned that a friend of his has had good success in fighting this insect by the use of alum diluted in water, and sprinkled along the rows of onions with an ordinary watering can. All of these root maggots are difficult to treat, some experimenters obtaining results with certain materials, which in the hands of others appear to have been of little value. The most successful experiments recorded in Canada, mentioned in the Reports of the Dominion Entomologist, have been with carbolic acid, in some of its various forms, and white hellebore. Full details of these experi-

The Red Spider (*Tetranychus telarius*) Fig. 61, was reported as doing damage to sweet peas on the property of Mr. Edward Leadley, of Robert Street, Toronto, who stated that this insect had appeared in sufficient numbers during the past summer to injure his crop of sweet peas. These little creatures although commonly called Red Spiders are not real spiders, and are difficult to treat when they become once established. As soon as they are noticed, if the plants are sprayed with kerosene emulsion, or whale-oil soap, much good will result. Dusting with sulphur is also very useful. Sweet peas in Toronto were also attacked by the Destructive Pea Louse (*Nectarophora destructor*) which has done so much harm this year in Canada, particularly in New Brunswick and Ontario. Mr. Leadley writes that it was extremely injurious on his sweet peas. In other places it has not only attacked this favorite flower but also done injury to field peas.

In Parkdale, Toronto, many of the residents complain of the prevalence of fleas in their houses during the past summer. About the first week in September these little pests were extremely abundant, much to the writer's regret, as he spent a night at a friend's house, while he was visiting Toronto. These may have been introduced into the houses at first, no doubt, through the agency of some pet animal, and had probably multiplied during the summer absence of some of the residents. The young larvae feed upon animal matter in dust, and being very slender and active, penetrate into the smallest of cracks in floors, walls, etc., and where dust has accumulated will breed rapidly. Thorough cleanliness therefore, and a frequent use of scalding water, will do much to remedy the occurrence of this pest.

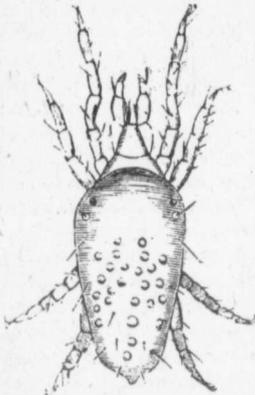


Fig. 61.—Red spider, greatly magnified.

Another insect which has caused some anxiety in Toronto during the past season is a black aphid attacking violets (*Rhopalosiphum violae* n. sp. Perg.). Mr. J. H. Dunlop, the well-known florist, has noticed the occurrence of this pest in his green houses among his violet beds. On the 13th October, when in Toronto, I visited Mr. Dunlop's houses and found this aphid very abundant, but fortunately it has not done much damage as yet in this country. Last year Mr. Dunlop's violets suffered from an attack of *Emphytus Canadensis*, the Pansy Sawfly, but this year he has not been troubled with this insect. A small pyralid moth (*Phlyctænia ferrugalis*) appeared among Mr. Dunlop's rose bushes the past year, and its larvae occurred in sufficient numbers to cause some damage to the foliage of these plants. When full grown the larva is about $\frac{3}{4}$ of an inch in length, and is a semi-translucent green with a dark green dorsal stripe, on each side of which is a sub-dorsal white band. Those which were found by the writer, when in Mr. Dunlop's houses, were feeding on the underside of the leaf, which had been drawn together somewhat by means of a slight web, the injury seemingly being chiefly done by eating the soft tissue on the lower side of the leaves.

NOTES ON THE SEASON OF 1899.

By J. ALSTON MOFFAT, LONDON.

From various causes, personal observations on the doings of insects during the past season, were with me decidedly limited; so I was dependent in large measure upon the observations of others for my knowledge of what was going on in the insect world.

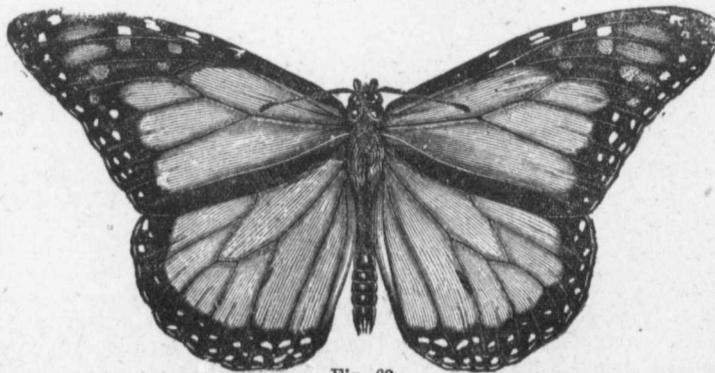


Fig. 62.

The Colorado potato beetle, *C. decemlineata*, was very late in putting in an appearance; so much so that many thought that the severe frosts of the previous winter on the

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The subject general attention. It appeared in specimens of



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bare ground had finished its career, but later on Paris Green was in demand all the same.⁶ The imported cabbage butterfly, *Pieris rapae* was to be seen in abundance, especially during the latter part of the season. The moth of the climbing cutworm, *Hadena arctica* which was such an unwelcome intruder in houses in the season of 1895, was again in evidence, but in moderate numbers.

The superabundance of the Milkweed butterfly, *Anosia archippus*, (Fig 62) attracted general attention, even amongst those who are not in the habit of noticing butterflies. It appeared early, and kept increasing in numbers until about the end of August; whilst specimens of it were taken as late as the middle of October. One of our members who



Fig. 63.

63.) During daytime they care nothing whatever for each other's company, but fly aimlessly about as solitary individuals, as if they were in a meditative mood. When, with night's approach they begin to congregate at their rendezvous, then they cannot get close enough to each other; but will crowd themselves in where there is no room, to the great inconvenience of those already there, and so cause much commotion in the flock before they finally settle down for their night's repose. *Anosia Archippus* appears to be an Entomological Enigma.

Reports of the butterflies appearing in vast numbers have been received from various localities, and newspapers have reported swarms of them as filling the air, but no intimation was given as to whence they came or whither they were going; indeed, the observers probably did not know that it was of any importance as to where they were going, or if they were going anywhere at all in particular, and so missed an opportunity of adding to our knowledge in this matter.

This has been a favorable season for making observations, as they were moving in masses that could be easily watched and a definite idea obtained of their rate of travel and the direction taken by them. But this is a kind of work that a central bureau of entomological information can alone accomplish satisfactorily. Notice could have been sent in of their having left the north, and warnings issued to every observer to be on the lookout for them on their way south, and thus a connected account obtained of their movements from start to finish.

Mr. Bird's paper in the *Canadian Entomologist*, vol. 30, page 126, giving his method of securing the larva and pupa of a variety of species of the genus *Hydracia* in their different food plants, and thus obtaining the moths in a perfectly fresh condition, which is of such advantage for the correct separation of the species in this genus, created much interest amongst collectors, and an effort was made here to follow out his directions, which resulted in a good measure of success. Mr. Bice secured in large numbers *H. cataphracta*, *H. nitela* and its variety *Nebris*, from Burdock, Giant Ragweed, Elder and Wild Parsnip. Mr. Balkwill collected in Burdock principally, from which was obtained a fine series of *Cataphracta*, with an interesting amount of variation in the depth of coloring, and in the conspicuousness of their ornamentation, which was gratifying to secure. Thus, although the hunts produced nothing new, they gave encouragement to the hope

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that with the knowledge acquired, better results may follow renewed efforts next season. There are species of *Hydracia* taken here whose food plants are not yet known, and a knowledge of which is of sufficient importance to warrant an expenditure of time and labor in an effort to try and discover them. But, as Mr. Bird has remarked, more species may be found in that way whose presence was never seen or suspected in that locality.

During the past five or six years the ornamental Birch trees of this city have been showing signs of being affected by some disease; indeed, several large and much valued trees have died outright during that time. The preliminary symptoms are a weakening of the growth, and a thinning of the leaves at the apex of the tree, which gradually spreads downwards until the whole tree is affected and gives up its life. I have thought that it might result from the work of borers, and I have taken *Clytanthus ruricola* and *Agrius bilineatus* on the trees, and have seen many holes in the trees out of which such beetles might have come,—with Woodpeckers' work conspicuous and abundant. And yet, if they are to blame, it does appear strange that the trees should be affected in that particular way; unless the borers are more numerous at the top than they are at the base of the tree.

A few important additions have been made during the past season to the Society's collection of native lepidoptera; amongst them are the following:

Orthosia helva, Grote. A species which I have had the impression for many years should be classed as Canadian, but could get no authentic record of its capture in Canada, until last summer, when Mr. H. S. Saunders of London took it at Ottawa, and presented a specimen to the Society.

Aglossa cuprealis, Hub. Taken at light by Mr. Bice.

Hydracia furcata, Smith. This was a capture made by Mr. C. G. Anderson several years ago. I regarded it as a badly faded specimen of some common form; but when seen by Dr. J. B. Smith, he informed me that the color was normal, and that it was really a very good species.

Hydracia stramentosa, Guenee. This is a species that has been regarded by Canadian collectors for the past thirty years as belonging to our fauna, and was placed in our label list as such; but all inquiries on my part failed to elicit any information concerning it, until I began to suspect that there had been a mistake made somewhere. Recently, whilst engaged in naming some material for Mr. Dwight Brainerd, of Montreal, a difference of opinion arose between us about the correct name of a *Hydracia*, which was settled by Dr. J. B. Smith in his favor. Then Mr. Brainerd sent me a second specimen of the disputed form, and with it another *Hydracia*, which he said he took at Montreal in numbers every season, and which was known to them as *Stramentosa*. And there, sure enough, was the long lost and much desired species, which had been kept out of sight, and from public knowledge through all these many years. This I regarded as the prize of the season.

NOTES ON THE SEASON OF 1899.

BY REV. C. J. S. BETHUNE, LONDON, ONT.

The writer's opportunities of collecting and observing insects have been very limited this year owing to his removal from Port Hope to London in the middle of the summer. No one, however, could fail to observe the enormous abundance of Tent Caterpillars (*Clisiocampa*) and the amount of damage inflicted by them on the foliage of fruit and forest trees. From every part of the Province they were reported to be similarly abundant, though in many places much more destructive than in others. In the neighbourhood of Port Hope the "Forest" species (*C. distria*) was not particularly noticeable and did not cause any injury worth mentioning; but the "Apple tree" species (*C. Americana*) was very abundant and destructive to foliage of fruit trees in gardens and orchards, especially

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where no attempt was made to get rid of them. In the winter the egg-bracelets may be cut off and destroyed, and in early spring the tents, or webs, can easily be seen in the forks of small branches when the tender leaves are expanding and can be removed without much difficulty. By adopting these means, the writer cleared his garden almost completely, a few stray caterpillars only escaping destruction.

The only other general outbreak of the year was that of various species of Aphides (plant lice), which have been swarming in myriads for several seasons now and attacking a large number of cultivated plants. The long continued drouth in the summer, combined with some very hot weather, reduced their number considerably and caused them to be much less troublesome in the autumn. During the two preceding seasons in October and November the air on sunny days was filled with infinite numbers of the winged specimens to the great annoyance of everyone out of doors, but this year, though numerous enough, they did not cause the same amount of discomfort and we may infer that they are not likely to be so abundant and destructive next year.

Every gardener and fruit grower has some insect or other to complain of; our familiar enemies are always at work, cut-worms, caterpillars, potato-beetles, codling worms, grasshoppers, curculios, slugs, sawflies, flea-beetles, and hosts besides, but there has been no one kind in more than ordinary abundance or requiring more vigilant measures for prevention than usual.

Among other insects—those that do no injury to cultivated plants—may be mentioned the handsome Archippus butterfly. Last year it was unusually scarce, but this year it swarmed all over the country, in cities and towns as well as in the rural districts. Even the most indifferent could not fail to be struck with the great numbers of these beautiful creatures which float so majestically in the summer air. Their curious practice of assembling in large numbers in the evening and roosting together was noticed by many observers. Night after night the writer observed them flying singly in rapid succession up the hill on which his garden stood, and, after a little soaring about, gathering together on the dead branches of some trees close to the house. Here they would huddle together in great numbers till the bough looked as if clothed with brown leaves of a triangular shape. If disturbed they would flutter about for a few minutes and then settle down again on the same or a neighboring twig. The late arrivals usually caused much commotion by trying to force their way in where there was no room for them. This singular proceeding lasted for many nights and was watched with great interest. When darkness came on they could easily be picked off with one's fingers without causing any alarm amongst those close by. In the early morning they were all off again on their individual duties or pleasures, and showed no desire for the companionship of others till the fading light of day caused them to look for a sleeping-place. The phenomenon is a singular one and not easily to be explained.

Another handsome butterfly, *Papilio Marcellus*, was seen again at Port Hope this summer. As this makes the fourth year of its appearance in the same locality, we may infer that it has succeeded in making a permanent residence there, though in very limited numbers at present.

In August last, the Editor of the "*Mattawa Tribune*" sent to the writer for identification, a caterpillar, which changed to a chrysalis before it arrived at its destination. It proved to be the Tiger Swallowtail (*Papilio Turnus*). About the middle of November, there emerged from the chrysalis, which had been kept in a warm room, instead of the expected butterfly, a large ichneumon fly, *Trogus fulvipes*, Oresson. This is rather a rare species, our common parasite of the Papilios being *Trogus exesorius*, Brulle, and is reported from the Province of Quebec, Maine and New Hampshire. It is almost entirely black with smoky wings, the lip, knees, tibia and tarsi being yellow.

The locust trees in and about Port Hope have been for some years severely attacked by the grubs of the well-known boring beetle, *Cyrtene robiniae*, and a large proportion of the smaller trees have been killed by them. In the case of older trees, branches and limbs are so much perforated that they break off when violent storms occur, but the tree itself does not usually succumb. Another enemy is now, however, at work boring into the solid wood, and it is not likely that even the largest trees will long be able

to withstand these combined attacks; this is called the locust tree carpenter-moth (*Prionoxystus robinia* Peck). The larva, when full grown, is between two and three inches in length and nearly half an inch in diameter; its borings through the solid wood are consequently very large and cause much injury to the trees. Fortunately the timber is of no commercial value, the trees being grown for shade or ornamental purposes, and being attractive chiefly from the fragrance of the blossoms and the ease and rapidity with which they can be grown. The moths of this species are very singular in appearance; the females are of a grey colour, similar to the bark of a locust tree, the fore-wings being closely covered with a net work of black lines and having also some irregular black spots; the hind wings are of a uniform dusky color; the wings expand about three inches. The male moths are much smaller, expanding only about two inches, darker in colour and distinguished by a large bright yellow patch on the hind wings. They are so unlike the other sex that they might easily be taken for a different species. The females come into houses attracted by light in June, but the males are rarely seen.

The squash bug (*Anasa tristis*) fig. 23 has been very abundant this year on the squash plants, great colonies of larvae in all stages of growth being found; these are of an ashen grey colour with pink antennae. When they have reached this stage in their career, it is not easy to find a remedy; in the case of a few plants in a garden hand picking may be resorted to, that is they can be brushed off into a shallow tin dish and then destroyed. But where they are grown on a large scale for marketing, kerosene emulsion might be applied but would involve a good deal of trouble as the bugs are concealed and somewhat protected by the leaves towards the base of the plant. As the insect passes the winter in the full grown state, many may be destroyed in the autumn when they are wandering about in search of shelter; and in the early summer, when they come out to lay their eggs, they may be trapped by placing chips or small pieces of board close to the young plants; under these they will hide in the day time, and may then be readily captured and destroyed.

An interesting capture in London was made by Mr. Short, one of the city postmen. On September 26th, when going his rounds he found a perfect specimen of the large and handsome sphinx moth, *Phlegethontius cingulatus*, which is distinguished by the series of rose-red spots on each side of its abdomen.

NOTES ON THE SEASON OF 1899.

BY REV. T. W. FYLES, LEVIS, QUEBEC.

The season of 1899 was, at Quebec, a strangely variable one. The thermometer under my verandah recorded 93° in the shade on July 25th, and 43° in the shade on October 2nd—a difference of 50°. On the latter date there was a slight flurry of snow.

The weather was dry when rain was needed, and wet when fine weather would have been welcome. So dry was it, for a time, that the leaves of some exposed trees withered and fell untimely, without having taken the autumn tints. For the same reason the potatoes on the high land have been found to be small and few to the hill.

INSECT PESTS.

Early in the season the tent-weaving caterpillars of *Clisiocampa Americana* Harris and *C. diastria*, Hbn. were exceedingly numerous and troublesome. On the railway, in parts of the eastern townships, their crushed multitudes are said to have made the rails slippery, and retarded the progress of the trains.

On the Island of Orleans, early in June, the larvæ of *Hybernia tiliaria*, Harris, defoliated many young trees. (Fig. 64.)

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BUTTERFLIES.

In June *Papilio Turnus* Linn, and *Danais Archippus*, Fab., were unusually abundant. On the 25th of the month I found *Archippus* larvæ in the second and third stages. At the same time the female butterflies were hovering about the milkweed in numbers, laying their eggs one here and one there on the plant. The more advanced larvæ were full fed on the 4th of July, and suspended themselves for the pupal change. A day later they cast the last caterpillar skin, working it upwards till it reached the cremaster, when a succession of convulsive twists dislodged it, and it fell to the ground. The abdominal segments were then drawn up and shaped into the rounded summit of the very beautiful pupa. The pupa changed from green to a rich mahogany brown in the night of July 16th-17th, and the perfect insects appeared in the afternoon of the 17th. Butterflies of this species were on the wing throughout the month of August.



Fig. 64.—*Hybernia tiliaria*: the winged male and wingless female moths; larvæ of various sizes.

In July *Chrysophanus epixanthe*, Bd., and Lec. was unusually abundant at the Gomin Swamp.

In August larvæ of *Grapta interrogationis*, Fab., were found feeding upon hops which shaded the verandah of the country residence of the Hon. Richard Turner, on the Island of Orleans.

In this month I saw *Pamphila Manitoba*, Scud, on the Heights of Levis, but not in numbers.

SAW-FLIES.

In the Society's Annual Report for 1897, on page 73, I gave an account of the saw-fly larvæ that fed on poplar, and a description of the perfect insect. Mr. Ashmead has since identified this for me as *Nematus luteotergum*, Norton.

On the same page I described saw-fly larvæ that fed on *Cornus*. They buried themselves in October, and I found some of the larvæ quite fresh in the Spring, but they failed to pupate, and perished. Last fall I obtained a new batch of the larvæ and placed in the cage with them some pieces of decayed birch-wood. On the 15th of September, immediately after a moult, they proceeded to tunnel into the wood. All had disappeared before the 24th of the month. It was amusing to see how expeditiously and neatly the creatures accomplished their task. Every larva cleared its way with a whisk of the after part of its body, which scattered the *frass* in a regular circle of about the diameter of a half dollar. The finished hibernaculum was a clean-swept, oval chamber, just large enough to hold the larva comfortably. In this the creature remained unchanged till the middle of June. On the 20th of June I saw the skin of one specimen burst at the head and reveal the pupa. The insect in the pupal stage was seven and a half lines in length, waxen in appearance. The head was distinct, and the eyes showed through the skin as

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reddish-brown spots. The antennæ and legs were free. Imagos of the species appeared in the last week of June and the first week of July. They proved to be *Harpiphorus tarsatus*, Say.

In the beginning of July, in examining a discolored larva of the species, I made a small opening in the head and suddenly a very active specimen of *Hemiteles mucronatus*, Prov., burst forth. Individuals of this species had previously shown themselves in the cage.

A PARASITE OF HYLATOMA PECTORALIS, SAY.

In the beginning of the season I obtained a specimen of *Pimpla inquisitor*, Say, from a pupa of *Hylotoma pectoralis*, Say.

DATES OF APPEARANCE OF CERTAIN INSECTS.

My insect breeding cage was placed out of doors, and was buried under the snow during the winter. It was not taken in till the spring opened. The following then may be regarded as indicating the natural times of appearance of the species mentioned.

- Papilio Turnus*, Linn, appeared May 28th.
Papilio brevicauda, Saund, appeared May 23rd.
Sphinx Kalmia, A. & S., appeared May 25th.
Sphinx luscitiosa, Olem., appeared May 27th.
Paonias excrucatus, A & S., appeared May 27th.
Edema albifrons, A & S., appeared May 27th.
Cerura borealis, Boisd. appeared June 3rd.
Cerura scolopendrina, Bdv. appeared June 6th.

SPHINX LUSCITOSA, CLEM.

On the 27th of May two beautiful specimens of this moth appeared in my insect cage. The larva of the species feeds on *Populus tremuloides*. It is long in proportion to its girth. It is apple green in colour and has seven side lines. Each line is white below and mauve darkening to purple above. The last line is extended to the end of the horn which is green and rather short. On the body are numerous minute rings with white centres. These are most numerous on the 3rd, and 4th, segments, and along the sides. The head is green, and has a yellowish-white line down either side, supported by a dark purplish line outwardly. The cheeks beyond the lines are spotted with white. The true legs are whitish and tipped with brown. The larvæ were full fed on the first of September, and buried themselves in the soil.

INTRUDERS.

Periplaneta Australasica.

In the beginning of June, a fine specimen of the Australian Cockroach (*Periplaneta Australasica*) was found in a bunch of bananas by Oswald Davie, a junior member of the Quebec branch of our society.

Tenebrioides Mauritanicus Linn.

In the middle of April, I discovered a number of "Cadelle" larva in some Graham flour obtained from a store in Levis. This is a description of them :

Larva 7 lines in length, greyish white in color; somewhat flattened in appearance, has white hairs thinly scattered over its body. The abdominal segments are larger than the thoracic. The head is brown and shining, as is also the plate on the second segment. The last segment has a peculiar dark brown forked termination. The legs are widespread, amber in colour. When near pupation the larvæ managed to escape.

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A BUSY SCENE.

On the 14th of June I found a thorn-tree (*Cratægus crus-galli*, L.) in full blossom. Growing on the north-west slope of a cliff, it was later in flowering than other trees of its sort. I was surprised to see the multitude of insects that thronged it. In the few minutes that I stood by, I noticed many specimens of the undermentioned kinds:—

BUTTERFLIES—*Papilio Turnus*, Linn; *Lycæna Couperi*, Grote.

BETTERFLIES—*Clytanthus ruficollis*; *Anatis 15-punctata*, Oliv.; *Cyrtophorus verrucosus*, Oliv.; *Leptura lineola*, Say; *Donacia emarginata*, Kirby.

TWO-WINGED FLIES—A species of *Chionomus*; *Pangonia tranquilla* O. S.; *Stratiomyia obesa*, Loew; *Milesia excentrica*, Harris; *Syrphus xanthostomus*, Wied; *Sericomyia militans*, Walker, *Sphærophoria cylindrica*, Say; *Musca Cesar*, Linné.

BEES—*Apis mellifica*, Drury; *Andrena nivalis*, Smith; *Osmia bucconis*, Say.

WASP—*Vespa maculata*, Fab.

SAW-FLIES—*Tenthredo lineata*, Prov.; *Monophadnus scelestus*, Cr.

METZNERIA LAPPELLA, LINN.

In the beginning of September, 1898, I discovered, in the heads of Burdock, a curious larva, of which the following is a description:

Head bi-lobed, brown; mouth organs large. A brown plate, marked longitudinally by a white line, on the second segment. Body rounded, much crinkled, of a fatty appearance, having a few white hairs along the sides. Anal segment small and protruding. The legs small and weak. The pro-legs seemingly atrophied into mere pseudopodia. Length of larva two and a half lines.

On the approach of winter, the larva having eaten out a convenient hollow in the closely packed seeds, cemented its surroundings together, and then lined its cell with a flocculent white cocoon. In this it remained unchanged till the beginning of June when it went into chrysalis.

The pupa was of elegant shape, amber-coloured—the head parts darkening into brown. The antennæ and legs were traceable through the skin. The length of the pupa was three lines. The moths appeared in the end of June and continued till August. They mated about the middle of July.

The dimensions of the perfect insects were as follows:

Expanse of wings (male) $5\frac{1}{2}$ lines, (female) 9 lines.

Length of body (male) $2\frac{1}{2}$ lines, (female) 4 lines.

Length of antennæ (male) 2 lines, (female) 3 lines.

The eyes of the moth were large and prominent, in color they were a rich, warm brown. The palpi were reflexed—the second joint was long and had long scales, and the terminal joint was pointed. The antennæ were filiform, prettily-encircled with minute, short bristles at the joints. The proboscis was long and coiled up, watch-spring fashion. The body terminated with a tuft like a paint brush. The tibia in the hindmost pair of legs had two pairs of spurs—that in the second pair, had but one pair of spurs.

The fore-wings were of a pale sienna brown, with a patch of darker brown extending along the costa and towards the inner margin, for two-thirds of the length of the wing. There were three or four lines of darker scales towards the hind margin and following its curve. Some of the specimens had the three dots on the disk spoken of by Stainton (*Man. of Bh. Butt. and Moths*, vol. II, p. 348.) The hind wings were slate-coloured and had long fringes of the same hue.

The eggs of the moth (obtained by pressure) were very minute, globular, smooth and white. They are dropped probably into the flower-head of the plant, for the most careful microscopical examination shewed no opening made by a larva through the glochidate involucre.

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On August the 4th, I found the newly hatched larva biting into the side of one of the outer seeds. The seeds at this time were white and tender. The body of the larva was white, waxen, and semi-translucent.

The insects were identified for me by Lord Walsingham and Mr. J. H. Durrant. To them also I am indebted for the correction of the generic name from *Parasia* to *Metzneria*, Zeller.

It may well be asked, How was this European insect advanced to Canada? This probably is the correct answer: At Point Levi there is a quarantine station for cattle; and old country hay and straw are often landed with the cattle; and burs containing larva of the species have, at some time, been landed with the fodder. The Burdock is plentiful on all our roads.

THE "KISSING BUG."

One of the strange occurrences that marked the season was the spread of the "newspaper scare" of the so-called "Kissing Bug." The rumour concerning this fabulous insect took its rise in the United States, and was echoed by our Canadian press. All over the country alarming reports were published till the women were afraid to open their bedroom windows lest the bug should gain admittance. At the time that the fever was at its height, an employee of the G. T. R. company residing at South Quebec, took his family for a trip to the Island of Orleans. The day was hot and the man lay down in the shade for a nap. While he slept something bit him—probably a mosquito or a cattle fly. In his efforts to allay the irritation occasioned by the bite, he enlarged the wound. A day or two afterwards his arm began to swell, and he became seriously ill. Herein was confirmation of the kissing-bug reports! The part of the story that was not generally known was, that the day after he was bitten the man assisted in unloading a car full of raw hides for the tanners, and that it was the corrupting animal matter from the hides that had poisoned the wound.

About this time I came upon a group of excited people at a street corner in Quebec. I looked over the shoulders of the crowd and saw a negro who was exhibiting a very fine specimen of *Sphinx Chersis* as the veritable bug. "And this," said he, drawing out its proboscis with a tooth-pick, "is the instrument that it kisses with." A shudder passed through his auditors as they thought of the deadly effects of a thrust from this long oculatory weapon into the soft cheek of Sleeping Beauty.

INJURIOUS INSECTS IN ONTARIO DURING 1899.

BY DR. JAMES FLETCHER, DOMINION ENTOMOLOGIST, OTTAWA.

A few different kinds of injurious insects have attracted more than usual notice during the past season from the farmers and fruit-growers of the province. The keen interest which has been taken in the spread of the San Jose Scale has been at least enough to satisfy even Entomologists, who have been for three years begging fruit growers to believe that the San Jose Scale is not as was claimed, "only an ordinary insect like the Colorado potato beetle and many others." Unfortunately this conviction may have come too late, and the very men who ought to have been seconding the wise efforts of the Government to conquer this enemy by adopting promptly the measures recommended which would have prevented its spreading, are now claiming that the infestation is so widespread that there is no chance of eradicating it and that therefore the Government must stop all extreme measures. This matter has been discussed at length on previous pages of this report so that it is unnecessary to say here more than that the San Jose Scale is still to be considered one of the very worst enemies that the fruit grower has ever had to fight against, that there is no cheap and easy method of controlling it and that fruit growers should make every effort to get suspicious scale-insects found on their trees identified, and if these prove to be the San Jose Scale, do everything in their power to destroy them promptly.

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CEREALS.

Grain crops throughout the province have not been injured to any large extent by insects. The Wheat Jointworm, which last year did some damage, has not re-occurred, and the same satisfactory report may be made with regard to the outbreak of the Wheat Midge, which appeared last year along the shore of Lake Ontario in the Niagara peninsula. The Hessian Fly, that old time enemy of the wheat grower, was rather more abundant than usual in Western Ontario, and letters were received asking as to the best way of preventing loss. Wireworms were troublesome in several places, and some practical treatment to prevent loss by these insects is much needed.

The Pea Weevil has done much harm this year. Farmers and pea growers are careless about getting their seed fumigated, and there are many complaints that this serious pest is increasing. In our last report, at page 78, full instructions were given as to the easiest and best means of treating seed pease to destroy the weevils. They were briefly¹ (1) fumigating the seed with bisulphide of carbon, or (2) the holding over of seed for a year.

The Destructive Pea Aphis (*Nectarophora destructor*, Jnsn.).—By far the most serious attack upon field and garden peas during the past summer was by a previously undescribed species of plant-louse. It is very remarkable that a species should suddenly appear, as this one did, in sufficient numbers to destroy millions of dollars worth of produce in a few days, and that it should have been previously so rare as to have entirely escaped detection and description by Entomologists. Such, however, was the case. The Destructive Pea Aphis occurred in vast numbers in several parts of Canada and the United States. Specimens of the insect and reports of its ravages were received from widely separated places, in a line extending from the Maritime Provinces to the Lake Erie counties of western Ontario, and from the Great Lakes down to the Southern States. The species has been worked up and described by Prof. W. G. Johnson, of College Park, Md., and an interesting account of it by him was read at the eleventh annual meeting of the Association of Economic Entomologists last August which will appear in the report of that meeting. Prof. Johnson said "the growing of peas in Maryland is a very important industry, and reliable conservative authorities place the loss this season at \$3,000,000, the principal cause being the Pea Louse. In many cases the destruction was complete, varying from mere garden patches to hundreds of acres." The States in which most injury has been recorded are Maryland, Virginia, North Carolina, Pennsylvania, New York, New Jersey and Delaware.

The two most notable occurrences of the Pea Aphis in Ontario were at Freeman, reported by Mr. G. E. Fisher with specimens, and at Ottawa where the insects were found in large numbers from August until the end of October. The attacks upon field peas at Ottawa were unimportant, but the sweet peas in some gardens were seriously injured. For field peas it is difficult to apply a remedy, owing to the way in which this crop covers the ground, but with Sweet peas, spraying with tobacco and soap wash (10 lbs. of native tobacco leaves and 2 lbs. whale oil soap in 40 gallons of water) was found very effective. Many predaceous and parasitic insects were observed at work. On the Experimental Farm larvæ of Syrphus flies and Lace-winged flies were common and beetles and larvæ of the two Lady-bird beetles, *Coccinella 9-notata* Hbst and *Hippodamia convergens* Guer, were extremely abundant, as well as the hymenopterous parasite *Praon cerasaphis*, Fitch. In the garden of Mr. Oollingwood Schrieber, in addition to the above, large numbers of a new species of Aphidius* were detected. Unfortunately both the Syrphus flies *S. ribesii*, Fab., and the nine spotted Ladybirds were attacked themselves by parasites; but nevertheless they reduced very materially the occurrence of the Pea Aphis. As well as the above-named, larvæ of a minute dipterous parasite (*Diplosis*?) and a fungous parasite appeared in small numbers in all colonies of the aphis and doubtless played an important part in bringing down the numbers. The undue increase of the various kinds of plant lice seems to be particularly affected by meteorological conditions, and, as in the past there is no record of serious injury to the pea crop by these insects, there is every reason to hope that we shall not have another visitation similar to that of 1899 for some years.

* Since named *Aphidius Fletcheri* by Mr. Ashmead.

FODDER CROPS.

There have been few complaints of injury to fodder crops during the past season, the usual occurrence of "silverstop" on grasses in old meadows was due to the depredations of small leaf-hoppers. Grasshoppers were destructive only in a few localities. In the Ottawa district a considerable quantity of the common red and mammoth clover was injured by the Smaller Clover weevil (*Phytonomus nigrirostris*, Fab.) just before flowering in June, but there was no recurrence noticed in the second crop, and as clover is not grown for seed in the district, the injury was unimportant. The clover-seed midge (*Cecidomyia leguminicola*, Lint.) occurred in Western Ontario; but less complaints than usual were received.

ROOT CROPS AND VEGETABLES.

The various Root Maggots, always so destructive, attacked turnips, onions and cabbages, and, although a certain amount of success was obtained from the use of carbolic applications and the Goff tar-paper disk, nothing new of value was elicited. Dr. W. Gilpin, of Brechin, reports some successful experiments with white-lead applied around the stems of cabbages at the time of setting out. A series of experiments with a diluted application of Jeye's fluid, watered along rows of onions and radishes once a week from the time they appeared above the ground, would indicate that this will prove a useful remedy. Cabbages and cauliflowers similarly treated were also much benefited by this application.

The Diamond-back moth (*Plutella cruciferarum*, Zell.). One of the remarkable attacks of the past season, which was widespread throughout the Province, was by the caterpillars of the Diamond back moth, and occurred upon turnips, rape, and cabbages of all kinds. The injury became noticeable during August, when white patches appeared upon the leaves. Fields of Swede turnips and rape were seen so seriously injured near Stittsville and Ottawa as to look quite white from a short distance, and the crops were materially reduced. The small active caterpillars swarmed upon the leaves, but were found to be attacked by the usual parasite (*Limneria parva*, Prov.). On walking through infested fields the small moths flew up in swarms. Upon the Central Experimental Farm Brussels sprouts were much injured, and rendered unfit for the market by the larvæ eating their way inside the nubs. The habits of the caterpillar render the successful application of remedies difficult; for the most part they work beneath the leaves, and at the slightest disturbance let themselves down by a silken thread. Remedies which have been used successfully are dry applications, containing Paris green and pyrethrum, or a kerosene emulsion spray; but all of these must be used promptly on the first appearance of the enemy.

Blister beetles (*Macrobasis unicolor*, Kirby) did some damage to potatoes in the north-western counties; but as usual their attacks were of short duration, and where spraying with Paris green was practised promptly little harm was done. The closely allied Oil beetle *Meloe Americanus* Leach was found by Mr. J. J. Sheil injuring potatoes at Ariel, Ont.

The Asparagus beetles (*Crioceris asparagi*, Linn.) and *C. 12-punctatus*, Linn.) appeared for the first time in Canada during the past summer. The two species were about equally abundant, and were the cause of loss to asparagus growers at Queenston and other places in the Niagara peninsula. These two beetles have been spreading slowly through the United States for some years. The common Asparagus beetle was first noticed in America 40 years ago; but it was not until 1881 that the 12-spotted asparagus beetle made its appearance, when it was found at Baltimore, Md.

The two species are very unlike. The asparagus beetle is a narrow black beetle about $\frac{1}{4}$ of an inch in length, very prettily marked; the head, legs and antennæ are black, the thorax red and the wing cases are black, with six silvery white spots, and widely bordered round their edges with orange red. The marks on the wing covers have sometimes the appearance of a black cross, for which reason it has also been called in England, the Cross-bearer. The 12-spotted asparagus beetle is of about the same length as the above; but slightly wider, and has the whole body orange-red, with exception of the antennæ, the feet, the knees and 12 black spots on the wing covers—6 on each. As a rule, the latter is

less abundant than some very important. It passes the winter young shoots black and elongated upon which there are with dark dots, to young plants the young shoots of the species the grub more or less sun and grubs from. When collected or water with a so that no eggs to lay their eggs left to take the summer with P. larvæ and the lime is very fatal four days is on also be brushed day it is claimed proving fatal.

The San Jose fruit-growers to no new enemies the summer of the San Jose Sc much better known *formis*, Curt. T. at Chilliwhach in numbers in many closely resembles the past. Among of the most effective cation of Bordeaux for fungous diseases new wood, it is place to attach the Horticulturist the opening of buds early last spring others not so true.

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Among fruit summer in Ontario

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less abundant than the former. The habits of the two species are very similar; but differ in some very important particulars. Those of the common Asparagus beetle are best known. It passes the winter as a perfect beetle, and appears early in the spring, eating into the young shoots when ready for the market, and laying its eggs upon them. These eggs are black and elongated. They stick out conspicuously in every direction from the shoots upon which they are laid. The grubs soon hatch, and are slimy greyish-looking slugs with dark dots, a blackish head and black legs. They frequently do a great deal of harm to young plants. There are two or three broods in a season, and they not only feed on the young shoots, but upon the old foliage of the asparagus. In the case of the 12-spotted species the grubs also live inside the berries. Among the remedies which have proved more or less successful the following may be mentioned: (1) The beating of the beetles and grubs from the plants into nets or broad pans, containing water and coal oil. When collected in nets the insects must be killed by throwing them into scalding water, or water with a little coal oil on the surface; (2) Keeping the beds closely cut in spring, so that no eggs are allowed to be hatched, a few stems are sometimes left for the females to lay their eggs upon. These are subsequently cut and destroyed and other shoots are left to take their place as traps; (3) Spraying the beds at short intervals during the summer with Paris green and water, 1 lb. in 100 gallons of water, will destroy both the larvæ and the beetles; (4) Dusting with lime. It has been found that freshly slaked lime is very fatal to the slimy larvæ, and dusting the beds at short intervals of three or four days is one of the best means of clearing them of the larvæ; (5) The larvæ may also be brushed off the plants with a stick, and if this is done in the middle of a hot day it is claimed that few of them ever get back again, a short time on the hot soil proving fatal.

FRUITS.

The San José Scale investigations have been the means of drawing the attention of fruit-growers to many insects which otherwise would have remained unnoticed, and although no new enemies have to be recorded as having done widespread or serious harm during the summer of 1899, most of the regular pests have been observed. Closely resembling the San José Scale are three other species, the occurrence and range of which are now much better known, viz., *Aspidiotus Ancyclus*, Putn., *A. Forbesi*, Jnson, and *A. ostreiformis*, Curt. The last named of these, a European species, was first discovered in America at Chilliwach in British Columbia; but it is now known to be present in considerable numbers in many parts of Western Ontario and in the Eastern United States. It most closely resembles *A. ancyclus*, and has been, doubtless, confounded with that species in the past. Among remedies for scale insects spraying with whale-oil soap seems to be one of the most effective. Kerosene applied in various forms is also very useful. The application of Bordeaux mixture, consisting of sulphate of copper and lime in water, as a remedy for fungous diseases has also been found to be useful against scale insects by rendering the new wood, it is thought, disagreeable to the young bark-lice when seeking for a suitable place to attach themselves to the tree. Some experiments made by Mr. W. T. Macoun, the Horticulturist at the Experimental Farm, in spraying trees with whitewash to retard the opening of buds in spring, seems to add confirmation to this theory. Trees sprayed early last spring with whitewash are certainly freer from oyster-shell bark-lice than others not so treated.

Tent caterpillars were again this year very numerous and destructive in many parts of the Province, notwithstanding an abundant presence of parasites and a bacterial disease which killed thousands of the larvæ. Early spraying, as soon as possible after the young larvæ hatch, with Paris green, 1 lb. in 100 gallons of water to which is added 1 lb. of fresh lime, is quite effective; but if the spraying is delayed until the caterpillars become nearly full grown, they are much more difficult to kill. The egg-masses should always be sought for carefully during the winter and burnt, and a sharp lookout should be kept at the time the young caterpillars hatch so that they may be destroyed when they gather together in clusters after feeding, either in a web or in the case of the Forest Tent caterpillars on the side of a branch.

Among fruit pests of lesser importance which have been reported during the past summer in Ontario the following may be referred to: The Apple Aphis at Meriton, the

Plum Aphis at Dresden, the Pear-leaf Blister Mite at several places, the New York Plum Scale at four different points, the Pistol Casebearer of the apple at Cobourg and Valentia, Pear-tree Psylla at Winona, and an interesting injury to young plums while green by the caterpillars of the Streaked Hair-streak butterfly reported by Mr. W. M. Orr from Winona.

Of rather greater importance and wider extent than the above were injuries by the Currant Aphis, the Imported Gooseberry Saw-fly, the Pear Slug and the Eye-spotted Bud Moth. Mr. J. Van Horn sent specimens of the Fruit Bark Beetle (*Scolytus rugulosus* Ratz) from Otham. This was first recorded as occurring in Canadian orchards last year.

GREENHOUSE PESTS.

Under this head two new enemies have to be reported. Both were found in the extensive houses of Mr. J. H. Dunlop in Toronto. The Black Violet Aphis (*Drepanosiphum viola* Pergande), which has been referred to from time to time in United States publications, was found in some abundance. As an aphid this is a beautiful species, although destructive where it occurs in numbers. It has been treated of in a special bulletin (Circular No. 37, Second Series) issued by the U. S. Division of Entomology, where the value of fumigating with hydrocyanic acid gas in greenhouses and cold frames is shown. While testifying to the effectiveness of the common remedy of fumigating with tobacco, it is pointed out that it requires repeated use at short intervals, and that it may even "cause serious injury to plants. In the case of violets, it has been found to be only of slight value against plant lice working in the bud, and, while it may destroy the so-called green aphid when exposed, it is not effective in killing the black aphid. Moreover, tobacco may prove injurious to the foliage and flowers, bringing on epidemics of 'spot.' Tobacco is also useless against scale insects in general and mealy bugs." The bulletin quoted from, is of very great value to horticulturists and others who grow plants under glass, but particularly to violet-growers. Violets are an expensive crop to grow, and this bulletin is the record of experiments which were specially undertaken to overcome the difficulties of treating violets under glass. Full particulars are given as to the methods of applying the remedy and the strength of gas to be used for various crops. The following quotation will illustrate the value of this pamphlet:

"Double English Violets—'Marie Louise,' 'Lady Campbell' and others. For plant lice and general fumigation fifteen-hundredths of a gram of 98 per cent. cyanide of potash for each cubic foot of space is required. The exposure, if made according to directions, will not hurt the plants in any stage of growth. The gas has been used on a large scale in fumigating violets for the past three years with the greatest success, only a few treatments during the season being required. Leaf-eating larvæ, slugs, millipedes, cut-worms, etc., when exposed are killed as well as plant lice. Red spiders, however, are not entirely eradicated by the treatment. The foliage of single violets like California and Princess of Wales are sometimes slightly injured by the stronger dose of gas. A weaker dose (one-tenth of a gram potassium cyanide per cubic foot) should be used when they are to be treated.

"Other Plants.—Other plants on which the gas has been tried on a small scale indicate that it may probably have quite a wide range of usefulness."

The other new pest is the caterpillar of a small moth, *Phlyctenia ferrugalis*, Hbn. This is a very slender leaf-eating caterpillar when full grown, about three-quarters of an inch in length. It is of a semi-translucent green in colour, with a double white band on each side of the dorsal vessel and two distinct black spots on the second segment. The head is white clouded on the cheeks with brown. When at rest the caterpillar has the habit of curling the head and the first two or three segments round at the side of the body. These caterpillars have done a good deal of harm in Mr. Dunlop's rose houses, and he complains of their working all through the season. The injury seems to be done chiefly by eating the parenchyma from the lower sides of the leaves. The specimens bred from Mr. Dunlop's material were kindly identified by Prof. C. H. Fernald, who also referred me to the article in the Michigan Experiment Station Bulletin, No. 102, by Mr. G. C.

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Davis, who treats of it as an enemy of celery, in which plant it is said to both bore into the stems, channelling at the base of the leaf stalks and leaving nothing but a shell on the outer side, and also feeds on the leaves, the larvæ being found either rolled up or sewed in between them. Mr. Davis states that Prof. Fernald had written to him that "to his knowledge the species had never been bred in this country before. In an English periodical, *Entomologists Monthly Magazine*, vol. 14, pages 200-4, all the early stages are fully described. The species was bred on the leaves of Boneset (*Eupatorium*), and was also taken on Hedge Nettle (*Stachys*) and strawberry leaves. It is thought to be two or more brooded."

SOME OBSERVATIONS ON A BUMBLE-BEES' NEST.

By REV. C. J. S. BETHUNE, LONDON, ONT.

In the Head Master's garden at Trinity College School, Port Hope, I had planted a clematis in the angle formed by some stone steps and the brick wall of the chapel organ-chamber. In the spring of 1897 I put some cut grass from the lawn at the base of the plant to serve as a mulch and keep the ground moist about the roots. A gravelled walk ran parallel to the building at a distance of about a yard, with a branch at right angles to the stone steps; between the clematis and the walk there was a densely growing young lilac tree. The creeper grew with great rapidity and I found it necessary to support it with wire netting. One day when putting this up, I noticed that whenever I touched the cut grass there came from it an ominous bizz z z. I thought it was only a Queen Bee looking for a deserted mouse's nest, but subsequently discovered that the "bizz" was always there when I poked the grass. Later on the worker bees were to be seen coming and going, and there was always a sturdy sentinel at the entrance to the nest. My manservant, who did not by any means share in my interest in all things entomological, wanted very much to destroy the nest as he was afraid of being stung by my friends the bumble-bees, but I would not allow him to do so. He then tried to drown them out when watering the lawn with the hose, so I protected them with a slanting piece of slate, which left a space between the top of the nest and its new roof.

One day in the middle of summer I dropped some bits of cut grass beside the slate, and found that the bees soon carried them off inside; I then gave them more and watched to see what they would do with it. Two of them apparently attended to this work, and they were most industrious, never seeming to stop throughout a long summer's day. The outside bee would run about, seize a bit of grass and pass it swiftly between his legs, under the length of his body, backwards,—and then another, and so on, till he got it all near the opening at the end of the slate—the end opposite to that at which the family went in and out. He then began again at the little pile that he had collected, and passed the bits of grass in to his companion under the slate—always sending them between his legs backwards. It was most interesting to watch the operation, and I paid frequent visits to the nest during the day to see how it was going on. After a time that opening was pretty well filled up with grass and the workmen took a rest.

Though bumble-bees were visiting the flowers close by until late in October, I very rarely saw one go in or out of my nest after the middle of September, and felt strongly inclined to think that my man must have drowned out a good many of the colony. He never neglected to water that clematis! I was quite grieved when one day I found my friend the door-keeper dead just outside the entrance, where he had so faithfully done his duty during many long summer's days. This was after some chilly nights, when there had been a slight touch of frost.

Towards the end of November, long after any bumble-bees were to be seen in the garden, I dug up the nest in order to send it to Dr. Fletcher, who wished to see whether there were any parasites affecting the bees. I found that the bees had done a good deal of excavation and gradually hollowed out the place for the nest till they had sunk it so that the top was level with the soil—it was started originally on the surface. They must have dug a hole at least three inches deep the whole size of the nest. The earth

was brought out in pellets and formed into a neat little embankment, or causeway, against the wall, leading away from the entrance. They were a very orderly and peaceable family, and never annoyed any one, though passers-by were frequent along the gravel path not a yard away, and up and down the stone steps at the end of the nest.

It cannot be too often repeated that bumble-bees are decidedly useful insects, and do much good work for farmers and fruit-growers. Their hairy bodies are specially adapted for carrying pollen from one blossom to another, and thus they are instrumental in fertilizing many varieties of fruit-trees, melons, cucumbers, pumpkins, etc., clover, red and white, and various flowers, many of which would be unable to produce any seeds but for the kindly offices of bees.

THE NORTH-WEST (CANADA) ENTOMOLOGICAL SOCIETY.

The First Annual Meeting of the North-West (Canada) Entomological Society was held at Lacombe, Alberta, N.W.T., in the Agricultural Hall on Tuesday, the 7th November, 1899. At the request of the President, the chair was taken by Griffin Fletcher, Esq., J.P.

Agriculturists were well represented. The minutes of the last ordinary meeting were read and approved. Letters were read from Mr. J. A. Guignard (in the absence of Dr. James Fletcher); Dr. L. O. Howard, of Washington; the Bishop of Calgary and Saskatchewan: Dr. Sanson, of Banff; F. Oliver, Esq., of Edmonton, M.P., and a very large number of other gentlemen interested in the work of the Society, expressing full sympathy with its objects.

The Chairman, in a few opening words, explained that the object of the meeting was to popularise the Society amongst farmers, by showing the use of Entomology and Botany, and that a number of gentlemen had written special letters with advice, which would be read after the addresses on the agenda had been delivered.

The Chairman then called upon the President, Mr. Percy B. Gregson, to address the meeting. (See page 114).

The President then read an address by the Revd. C. J. S. Bethune, D.C.L., upon "The Use of Entomology."

An address from Mr. H. H. Lyman, M.A., (the President of the Entomological Society of Ontario), was next read.

The suggestion in Mr. Lyman's address as to affiliation of the North-West Entomological Society was discussed, and it was decided that at present affiliation was impracticable, owing to the somewhat original course adopted by the North-West Society, (of which details appear in the Report of Council).

An address by Dr. Henry George, M.R.C.S. (Eng.), of Innisfail, Alta., on "The Pocket-Gopher," (*G. bursarius*) was next read by the President.

Numerous letters in support of the President's course of procedure were next read from members of the Society, among them being a letter from The Bishop of Calgary, in which His Lordship (after remarks as to the uphill work before the Society) advised quarterly meetings, to which the public should be specially invited; a letter from Mr. E. Firmstone Heath cordially supporting the President's project of giving sketches of insect life to the school children and parents, and of holding quarterly meetings for interchange of experiences; from Mr. A. W. Hanham, Mr. F. Oliver, M.P., Dr. N. B. Sanson, of Banff, Alta., and several other gentlemen to the same effect.

Mr. Hanham and Dr. Sanson suggested the formation of a "Naturalists' Club," but, in view of the scattered community, it was decided to be impracticable at present; but that a suggestion by Mr. Heath that some kind of Natural History Periodical might be published eventually by the Society, which would be circulated among the public, should be seriously considered at the earliest opportunity.

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A letter from Mr. C. W. Peterson Deputy Commissioner of Agriculture, Regina, was then read, in which he remarked among other things upon the importance of investigations into the insect life of the country, and mentioned an estimate of damage done by insects to crops of the United States at \$300,000,000 per annum, and concluded with expressions of the Commissioner's appreciation of the President's efforts to create an interest in Entomological and Botanical matters in Alberta and the Territories.

A letter from Dr. L. O. Howard was also read, in which, after wishing success to the President's work, Dr. Howard remarked that though the actual value of this class of work could not fairly be reckoned in dollars and cents, yet that there was no doubt that hundreds of thousands of dollars were saved to the farmers of the United States every year by the carrying out of the recommendations of the State Entomologists. Dr. Howard also, in approving of the encouragement of nature study in the local schools, advised the display of insects characteristic to the locality.

The Chairman then read the Report of Council.

The election of fresh members then took place; and the election of officers for the ensuing year; Percy B. Gregson remaining President of the Society.

The Rev. Matthew White, of Lacombe, was elected Vice-President: Arthur D. Gregson, J. P., of Waghorn, the Librarian-Curator; Percy B. Gregson, the Secretary-Treasurer; and the Rev. J. Hinchliffe of Red Deer, Alta.; William Wenman of Red Deer; T. N. Willing of Olds; and F. H. Wolley-Dod of Calgary, as Members of Council.

Before conclusion of proceedings, Mr. C. T. Daykin announced to the meeting that the President had already arranged to give every month at the Waghorn School-house a short sketch on the life of some insect, or of some other phase of nature, and its economic value, and the date would be published in newspapers in time for every one to attend, and the sketches would interest not only the young folk but "grown ups."

The Chairman then read a letter just received by the President from Mr. Arthur G. Wolley-Dod (Vice-President of the Calgary, and Secretary of the Fish Creek, Agricultural Societies), requesting the President to prepare a short treatise on insects and their value as regards agriculture, which he could read at the forthcoming Agricultural Societies' annual meetings in December.

The Secretary of the Lacombe Agricultural Society also requested a paper by the President for reading at the December annual meeting of the Lacombe Agricultural Society.

After a vote of thanks to the Chairman, the proceedings terminated.

REPORT OF COUNCIL.

In submitting its First Annual Report, the Council take the opportunity of recording their sincere expressions of gratitude to the many gentlemen high in the Entomological and Agricultural worlds for their sympathy—their actual co-operation—with the work of the North-west (Oanac) Entomological Society. The Society has embarked in an enterprise in a distant and comparatively unknown land, whose settlers are pioneers and from many parts of the globe, and untutored; and the advantage to the Council in having advice from such men as the Founders of the Entomological Society of Ontario, Dr. James Fletcher, Dr. L. O. Howard, and Mr. C. W. Peterson, cannot be overvalued.

The Society's Collection of Insects has been greatly augmented by gifts from Dr. Sanson, of Banff; Dr. Herman Strecker, of Reading, Pa.; and Dr. Henry Skinner; and other gentlemen, including Messrs. W. Wenman, E. F. Heath, T. N. Willing, H. Hutchinson, A. W. Hanham, and A. J. Dennis have kindly promised examples representative of their respective districts. The Society's Collections are always on view to the public.

Mr. E. Baynes Reed, the Rev. Dr. Bethune and Prof. James have presented to the President the entire set of Reports of the Entomological Society of Ontario. Dr. James Fletcher, a full set of his Reports since the establishment of the Ottawa Experimental

Farm; Dr. Howard, a large number of Reports and publications of great value (bound and unbound) from his Department; and to these the President of the North-West Entomological Society has added a number of other works on Entomology, Botany, and Geology.

The Council, noting the large influx of immigrants into Alberta from all lands (Swedes, Bohemians, Galicians, Russians, Norwegians, etc.), realises their great need for a right apprehension of the value of economic entomology.

The Council begs to tender the reason for the absence of a balance-sheet and statement of expenditure:—In founding the Society the President elected to defray every expense, until its objects should have become appreciated, and a course of procedure formulated. The kind recognition of the value of such a Society in the North West, coupled with much practical advice, has made the way the President should pursue clear and defined, and a way which has received the fullest approval. Pursuing strictly this course, the President of the Society purposes to give a monthly sketch in the local Public Schools before the children and their parents on insect life or other phase of nature and its economic value; and to call quarterly meetings at different points of the members of the Society, to which the public will be specially invited, for interchange of experiences, etc., and receiving accounts of new insects and weeds; and to submit short papers for reading and discussion at the meetings of local Agricultural Societies.

Presented on behalf of the Council.

7th November, 1899.

PERCY B. GREGSON,
Secretary-Treasurer.

ADDRESS BY PRESIDENT OF N. W. ENTOMOLOGICAL SOCIETY

Ladies and Gentlemen, and members of the North West Entomological Society:

A year ago a few of the members of this district felt that the time had come when the insects of this great North-West should receive more attention. With the spread of immigration "bugs" and "grubs" of various sorts had also spread westward, and the greater part of the country itself was practically unexplored, as far as insect or plant life was concerned.

We met, therefore—a few of us—and the outcome of the meeting was the formation of the North-West (Canada) Entomological Society. We have been exceptionally favoured in having the sympathy and advice of men of large experience and influence: I allude to Dr. James Fletcher, the Dominion Entomologist; to Prof. James, Deputy Minister of Agriculture for Ontario; to Mr. O. W. Peterson, our own Deputy Minister of Agriculture; the Bishop of Calgary; Mr. Oliver, M.P.; Mr. Simpson, M.L.A.; Mr. E. Baynes Reed, the Government Meteorologist at Victoria; the Reverend Dr. Bethune, Editor of the Canadian Entomologist; the Reverend G. W. Taylor, Government Entomologist for British Columbia; Mr. H. H. Lyman, President of the Entomological Society of Ontario; Mr. Young, Editor of the Calgary Herald; Dr. Herman Strecker, and many other gentlemen (all of whom are members of the Society). By the generous gifts of Mr. Reed, Dr. Fletcher, Dr. Bethune, Prof. James and Dr. L. O. Howard of Washington (The Government Entomologist for the United States) a nucleus for a good library has been formed. Other gentlemen, including Dr. Sanson, of Banff, Mr. T. N. Willing, and Mr. E. Firmstone Heath of Manitoba, have donated insects, and we owe to the generosity of Mr. Edmond a serviceable working microscope.

So much for the introduction of the Society, but before proceeding to the object for which this meeting has been called, I wish to publicly and most sincerely thank the number of gentlemen who have been so kind as to write, with assurances of their continued support and sympathy with my efforts, while regretting their inability to attend this meeting. These letters will be read presently.

We now come to the objects of this meeting, and I am very heartily glad to see so large a gathering. The question I am most frequently asked in connection with this

society is; Wl look at anyth another name! insects—not m show are, that in agriculture, insect foes; an know how to d

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society is ; What is the use of it ? This is a practical age, and farmers cannot afford to look at anything they have no use for. Now, an entomological society is simply another name for a society of persons who are making some sort of observations about insects—not merely butterflies—but grubs, bugs, worms etc., and the points I wish to show are, that some knowledge of insects is very important to all of us who are engaged in agriculture, so that we may rightly distinguish between our insect friends and our insect foes ; and some knowledge of insects is also necessary in order that the farmer may know how to deal with his insect foes, and how to make the most of his insect friends.

Now to see how to deal with insect foes, we must first of all learn something about them ; there are many, like the Hessian Fly, whose grubs do all the harm and many others, who themselves as well as their grubs do the harm, like the Colorado Beetle. Insects that themselves do harm, do so by mouths that bite or mouths that only suck. Those that bite have jaws, with which they bite off solid pieces of food from the plants or animals they attack. Some poisonous material must therefore be placed on their food, so that when this food is eaten by the insects they may be destroyed by the poison. Those insects that suck, have no jaws, but sharp hollow beaks through which they suck the juice of the plants or blood of the animals they attack. For sucking insects it is therefore useless to place poison on the plants, because, having no jaws, they only feed on liquids such as juice or blood, for which they have to sink their beak-like tubes beneath the surface of the object attacked. For this class of insects, substances, which kill by coming into contact with the bodies must be used, e.g., kerosene and soap emulsion, or oils, which stops up the breathing organs. The losses in agricultural products from insects and their grubs is reckoned at fully ten per cent.

A few of our common insect foes in this country are pretty well known. There is the red turnip beetle, which destroys our Swede turnips [example of *Entomoscelis adonidis* Fab, produced and handed round]. The little turnip "fly" which destroys the young turnips when in first "leaf". These "flies" are really little beetles, and, like all beetles, pass through the grub and chrysalis stage, so that if we learn the probable date for hatching (for all insects are very regular) we shall know when to sow the turnip seed—They should be sown either sooner than the beetle hatches, so as to get their second or third rough leaf before it hatches, or they should be sown so much later than the hatching time so that when the "flies" hatch they have to starve. And we must now, it seems, look out for the Colorado beetle, or potato bug. It has appeared in two or three places in Alberta this summer, and last year was injurious in several parts of Manitoba. The red turnip beetle is sometimes mistaken for it, but the potato bug has ten stripes altogether, and the red turnip beetle has only three, but both are destroyed by the same treatment (Paris green solution).

Now, all the insects I have mentioned have jaws, so that they are "biting" insects, and the remedy against them is to sprinkle poison on their food.

Then there are the grubs that work underground or at the surface of the soil. We all know the garden "cut-worm". This is a caterpillar, which eventually develops into a very common moth that flies about our lamps and windows in the fall, and which is easily caught and destroyed. When in the "grub" stage, it is very destructive to our young cabbages and other young plants. It lodges during the day just under the soil—you can find it in the mornings by the small hole it leaves in the ground near the plant it has attacked over night. They come out only at night, and then they nibble through the small stem of the plant, and sometimes draw the leaf down into the soil to consume at leisure. Now these grubs are very fond of bran, so that a little damp bran with a very small quantity of dry Paris green stirred in (proportions 50 to 1) will be sure to destroy them, or wrap paper round your cabbages when you plant them out. Another very common grub in our potato patches is the wire-worm. These are a nuisance in the way they work into our best potatoes. The wire-worm lives in the ground through the winter, and in the spring, after going through one more stage (pupa), develops into a small brown or black beetle, called a "click" beetle, because when the beetle is touched it gives a quick spring away. These beetles we should learn to recognize as our foes, and should kill them all on sight, because it is from their eggs that the next crop of

wire-worms will come. And so we see that by knowing the life history of these things we get a double shot at them. We kill the worm, and we also know its parent, the "click" beetle, and kill it.

Among the *sucking* insects are various kinds of lice. They have only long beaks, for sucking, but no jaws. We find them on animals and plants, and as they get their food by sinking their beaks (which are as sharp as a very fine needle) through the surface, any amount of poison on the surface will not kill them, so the way to attack them is by something that will stop up their breathing organs and suffocate them, *e. g.*, coal oil emulsion, tobacco decoction or smoke. And so there are many other insects which we soon learn to recognize as foes, and by knowing their habits and how and when they breed, we can learn how to deal with them. There are foes all around, grubs eating our poplar and other trees, our fence posts, spruce trees, etc.

To come now to our insect friends. We have many among our ordinary beetles, and whenever we recognise any of our friends among them we should be careful not to destroy them. In our gardens and fields there is a beetle called the "fiery" beetle, which has six rows of bright bronze spots on each wing cover. This insect in two of its stages (grub and beetle) feeds on the cutworm and wireworm. It attacks the cutworm so eagerly that it is often called the "cut worm lion beetle." [Specimen of *Calosoma calidum*, Fab., handed round]. Then there is a smaller beetle (black) called the "ground beetle," which also feeds on cutworms, etc. [Specimen of *Harpalus caliginosus*, Fab., handed round]. The "tiger" beetle is also a great friend of ours in that way. [Example of *Oicindela vulgaris*, Say, handed round]. And the familiar little "lady-bird" (of which there are several varieties) lives on nothing else but our insect foes. It's "grub" devours wholesale the young plant lice and the young of turnips and potato bugs. Wasps, too, are among our insect friends and all "dragon flies." Besides these and many other of our friends which we can see every day, there is a host of minute flies, whose grubs feed upon our enemies and should not be recklessly destroyed.

A good general agricultural remedy is summer fallowing, as it starves the insects, and exposes them to birds, etc. You might try a small patch next year, and see the effect. Then late fall plowing will turn up to the frost and so destroy hundreds of wireworms and other grubs. We have also many friends among our common birds, such as jays, crows, and all sorts of wood-peckers. Wood-peckers never attack a tree, either dead or alive, unless there are grubs first eating the tree, and it is to get at these that they peck the trees at all. Their long tongue works into all the cracks of bark, etc. And this year there has been an unusual number of toads. Toads do no harm and feed almost entirely upon insects, and should be carefully protected accordingly.

Among our enemies too is "smut," though this is really a fungus. This is a fungus on grains, and, while always a pest, is rather more prevalent this wet year than usual. The bad features of "smut" are that it lowers the standard of purity in the flour, and it takes away from the profit of the crop. A deduction of 8 p.c. is a fair estimate of the loss from smut alone to the farmer, and the worst of it is a "smutty" plant does not thin out the stand and give the healthy plants more light and soil. It takes up just as much room, and requires as much nourishment and moisture from the soil as do the healthy ones. One single germ of smut coming in contact with a healthy grain will infect it, and smut germs are easily blown about by the wind, or carried from field to field by threshing machines.*

It often seems strange that there should be in the ground so many cutworms and other grubs, but this would not be the case if the land were kept perfectly clear of weeds. Weeds, such as Lamb's quarter, are their natural food, and where these grow the insects naturally go in order to lay their eggs, which hatch into the grubs.

*NOTE—In answer to several enquiries at the meeting as to the remedies to prevent smut, I gave the general formula advised by Dr. Fletcher in ordinary cases, viz.: Dissolve 1 lb. of bluestone in a quart of hot water, which is then sprinkled by one person over 10 bushels of wheat or barley, placed in a wagon-box, whilst some one else keeps the grain well stirred. Oats should be *submerged*, not sprinkled only.

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There has this year appeared among us for the first time a tiny grey "plume" moth, whose larva is very destructive to clothes, furs, sacking, etc., and whose presence in this country can only be accounted for by coming with outfits of new settlers.† It will be interesting to see if it reappears next year. The moth is in great abundance, and if its eggs hatch next spring, it will become a troublesome household pest, and we can only hope that a dry year will exterminate it. We know that many insects and the grubs of others stand extreme degrees of cold. In this North-West they often endure 50 or 60 below zero without injury, so that we cannot rely on winter to destroy them. If they reappear, we must be prepared with a remedy.

I thank you, Ladies and Gentlemen, for having heard me so patiently, and I come now to the suggestions I have to make. The large immigration that is being attracted to this country is in one respect a source of danger, because there is always a liability of any new settler inadvertently introducing a new weed, or a new insect, which may turn out to be a pest. We should therefore be on the watch, and that is one of the reasons why I have invited so many agriculturists to join an entomological society. I wish the heads of all our agricultural societies to become members, so that by personal intercourse, by correspondence and quarterly meetings (which I will try to hold at different points along the line), we can keep in constant touch with each other, and the presence of any troublesome or new insect or weed in any locality can at once be ascertained and kept under control before it becomes aggressive. We have already on our members' roll agriculturists scattered throughout Alberta and Manitoba, and on the roll are the Presidents or Secretaries of our own (*Lacombe*) Agricultural Society, and of that of Red Deer, Innisfail, Calgary and Fish Creek, and I hope soon members of other agricultural boards will join.

Many of our leading members wish the Society to issue a small periodical magazine, and it seems to me that we might do so every quarter. This magazine would, with other matters of interest to the farmer, mention new insects or weeds affecting us, and sketch the life history of some insect or animal or trace the progress and effect of some weed, or treat of some other phase of natural history, and be circulated in the country.

Another suggestion I have to make, which is, that the young folk of this country might be made to take an interest in the flowers and insects they see around. They would soon understand their value as affects agriculture. The young are the coming generation, and what they can learn now about these things will stand them in good stead when they are older. They will soon take a real interest in these things. It will be like a new world to them, a world peopled with hundreds of different forms, and every one of which will have a beauty and interest of its own. The powers of observation of our children would grow, and every spark of knowledge they gain of insects and plants would make them fitter men and women.

This brings me to the answer of the question with which I introduced this Society. The question I asked was:—"What is the use of an Entomological Society?" In mentioning certain insects I have alluded to certain remedies, and, though there are certain standard remedies now very well known, they are the outcome of many trials and experiments by people who study these things. In most instances of insect pests their entire life history has to be observed, and the various stages they pass through and their habits carefully investigated. And we must remember that although we ourselves may know how to deal with insects (both foes and friends), there are thousands of immigrants from foreign lands now settling around us who have never heard of any remedies against insects. There are Galicians, Russians, Finlanders, Swedes, and many others. These will have just the same insects to contend with as we have, and it is our privilege—even our duty—to see that they also are made acquainted with our tested remedies, and methods of dealing with them.

The Society is, however, not confined to the economic side of entomology and botany. It has been organized also to collect and investigate insects of various orders.

†Genus *Alucita*, Linn.

The field of its operations is very little known, and we hope that in course of time the society will be in possession of a collection of rarities from districts hitherto unexplored, which will be contributions to science. We hope, through our members, to extend our researches further north and north-west next year, and to gradually increase our field, and any discoveries made will be recorded in one common centre and published from time to time. There are very many boreal and arctic insects whose life histories are unknown, and these as far as possible the society will endeavour to work out. Of course at present we are a small body, but everything must have a beginning, and we hope and believe that, with loyal and earnest members, the Society we now are is but the nucleus of one which will be of much use both to science and to the Canadian farmer.

PERCY B. GREGSON,
President.

THE USE OF ENTOMOLOGY.

BY THE REV. DR. BETHUNE, LONDON, ONT.

Everyone interested in the cultivation of the soil, whether for profit or pleasure, every farmer, gardener and fruit-grower, will require but a short experience to convince him that he has a hard and never-ceasing battle to fight in order to reap a due reward from his labour. After he has duly prepared his ground and put in his crop, of whatever kind it may be, he is sure to find, before it comes to maturity, that there are many enemies who will try to rob him of a large portion of the fruits of his toil. Oftentimes there will be no visible token of their presence until the ingathering reveals a diminished or damaged return; in other cases injury will be apparent, but the enemy who wrought the mischief cannot be seen, the mysterious foe is working by night, or contrives to hide himself so completely from observation that only the destructive results are apparent, while the culprit keeps out of sight.

It will readily be guessed that the enemies I refer to are injurious insects. Their name is legion and their numbers are as the sand of the sea shore. Every plant that grows, whether great or small, is liable to attack—it may be in the roots underground, in the stem or trunk, in the bark or wood, in bud or leaf or branch, in blossom, seed or fruit, and after the grain has been safely housed or the fruits and vegetables stored for the winter's food, there are still foes to be fought, insect enemies to be guarded against.

With such myriads of minute creatures to contend against, working in such diverse manners, the contest might seem a hopeless one, and indeed it would be were it not that nature has imposed her own limitations, and no single insect foe is long allowed to pursue its way unchecked. Where we have to deal with species native to the country, we may feel sure that however much the injurious kind has been allowed to multiply and spread, it will not be long before the balance is restored and the damages reduced to an average amount. But when we are invaded by species introduced from a far distant land, especially those brought from across the seas, the case is usually very different. The enemy arrives in our midst, unaccompanied by the predaceous insects, parasites or diseases that keep down his numbers in his place of origin, and he rapidly increases and multiplies without let or hindrance, until artificial means are employed for his subjection. In such cases the farmer or fruit-grower may suddenly find himself confronted with a mischief worker whom he has never seen before, and with whom he has no idea how to wage a war. His plight may be a serious one, and his losses more than he can bear; he knows not what to do nor where to turn for relief. Hitherto, in Alberta, there has been no help at hand, but now we may rejoice that measures have been taken to give assistance and advice wherever they may be needed. The North-west (Canada) Entomological Society has been organized mainly for the purpose of doing good to all the dwellers-in the Territory who are employed in the cultivation of the soil. It is their business, and also their pleasure, to study the insects that dwell in the land, to trace out their life-histories, watch how they work, learn their habits, whether they are noxious or beneficial, or simply

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beautiful, and then to study and experiment upon the best means of getting rid of the enemy and encouraging the friend. It will help on the cause very greatly if every farmer will take note of the insects affecting his crops and give all the information he can to the Society; and also send specimens of both the creature and its work.

The entomologist does not pretend to a universal knowledge of insects, but he can usually tell at a glance whether a specimen belongs to a good or evil tribe, and if it should be new to him he can always apply to his correspondents in other parts of the continent for the information that they have been able to acquire. Science knows no political or geographical boundaries, and help may be sought and will be promptly and cheerfully given whether the application is made to the entomologist in charge at Ottawa or Washington. In your case you have the satisfaction of knowing that this department at Ottawa is in the hands of Dr. James Fletcher, who has often visited the North-West Territories and made himself familiar with the most important of your insect enemies. Should the local members be puzzled over some new importation or immigrant they may feel sure that any assistance they require can be obtained from Dr. Fletcher. But they do not by any means intend to be dependent upon one who is many hundreds of miles distant; they mean to be up and doing for themselves and to spare no pains till they get toknow as much as they possibly can about the insects that infest the country round them.

The ordinary entomologist is often looked upon by his acquaintances as a somewhat silly person who devotes much of his time to chasing butterflies and searching for bugs and beetles, but this is work that has to be done. We must collect the insects in our neighborhood and study them before any progress can be made—we must find out their names and the families to which they belong before we can make use of the records and observations of others; we must rear them through all their stages and watch their habits before we can be sure what remedies will be available against them. It is a vast, and endless work, one that may well engage a multitude of enthusiastic students and which should enlist the co-operation of every farmer and gardener in the land. Every one may help by keeping his eyes open and making known his observations to the members of the Society. Any unusual visitation of insects, whether as regards numbers or effects, should be at once reported, and the results of any experiments placed on record. Insects should by no means be ruthlessly destroyed unless in the form of caterpillars, grubs or plant lice, they are found in the act of devastation. There are many kinds that are really the farmer's best friends, and it would be a sad mistake to slay the benefactor with the wicked. This shows the necessity of a little knowledge of the subject; every one, for instance, ought surely to know that a lady-bird is a most useful destroyer of plant-lice, and so, also, is a Syrphus and a lace-winged fly, and yet how few there are who would recognize the two latter if they saw them. A beginning ought to be made with the children. They take an instinctive delight, as a rule, in living creatures and are charmed to learn something about them. An hour a week at school devoted to the elements of entomology and botany in a practical form would be of untold benefit in the course of subsequent years.

I have only attempted in this paper to give a brief outline, in general terms, of some of the benefits to be derived from the study of entomology; those who are on the spot can enter into details and discuss the special insects that are present causes of anxiety. I would only say further that entomology means money—means dollars and cents lost or saved to the farmer, fruit-grower and gardener. If the Hessian-fly has this year, as is reported, destroyed in some cases 25 per cent., and on the whole from 5 to 10 per cent. of the vast wheat crops of Manitoba, just think of the millions of dollars that that means! What more useful work, then, can be undertaken than the effort to save at least a portion of this immense sum? Entomology can do it, if the farmers will only believe it, and adopt the measures that its experience in other regions has proved to be effective. The expenditure on the part of the government of each Province or Territory of a few thousand dollars a year in securing the services of a trained entomologist and in disseminating broadcast the requisite information would enable the whole of the farming community to unite in an intelligent plan of campaign against the common foe and clear their fields of

the insidious pest. If a pack of wolves were to come down from the mountains and ravage the flock and herds of the community, carrying off and destroying one-tenth of the cattle and sheep, it would not be long before every man in the country who could fire a gun and ride a horse would be in hot haste to join in a fierce onslaught upon them. Why should there not be an equal effort and an equal determination to get rid of an insect enemy that causes the loss of just as great an amount of most valuable property? In the one case there is, to be sure, the instinctive love of the chase and all its attendant excitement, while in the other there is the humdrum adoption of some special date of ploughing, some particular variety of seed, some careful burning of stubble, some extra cleaning of grain,—perhaps some little expense, not for powder and shot, but for remedial applications.

There is another side, also, I am glad to learn, to the North-West Entomological Society. It is paying attention to practical Botany, and also to Geology. The latter, to the ears of most, conveys the word *gold*, and I need not, therefore, refer to the value of it,—but all I have said about the study of insects applies equally well to that of weeds. The one are as ubiquitous as the other, and it is quite evident that over the vast prairies of the North-West, with their rich soil and luxurious vegetation, weeds are going to prove as tough a problem as the worst of our insect foes. Here, too, all can do something—all can co-operate. No man should be permitted to let his neighbour's fields be sown with the seeds of weeds that he has been too lazy or too careless to cut down. But many weeds are blown for miles across the land and have to be dealt with in various ways. These are matters to be studied and objects upon which experiments must be tried,—and here, too, comes in the necessity of some education, some elementary information by means of which a noxious weed may be distinguished from a useful or a harmless plant.

I am writing from a long way off and to dwellers in a land that I have never seen, but in matters of science distance makes no difference. We are all brothers in search of truth. We are all at one in our desire to help each other in any way we can—to lessen the toil and cheer the labours of those who are preparing the way for a rich and prosperous community, a goodly province in the Empire of our Queen and the Confederacy of our Dominion.

ADDRESS BY DR. HENRY GEORGE, M.R.O.S., ENG., L.R.O.P.

Mr. President, ladies and gentlemen, and fellow members of the Northwest Entomological Society, I am glad to greet you. As long as I have been in Alberta—some ten years—I have looked forward to this time, when men are ready to use both brains and eyes, and not merely till the ground and perform various other labors in these almost wild parts of the world.

I take it that the chief object of this Society is to enable the farmer to distinguish between his friends and enemies, as relating to his crops, grasses, domestic herds, &c. Birds, animals, insects, weeds, are all under this head; and it behoves us to help our Secretary in his praiseworthy endeavor to make us understand and learn how to distinguish between what we should destroy as vermin and what we should protect as beneficial to the agricultural interests.

I may say that the love of observing nature has been born in me, and when I came out here and heard a man called a "bug hunter" I was much insulted, as I had never before connected that obnoxious word with anything except the little insect that disturbs night's slumbers in some cases. But I might bring these remarks to an end as the Secretary has kindly asked me to pick out some animal or bird and give you my observations and readings on the same. I am going to give you a few words on the

POCKET GOPHER. (*G. burbarius*).

This animal is like the English mole in many respects, but differs in others. Like the mole it lives underground and throws up small heaps of fine earth, having "runs" under the ground. Its fur, both in texture and color, is very similar. It looks like a

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large mouse; is thick set, with a short tail, almost devoid of hair. Its claws are long for digging, but are not shaped like the mole's; also, its teeth are quite different, showing that they live on different diets. The pocket gopher is essentially a rodent, i.e., one of the gnawing animals, having the four incisor teeth long and like chisels, whereas the mole has regular flesh-eating teeth, and is insectivorous chiefly in its diet. The reason this is called "pocket" gopher is because it has on each side of the mouth two pouches which are just like the fingers of a glove when turned inside out. They are outside the mouth, so that when filled have to be emptied by the forepaws which press out the contents. These animals are more destructive than useful, and though I have no doubt that they kill many insects yet they chiefly live on roots of grass, grain, &c., also are fond of potatoes, carrots, and most of the farmer's root crops. They chiefly come up from the ground in the twilight and form one of the chief foods of the long-eared and short-eared owls. I have seen them in the day-time but rarely. I understand that one of the best ways of catching them is by putting a trap in the "run" between two heaps of earth. This is one of the farmer's foes and wants destroying. It's heaps of earth are unsightly, and do harm in covering up grain and seeds too deep; their "runs" take away earth from the roots of grass, grain and shrubs, and lastly they eat and destroy root crops.

With many thanks for listening to these few words, I must conclude; but I hope to see this Society progress and take its place as one of the first scientific societies in the great North-west of Canada.



FIG. 65.—Head of Pocket Gopher.
Life size.

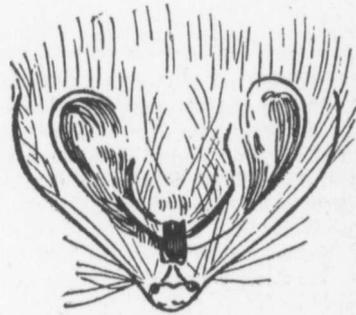


FIG. 66.—Underside of Gopher's head,
showing the "pockets."

ADDRESS BY MR. HENRY H. LYMAN, MONTREAL.

GENTLEMEN.—Your President, or should I not rather say our President as I also am enrolled as a member of the North West (Canada) Entomological Society, has asked me to contribute a paper on the best means of furthering the aims of the Society, for the annual meeting.

Living so far east from the headquarters of the Society it is not easy to be fully aware of the conditions under which the work is carried on.

In our Montreal Branch of the Entomological Society of Ontario we have only about 20 members, but as all but one or two live in Montreal or the surrounding municipalities it is easy for us to get together, and we usually hold eight or nine monthly meetings during the winter season.

These meetings are generally held at the house of the President, but sometimes at the houses of other members or in the Natural History Museum. When held in private houses we generally have some refreshments, such as coffee and cake, or lemonade, etc., and social conversation after the adjournment of the meeting.

Probably the holding of such meetings would not be practicable in the case of the North West Society, on account of the members being too much scattered.

For myself, not being an agriculturist, I must confess that my interests lie more on the purely scientific side of the subject, but doubtless you are more interested in the practical side of the matter and desire to know how best to fight the insects which are always attacking your crops.

The first suggestion that I would make is that you should join the Entomological Society of Ontario as a branch, as the benefits to be derived from such union are very great as I think I can show you.

Membership in the Society only involves an annual subscription of one dollar per member, half of which sum is retained by the Branch for its own expenses, while the other half is transmitted to the head office at London, Ont. This, surely, is a very moderate subscription when the benefits received are considered, and I would now invite your consideration to those benefits. In the first place each member of the Branch becomes a full member of the Society with all the rights and privileges. Each member receives regularly the monthly journal of the Society, the Canadian Entomologist, which, though a highly scientific magazine, always contains something of interest even to the tyro. Each member also receives the Annual Report of the Society, and this will probably be the most important consideration to the majority of the members, especially as the value of this privilege has been greatly enhanced of recent years as Prof. James, the Deputy Minister of Agriculture of Ontario, has adopted the practice of sending to all members who are not in arrears a bound volume containing not only the Annual Report of the Entomological Society but also the Annual Report of the Fruit Growers' Association of Ontario and the Annual Report of the Fruit Experiment Stations of Ontario. The volume for 1898 recently distributed contained altogether 403 pages fully illustrated and of great interest and value to agriculturists and fruit growers.

And while the advantages of belonging to the larger society are so great there are no disadvantages. The North West Branch would be still as free as it is now to manage its own affairs, and would have the advantage of all this valuable and popular agricultural and scientific literature, and if this suggestion were adopted the membership of the Branch could be divided into honorary and regular.

As every year Dr. James Fletcher, the Entomologist and Botanist of the Experimental Farms, makes a trip through the Northwest Territories, I would suggest that if possible the Society should receive from him an annual lecture under the auspices of the Society.

One other suggestion that I should make is that those who make collections of insects or plants should be most particular in labeling them with the exact locality where obtained and date of capture or of blooming, as the case may be, and that those who do not regularly collect specimens should at least preserve specimens of those which are found troublesome, in order that they may be correctly determined, and also that they may be able to compare them with other and similar insects, so many species being easily confused with other forms, and that all observations of interest be invariably entered at the time in a note book, it not being safe to trust even to the best memory in such cases.

In regard to Botany I should say that this science is so closely connected with Entomology that every entomologist should be also a botanist, and every botanist might well be an entomologist also. The flowers of the North West are so beautiful that I should think that everyone must be charmed by them.

I had the pleasure of making a trip across the continent in 1890 and was simply delighted by the beauty of the wild flowers of the prairies. Though travelling rapidly, only stopping a day or two at a few of the principal points, I yet succeeded in making a very respectable collection of both the plants and butterflies of the region traversed, jumping off the train to gather plants at almost every stopping place along the line during the day time.

I regret that I am unable to meet with you at this the first annual meeting of the Society, but hope that you will have a very successful meeting, and if any of my suggestions are deemed worthy of adoption I shall be very glad.

With all good wishes I am,

faithfully yours,

HENRY H. LYMAN.

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HENRY HERBERT LYMAN, M. A.

The portrait prefixed to this volume is that of Mr. Henry Herbert Lyman, of Montreal, who has just retired from the Presidency of the Entomological Society of Ontario. He was born at Montreal on the 21st of December, 1854, and was educated at the West End Academy and the High School, winning at the latter the Davidson medal. From school he proceeded to the McGill University and obtained his degree of B. A., with the distinction of being the Logan Medalist in Geology and Natural Sciences, in 1876; in due course he took his M. A. degree in 1880.

The year following his graduation at McGill (1877) he entered the business of Lymans, Clare & Co., wholesale druggists, in Montreal, of which his father was a principal partner; two years later the firm became Lyman, Sons & Co. Mr. H. H. Lyman is now senior partner in the firm and is also president of the Lyman Bros. & Co. (limited) of Toronto. These business houses are known throughout the length and breadth of the Dominion, and have always been distinguished for their upright dealing, energy and enterprise.

At the same time that he began his business career he joined the volunteers in Montreal; starting as an Ensign in the 5th battalion, now the Royal Scots of Canada, he gradually rose to be Major in 1885, with which rank he retired in 1891.

Though deeply engrossed in business and with much of his leisure taken up by his military duties, he yet found time to devote to his instinctive love for Natural History. When less than eight years old he began to take an interest in insects and to observe their ways, and when only twelve he started to form a collection, the precursor of what is now one of the finest collections of Lepidoptera in Canada. His first printed observations on insects appeared in the 6th volume of the *Canadian Entomologist* (1874), and shewed that even in those early days he was engaged in the rearing of butterflies and moths, a work to which he has largely devoted himself ever since. He has now contributed to eighteen out of the thirty-one volumes thus far published, and has also furnished useful and interesting papers to several of the Annual Reports of the Society. The value of his scientific work and attainments has been widely recognized. Since 1891 he has been a member of the Editing Committee of the *Canadian Entomologist*: in 1895 he was elected Vice-President of the Entomological Society of Ontario and continued to hold that position until his election as President in 1897. He held this highest place in the Society for two years to the great satisfaction of the members, and retired at the recent annual meeting. He is also a Vice-President of the Natural History Society of Montreal, in whose winter lectures he takes an active part; an associate member of the Cambridge Entomological Club; a corresponding member of the New York Entomological Society and of the United States National Geographic Society; an honorary member of the North West (Canada) Entomological Society; Fellow of the Royal Colonial Institute, Member of Council of the British Empire League, and Member of both the British and American Associations for the Advancement of Science. He has also been for the last thirteen years President of the Montreal Branch of the Entomological Society of Ontario, and has done more than any other man to keep alive the enthusiasm of the members and encourage all who show any interest in the subject to persevere in the study and experience for themselves the joys of the ardent naturalist. During all these years nearly all the monthly meetings have been held at his house, and the members have greatly enjoyed his generous hospitality.

Mr. Lyman is a notable example of what a busy man can do. Though engrossed all day long with the duties and cares of a very extensive business, which demands, more perhaps than any other, a close attention to innumerable details, he yet finds time, not only for the pleasures of an energetic collector of insects, but also for the performance of much careful and conscientious scientific work. His published papers are valuable contributions to science, being always characterized by thorough accuracy of statement and shewing the results of painstaking and long-continued research.