ANNUAL REPORT

OF THE

Entomological Society

OF ONTARIO

1910

FORTY-FIRST ANNUAL REPORT

OF THE

Entomological Society

OF ONTARIO

1910

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

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1911.

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To the Honourable John Morison Gibson, K.C., LL.D., etc., etc., etc.

MAY IT PLEASE YOUR HONOUR:

The undersigned begs to present herewith, for the consideration of your Honour, the Report of the Entomological Society of Ontario for 1910.

Respectfully submitted,

JAMES S. DUFF,

Minister of Agriculture.

Toronto, 1911.

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1910

To the Honourable James S. Duff, Minister of Agriculture.

SIR,—I have the honour to present herewith the Forty-first Annual Report of the Entomological Society of Ontario.

The Forty-seventh Annual Meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 3rd and 4th, 1910. The proceedings are given in full in the following pages, and include the reports of the various officers and branches of the Society, together with the addresses delivered and the audited financial statement of the Treasurer.

The "Canadian Entomologist," the Society's monthly journal, has been issued regularly during the past year, and has now completed its forty-second volume. It continues to maintain the wide circulation and high scientific value which have characterized it in the past.

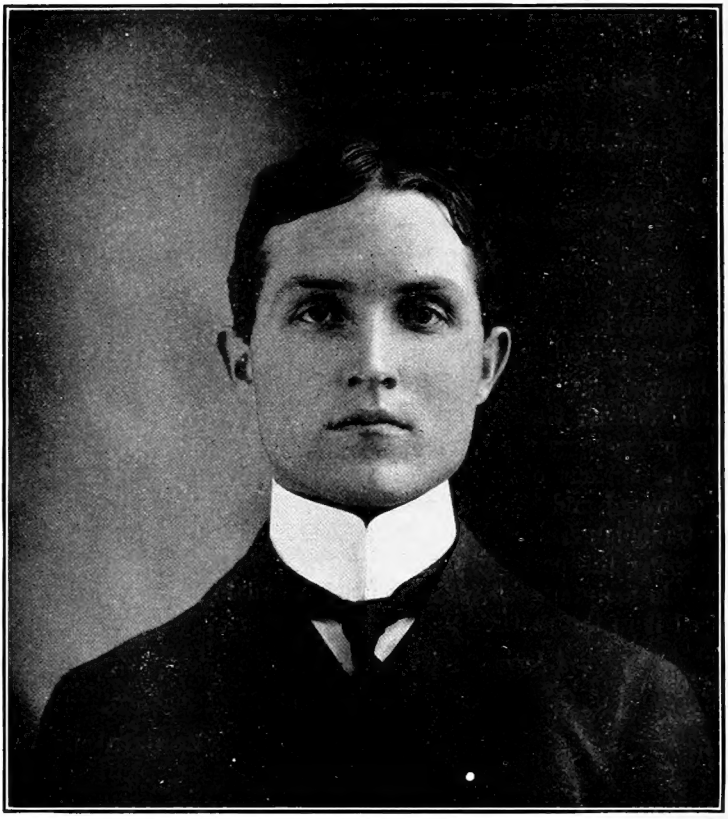
I have the honour to be, Sir,

Your obedient servant,

EDMUND M. WALKER,

Editor.

Biological Department,
University of Toronto.



PROFESSOR TENNYSON D. JARVIS, B.S.A. (Ontario Agricultural College, Guelph). President of the Entomological Society of Ontario, 1908-1910.

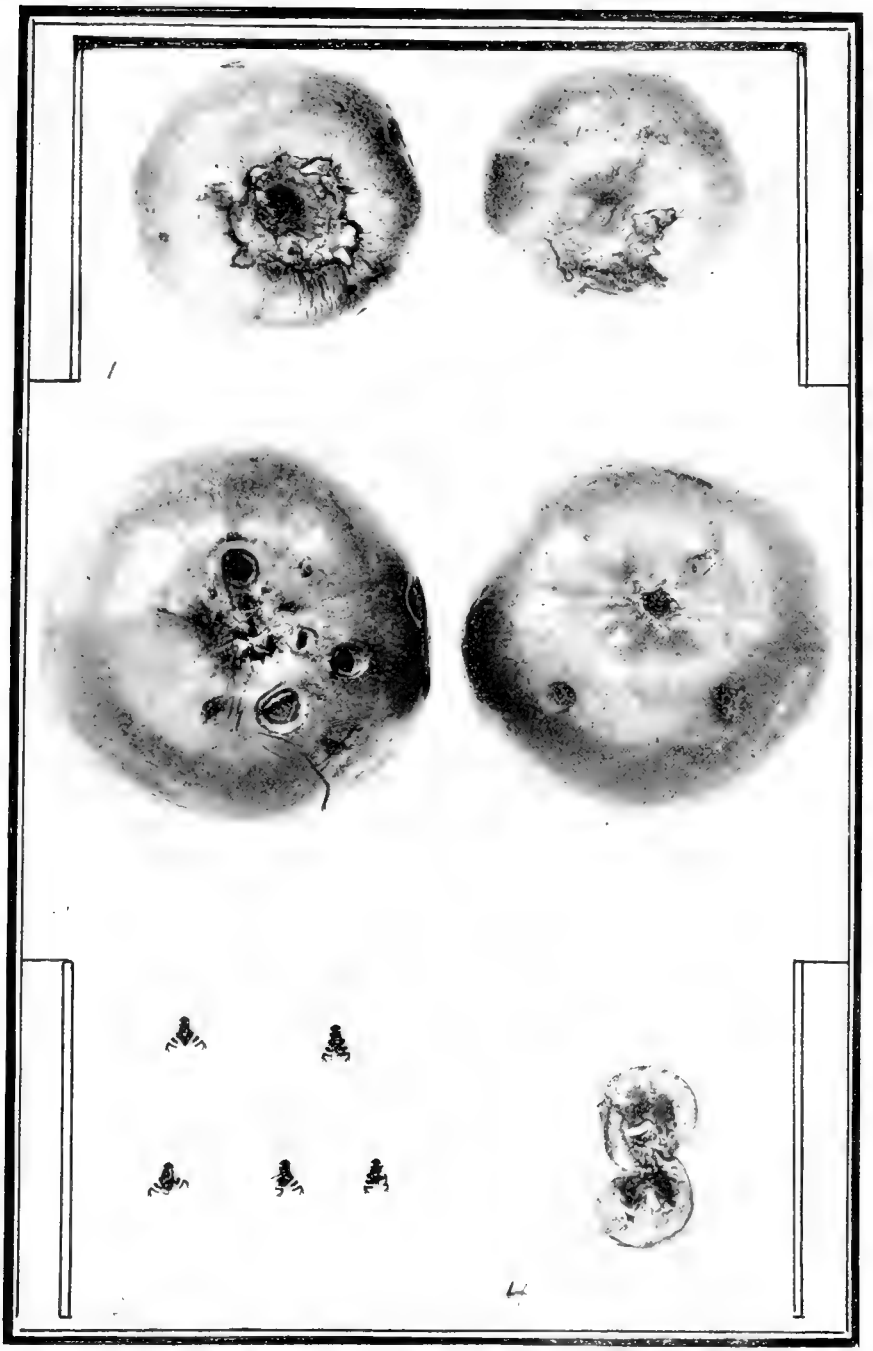


PLATE A.—1. Work of Lesser Apple Worm. Note the large area injured. 2. Feeding punctures of Plum Curculio made by the new beetles in autumn. 3. Cherry Fruit Flies. (Natural size.) 4. Opened Cherry showing maggot about full-grown inside.
(See pages 21 and 24.)

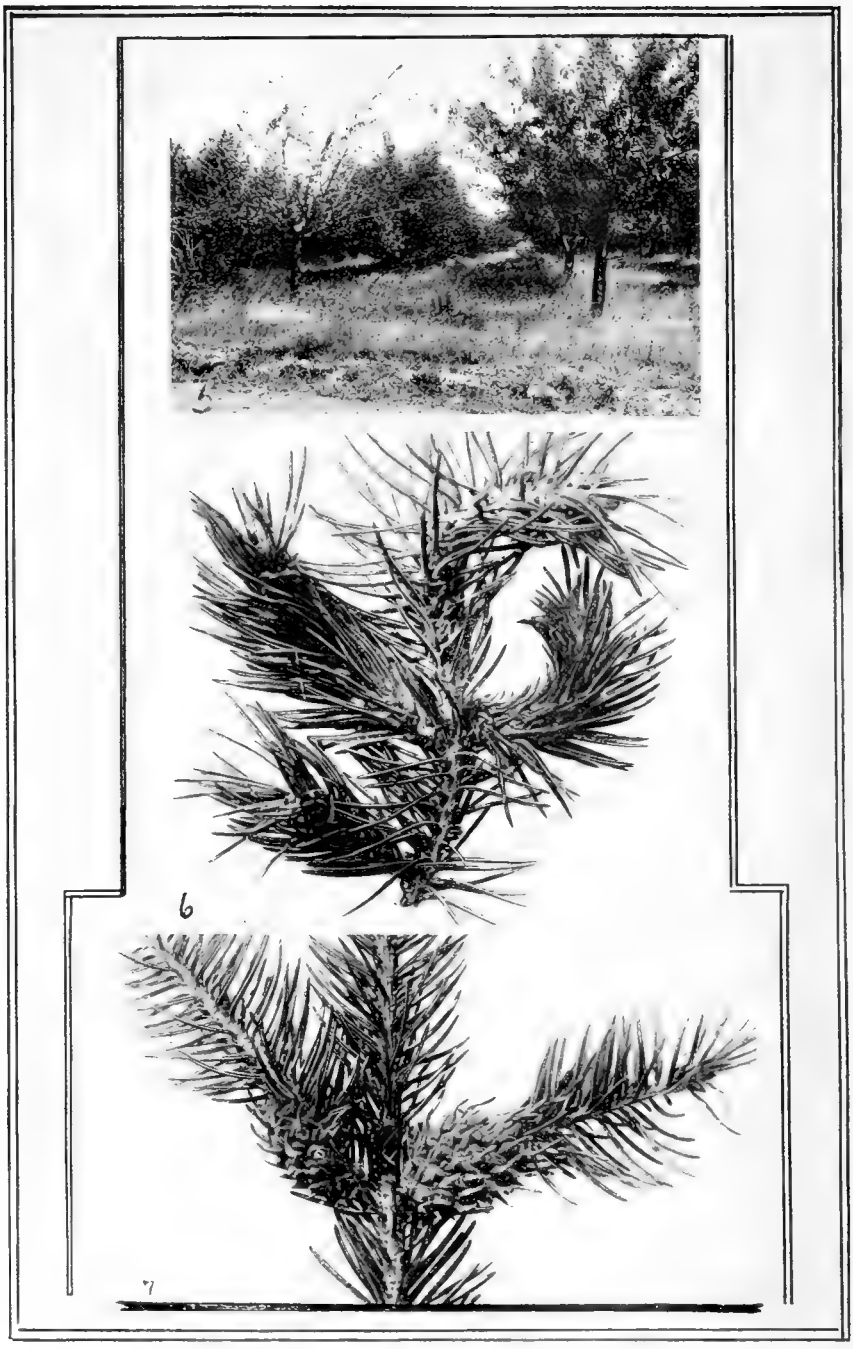


PLATE B.—5. Sweet Cherry tree on the left almost completely defoliated by the Slug; tree on the right only slightly injured. 6. Galls on White Spruce caused by *Chermes similis*. 7. Galls on Norway Spruce caused by *Chermes abietis*.
(See pages 24 and 26.)

Entomological Society of Ontario.

OFFICERS FOR 1910-1911.

President—Dr. Edmund M. Walker, Lecturer in Zoology, University of Toronto.

Vice-President—Dr. C. Gordon Hewitt, Dominion Entomologist, Central Experimental Farm, Ottawa.

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Librarian—Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Professor of Entomology and Zoology, O. A. College.

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Directors (Ex-Presidents of the Society).—Professor Wm. Saunders, C.M.G., LL.D., F.R.S.C., F.L.S., Director of the Experimental Farms of the Dominion of Canada, Ottawa; Rev. C. J. S. Bethune, M.A., D.C.L., F.R.S.C., Guelph; W. Hague Harrington, F.R.S.C., Ottawa; Professor John Dearness, Vice-Principal Normal School, London; Henry H. Lyman, M.A., F.E.S., F.R.G.S., Montreal; Rev. Thomas W. Fyles, D.C.L., F.L.S., Hull, P.Q.; Professor Wm. Lochhead, B.A., M.S., Macdonald College, P.Q.; John D. Evans, C.E., Chief Engineer, Central Ontario Railway, Trenton; Professor Tennyson D. Jarvis, B.S.A., Ontario Agricultural College, Guelph.

Editor of the "Canadian Entomologist"—Dr. E. M. Walker, Toronto.

Delegate to the Royal Society—Professor J. M. Swaine, Macdonald College, P.Q.

Auditors—Professors S. B. McCready and J. W. Crow, Ontario Agricultural College, Guelph.

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Mackay, Dr. A. H. .....Halifax.
Payne, H. G. .....Granville Ferry.

Saskatchewan.

Androchowicz, E. .....Humboldt.
Willing, T. N. .....Regina.
Neville, S. J. .....Cottonwood.

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Scudder, Dr. S. H. .....Cambridge, Mass.
Smith, Prof. J. B. .....NewBrunswick,NJ
Uhler, P. R. .....Baltimore, Md.
Webster, F. M. .....Washington, D.C.
Wickham, Prof. H. F. ....Iowa City, Iowa.

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Saunders, Dr. William ...Ottawa.
Director of the Experimental Farms of the Dominion.
Bethune, Rev. C. J. S.....Guelph.
Professor of Entomology, Ontario Agricultural College.

The Entomological Society of Ontario.

ANNUAL MEETING.

The forty-seventh annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 3rd and 4th. Professor Tennyson D. Jarvis, President of the Society, occupied the chair during the day meetings, and at the evening session the meeting was presided over by Mr. C. C. James, Deputy Minister of Agriculture for Ontario.

Amongst those present were Mr. H. H. Lyman, Montreal; Dr. C. G. Hewitt, Mr. Arthur Gibson and Mr. Groh, Central Experimental Farm, Ottawa; Prof. Swaine, Macdonald College, St. Anne's, P.Q.; Mr. John D. Evans and Miss Evans, Trenton; Mr. F. J. A. Morris, Trinity College School, Port Hope; Dr. E. M. Walker and Messrs. C. W. Nash, J. B. Williams and A. Gummer, Toronto; Prof. Needham, Cornell University, Ithaca, N.Y.; President Creelman, Professors C. A. Zavitz, W. H. Day, S. F. Edwards, E. J. Zavitz, C. J. S. Bethune, Messrs. J. E. Howitt, J. W. Eastham, L. Cæsar, D. H. Jones, Morley Pettit, of the staff; and a number of the students of the Ontario Agricultural College.

Letters expressing regret at their inability to attend were received from Dr. William Saunders, Director of the Dominion Experimental Farms, Ottawa; the Rev. Dr. Fyles, Hull, P.Q.; Prof. Wm. Lochhead, Macdonald College, P.Q.; Messrs. R. C. Treherne and G. E. Sanders, Central Experimental Farm, Ottawa; Messrs. A. F. Winn and G. Chagnon, Montreal; Dr. Watson, Port Hope; Mr. C. E. Grant, Orillia; Mr. A. Cosens and Miss Brodie, Toronto; Mr. R. S. Hamilton, Galt; and Prof. J. Dearness, London.

On Thursday morning a meeting of the Council was held, at which the report of the proceedings during the past year was drawn up, and several questions concerning the welfare of the Society were discussed. Amongst others was the consideration of a proposal to hold the next annual meeting at either Macdonald College, P.Q., or the Experimental Farm at Ottawa. This was referred to the Executive Committee for further action. Dr. Bethune was elected a Life Member, in recognition of his services to the Society since its inception 47 years ago.

In the afternoon the proceedings began with the reading of reports by the Directors on the insects observed in their respective districts during the past season. No report was furnished by Mr. C. W. Nash, Director for District No. 4, East Toronto.

REPORTS ON INSECTS OF THE YEAR.

Division No. 1, Ottawa District—Arthur Gibson, Central Experimental Farm, Ottawa.

Throughout the Ottawa district, injurious insects were remarkably abundant during the season of 1910. Most of the regularly-occurring pests were present in greater numbers than usual. The season, on the whole, was much drier than that of 1909, the rainfall being below the average; July and August were particularly dry.

ATTACKING FIELD CROPS.

The HESSIAN FLY (*Mayetiola destructor,* Say) was conspicuously present in wheat fields in the district. In 1909 no trace of it could be detected in fields where it did noticeable injury in 1908. During the past season large numbers of broken-down straws were seen in the middle of July, and all examined contained the well-known "flax seeds." In one plot on the Central Experimental Farm fully 10 per cent. of the plants were infested. The "flax seeds" were just above the first and second joints of the stems.

The GREATER WHEAT-STEM MAGGOT (*Meromyza americana,* Fitch) again attacked many of the varieties of wheat in the plots on the Central Experimental Farm, but as in 1909, the infestation was not serious. The so-called "silver-tops," or "dead heads," were easily detected in July. The larvæ were full grown about the middle of the month. The insect was present in larger numbers in the varieties of Durum and Emmer wheats.

CUTWORMS. The Red-backed Cutworm (*Paragrotis ochrogaster,* Gn.) and the Greasy Cutworm (*Agrotis ypsilon,* Rott.) were responsible for much damage throughout the Ottawa district. Rows of young beets were entirely destroyed, radishes were freely attacked, and young cabbages and cauliflowers were cut off soon after planting out. In larger fields many mangels were rendered useless. The cutworms were present in particularly large numbers in the first week of June.

WHITE GRUBS were reported as doing some injury, especially to potatoes. A friend of mine, living at Meach Lake, lost many of his potatoes from the work of these larvæ, which ate into them, making large holes and rendering them useless.

WIREWORMS were also destructive in the district. On one farm, a few miles from Ottawa, land which had been in sod for many years was used for growing celery. Just recently the owner of the place mentioned to me that his celery plants had been practically all destroyed by the wireworms.

Some injury by the CLOVER ROOT-BORER (*Hylastinus obscurus,* Marsh.) was observed on July 14th. At this time the larvæ were nearly full grown; at one place they had done a good deal of harm to Red Clover. The GREEN CLOVER WEEVIL (*Phytonomus nigrirostris,* Fab.) was also present in injurious numbers in the district. The work of the larvæ was very apparent towards the end of June. On 29th June some mature larvæ were collected; these spun their pretty little cocoons soon afterwards, and the beetles emerged on July 9th; at this date larvæ were still to be found.

The TURNIP FLEA BEETLE (*Phyllotreta vittata,* Fab.) was noticed to be very abundant on young turnips and radishes, particularly the former, on May 27th. These small, very active, shining black beetles are responsible for much damage, but they can be controlled by dusting the plants with Paris green and flour, or Paris green and land plaster, one pound of the former to 20 lbs. of the latter.

ROOT MAGGOTS. During the present year these very destructive insects have been extremely abundant in eastern Ontario. On the Central Experimental Farm the Radish or Cabbage Maggot destroyed radishes, cabbages and cauliflowers. Onions on the Farm were not attacked by the Onion Maggot, but in my own garden in the city about half of my onions were infested. The Corn-seed Maggot (*Phorbia fusciceps,* Zett.) did a good deal of injury to beans. In some fields examined towards the end of June, where pea beans had been planted, it was seen that the maggots first attacked the cotyledons, but as the plants grew and these were pushed up above the ground the maggots left them, and, in most plants examined, entered the stem, mostly near the roots. In some cases, however, the maggots had bur-

rowed down through the stem from the cotyledons. The important injury caused by this maggot, of course, is in the destruction of the primary shoot. Some white beans, which were planted near these pea beans, were not injured by the maggot. An interesting result obtained in our rearing of these maggots this season was the discovery that root maggots were not altogether responsible for the damage done. From infested radishes we also obtained, in early July, large numbers of the larger fly, *Muscina stabulans,* Fallen. A few specimens were also reared from pea beans. The food of *Muscina stabulans* is chiefly decaying vegetable matter, but it is known to attack growing vegetables. On the 14th October, mature larvæ and puparia of the Radish and Cabbage Maggot were found at the roots of cabbage plants.

Attacking Fruit Trees.

The Oyster-shell Scale (*Lepidosaphes ulmi,* L.) is very prevalent throughout the district. Apple trees are especially attacked. This autumn large numbers of the fruit bear many of the characteristic scales.

The Cherry and Pear Slug (*Eriocampa cerasi,* Peck.) has this year been again abundant around Ottawa. In September, many of the dull-coloured slimy larvæ were present on plum and cherry trees, as well as on mountain ash. This late brood seldom does serious damage. The foliage of some of the ornamental mountain ash trees on the Experimental Farm was conspicuously eaten, and when the skeletonized portions turned brownish the trees showed the attack very plainly.

The Apple-leaf Hopper (*Empoasca mali,* LeB.) was fairly abundant in apple orchards, and although it apparently did not do any very noticeable injury, its work could be easily seen on the leaves late in the season.

The American Tent Caterpillar (*Malacosoma americana,* Harr.) In spring and early summer many nests of this Tent Caterpillar were observed. The egg clusters were seen in the end of July to be very abundant, and for this reason we will most probably see next year a very much increased outbreak of the insect. Orchardists would do well to look for the nests of this caterpillar next spring, and as soon as they are noticed, cut them off and destroy them.

The Eye-spotted Bud-moth (*Tmetocera ocellana,* Schiff.). This well-known apple pest was abundant in the district the past season, and did much injury in some orchards. At Ottawa this year the larvæ were noticed to be almost full-grown on July 9th.

Other such well-known pests of the apple as the Codling Moth (*Carpocapsa pomonella,* L.), the Woolly Aphis of the Apple (*Schizoneura lanigera,* Hausm.), and the Apple Aphis (*Aphis mali,* Fab.) were, as usual, present in injurious numbers.

Attacking Forest and Shade Trees.

The Fall Webworm (*Hyphantria textor,* Harr.) was extremely numerous during the season. During my residence in Ottawa, since 1899, I have never seen so much injury by this well-known pest, as was done this year. Apple and wild cherry were the trees principally attacked; some of the smaller trees were entirely defoliated and rendered very unsightly by the many nests they bore. The work of this caterpillar was particularly noticeable in August. The Fall Webworm has been abundant this year all through eastern parts of Canada and the United States. In Maine, in the same month, I saw large numbers of the nests, dozens on a single tree. On July 6th I took from a raspberry bush near Ottawa a large nest, and by actual count it contained 318 larvæ. These varied in size from ⅛ of an inch to ½ an inch in length.

The Spruce Bud-worm (*Tortrix fumiferana,* Clemens). In my report last year I mentioned an outbreak of this insect, which occurred particularly in the Upper Gatineau district, north of Ottawa. We had hoped that the outbreak of 1909 would not be repeated in 1910, but most unfortunately the insect was again present in enormous numbers during the past season, not only in the Upper Gatineau district, but throughout other areas in the Province of Quebec. In the immediate vicinity of Ottawa the larvæ could be found without difficulty on spruce trees, but they were not present near the city in numbers sufficient to do noticeable injury. At Ottawa, this year, many larvæ were mature in the first week in June, and specimens collected at that time produced the moths about two weeks later. On June 27 many empty chrysalides were seen on spruce trees on the grounds of the Central Experimental Farm. Female moths collected on July 16th deposited eggs on July 18, the larvæ hatching 7 days later. On July 23 thousands of the moths were present in store windows on Sparks Street.

The Larch Sawfly (*Nematus erichsonii,* Hartg.), is continuing its ravages all through the district. Many trees were seen which had been entirely defoliated. At Ottawa I found the clusters of the eggs on May 28 and at that time some of the young larvæ were just appearing.

Two other insects were very abundant on larches this year, viz., the Larch Case-bearer (*Coleophora laricella,* Hbn.), and the Woolly Larch Aphid (*Chermes strobilobius,* Kalt.) The Larch Case-bearer made its first appearance at Ottawa, as recorded by the late Dr. Fletcher, in 1905. Since then it has not been abundant until the present year. The attack this year was very apparent early in May. The moths began to emerge towards the end of that month. On June 15, moths were seen in numbers around the trees. This autumn the larvæ are plentiful on the trees, in their small incomplete cases. On May 27, the larches on the Central Experimental Farm were abundantly infested with the Woolly Larch Aphid. Clusters of the brownish eggs were found at the fascicles of the leaves on this date, and the young woolly aphids were scattered all over the leaves, the white woolly secretion being very conspicuous. The young were small and had only recently hatched. From one egg mass brought into the Division, some young emerged May 31.

The White-cedar Twig Borer (*Argyresthia thuiella,* Pack.) is this year again present in numbers throughout the district. It is not, however, as numerous as it was in 1905 and 1906. The tiny green larvæ of this species bore inside of the young tips of white cedar, causing the same to die, which injury, of course, is conspicuous and gives the trees a sickly appearance. The partly grown larva passes the winter within the twig where it has been working.

The Maple Phenacoccus (*Phenacoccus acericola,* King). On many of the trunks and lower branches of maple trees along the streets of Ottawa there are, at the present time, small, but conspicuous deposits of a cotton-like waxy secretion beneath which are colonies of this insect. Towards the end of September adult females, which are light yellow in colour and about one-fifth of an inch long, were found and large numbers of eggs. These latter were noticed to be hatching on Oct. 13. The young larvæ, which winter on the trees, were, on hatching, white with a yellowish tinge on the dorsum. As yet the trees are not seriously infested but the insect has increased abundantly this year and, as it is capable of doing important injury, if this continues, the trees may, of course, require some treatment. This is the first record of the Maple Phenacoccus occurring in the Ottawa district.

An interesting outbreak of the small Curculionid beetle, *Orchestes rufipes*, Lec., occurred locally on willow toward the end of May and during the first half of June. The beetles were first noticed on a large laurel-leaved willow, (*Salix pentandra*, L.), on the Experimental Farm, on May 31; four days later the beetles were more plentiful and by the 15th of June they were quite numerous and their work very noticeable. While the beetles did not do any serious injury their habit of eating small, round holes into the epidermis on the underside of the leaves, destroyed, of course, the beauty of the foliage to a marked degree. In one leaf, which measured 2¼ inches long by 1 inch wide, at its widest part, I counted 329 of these little holes. When standing beneath a tree and looking up among the foliage the work of this insect is very conspicuous.

The Butternut Tingis (*Corythuca arcuata*, Say.) At Chelsea, Que., Mr. Herbert Groh found a pretty little lace-bug in large numbers on butternut on June 20. The species answers to the description by Fitch of *C. arcuata* which appears in "Packard's Forest Insects." The species is known to occur also on birch, willow and other trees. The injury is done by the insects puncturing the leaves and sucking the juices.

The Pine Bark Aphid (*Chermes pinicorticis*, Fitch.) This insect is abundant on some white pine trees at the present time near Ottawa. The trunk of one large tree recently under observation is much infested with the aphid, and the patches of the flocculent downy matter give the trunk a very white appearance not unlike snow. A Syrphid larva is present in numbers feeding upon the aphides.

Plant Lice were extremely abundant on shade trees. The large green aphis on cut-leaved birches occurred in great numbers. In the middle of September the trees showed conspicuously the result of the attack. Manitoba maples were heavily infested with plant lice. The Elm Leaf Woolly Aphid was again injurious. The Snowball Aphis rendered unsightly the foliage of many beautiful Viburnums in gardens.

The Fall Cankerworm (*Anisopteryx pometaria*, Harris) was noticed in numbers on basswood and other trees. At the end of May the work of the larvæ was very apparent.

The Birch Leaf Skeletonizer (*Bucculatrix canadensisella*, Chamb.). The presence of this insect on cut-leaved birches was apparent in August and September; on September 16th some full-grown larvæ were seen. The small white pseudo-cocoons, which are made by the larvæ as temporary shelters during the time they are moulting, were conspicuous on the leaves.

Greenhouse and Flower Gardens.

Of the greenhouse insects which were specially troublesome in the district, the following may be briefly mentioned:

The Greenhouse Leaf-tyer (*Phlyctænia ferrugalis*, Hbn.) occurred in large numbers in the houses of one of our local florists; roses were chiefly attacked. In the same house, last month, a small black Thrip was doing considerable injury to the buds of roses. The White Fly is troublesome in some houses, attacking a large variety of plants; it was noticed to be working particularly on *Coleus* and *Primula*.

In flower gardens the worst insect of the year was the Tarnished Plant Bug (*Lygus pratensis*, L.). This insect does a tremendous amount of damage almost every year to all kinds of flowering plants. It takes a special delight in destroying the tender buds.

The Four-lined Leaf Bug (*Pœcilocapsus lineatus*, Fab.) was found destroying dahlias in July; it attacked the leaves and buds. Many of these insects, as well as of the Tarnished Plant Bug, can be destroyed by spraying the infested plants with either kerosene emulsion or whale-oil soap. They can also be jarred from the plants into an inverted umbrella and then put into a receptacle containing coal oil and water.

The Grape-vine Leaf-hopper (*Typhlocyba*) occurred abundantly the past season. Virginia creepers all through the city of Ottawa were severely infested, and before the middle of July much of the foliage had turned whitish in places, owing to the attack of the insect.

The Destructive Pea Aphis (*Nectarophora pisi*, Kalt.) was again present in the district, but was not particularly injurious. Small colonies were seen on field peas at the end of July, but later it was found in numbers on sweet peas in gardens. In my own garden, the parasite *Praon cerasaphis*, Fitch. did good service in reducing the numbers of the plant louse; the lady-bird beetles (*Hippodamia convergens*, Guer., *Adalia bipunctata*, L., and *Coccinella transversoguttata*, Fab.) were also present in fair numbers, feeding upon the aphis.

The Curled Rose Worm (*Emphytus cinctipes*, Nort.) was more than usually abundant, and infested roses could be seen in many gardens. The larvæ were particularly noticed in the middle of July, when they were about full-grown and when their work was easily detected. This is an extremely easy insect to control, and there is no reason why beautiful rose bushes should be rendered unsightly by the attacks of this false caterpillar. A weak Paris green mixture sprayed over the bushes will quickly destroy all the larvæ on the leaves.

Household Insects.

All of the worst household insects were present in Ottawa during the year. Cockroaches were complained of from many sources. The Buffalo Carpet Beetle was abundant in some houses, and caused a good deal of anxiety. Both of the two common Clothes Moths were especially numerous, and much havoc was wrought in houses where woollen clothing, furs, etc., had carelessly been left to hang in cupboards during the summer. A few weeks ago I saw a beautiful Persian lambskin coat, which had been practically destroyed by the larvæ of the Southern Clothes Moth (*Tinecola biselliella*, Hum.). Although called the Southern Clothes Moth, this insect, unfortunately for us, does not confine its work of destruction to localities to the south of us. The Black Carpet Beetle (*Attagenus piceus*, Oliv.), during the winter of 1909-1910, was present in destructive numbers. In one instance, that came under my notice, these insects did serious injury. In two cupboards, the contents of which had not been examined for some months, damage was done to woollen goods, and also to a beaver collar of a fur-lined coat. Larvæ noticed in the early part of April were from 6 to 10 mm. in length.

Division No. 5, Port Hope District—F. J. A. Morris, Port Hope.

Owing to prolonged absence I have had little opportunity of direct observations. At the end of September I interviewed a young farmer east of the town, whose orchards two or three seasons ago were badly infested with the Oyster-shell Bark-louse. He tells me that the pest has almost entirely disappeared in the neighbourhood; and this good result he believes is due to careful cleaning and spraying under advice from the Agricultural Department.

Mr. Hume, a well-known seedsman in Port Hope, who is a large grower of peas, informs me that a greenish black louse (presumably *Nectarophora destructor*) has been abundant this year, far more so than he has ever found it before; he thought that it was most prevalent just after damp spells in the hottest part of the season; this would be rather contrary to the habit of most plant lice which multiply in dry seasons. The insect had destroyed a great many of his pea-vines.

The larva of the SAW-FLY (*Selandria cerasi*) has been abundant in our neighbourhood this season, and has completely destroyed the foliage of some trees. Mr. Mitchell, of the Ontario Gardens, had some young pear trees stripped; a neighbour some cherry trees; and in one orchard the larva was found prevalent on plum trees, as well as cherry and pear. The damage in all cases was done by the later brood at the end of August and in September.

The larva of *Rhagoletis pomonella* (the APPLE MAGGOT) has been quite a severe pest in our neighbourhood, chiefly affecting the early apples; a great many of the apples that ripen in September were attacked by this fly, and the fruit fell to the ground spoiled. In the east section of Port Hope the apple-pickers complain of the damage done by the "Railroad Worm," or by some disease that turns the flesh of the apple to a woody consistency and causes the fruit to develop irregularly; on the outside the apple has a gnarled and deformed appearance. This does not appear to be caused by an insect, though one apple-picker assured me that "the railroad worm" was not a grub, but a name given to the green fibrous thread that sometimes showed in the flesh of the apple where it had turned woody. In some orchards the entire crop was ruined; in all the affected area the apples that were gathered were marked second grade. It was first noticed in Snow apples, but Talmon Sweets were also affected, and the worst sufferers were Spies.

The day after returning to Port Hope I examined a large field of asparagus north of the town, and found both species of asparagus beetle fairly abundant; it was three years ago that I first found *Crioceris 12-punctatus* so far east, and this season of 1910 is the first in which the other species (*C. asparagi*) has come under my notice. The spotted kind was more abundant than the more recent arrival in the neighbourhood. I examined two other asparagus beds, east and north-east of the town; in each case the two species were present. Larvæ as well as beetles were observed in the foliage as late as the 20th of September. They do not appear to do much harm to the full grown plant, and there was little sign of the spring brood having wrought havoc; the asparagus rows appeared well filled, as though few heads had been destroyed at the beginning of the season.

To turn from economics, some remarkable gatherings of butterflies were noticed this year; Mr. Mitchell, of the Ontario Gardens, saw great masses of a yellow butterfly along the road sides while driving through the country. This was doubtless one of the Clouded Yellows (*Colias philodice*). In August, too, were noticed in two or three parts near Port Hope, millions of the Milkweed Butterfly (*Anosia plexippus*). In one case a small beech wood was filled with swarms of this butterfly, so that the branches of the trees appeared as if covered with brown foliage; if a stick was thrown up, myriads of the insects rose into the air and settled down again.

In the order Coleoptera, nothing new was taken by myself, and Dr. Watson, my fellow-collector, noticed nothing much that was unusual in our collecting grounds, though few of our old friends about the blossoms and foliage failed to return to their haunts as usual. On June 26th were captured one or two specimens of *Acmæops proteus* settling on a pine trunk; and between that date and July 13th were taken some five or six specimens of *Neoclytus erythrocephalus* on the trunk

of a felled oak. From the latter date till August 7 were found some specimens of *Leptostylus* resorting to a pile of oak billets at the same spot; they appeared to be about to oviposit between the bark and the wood at the ends of the billets, probably attracted by the smell of fermenting sap. Two species of *Oberea* were captured between June 26 and July 13, one feeding in dogwood blossom, the other resting on raspberry foliage. About raspberry foliage, too, as well as about basswood leaves there were more specimens of *Agrilus* than usual seen, mostly of two species, *ruficollis* and *anxius*.

Among Hymenoptera, the Horn-tails seem to have been active on the young elms bordering some of our residential streets; I found in October as many as three females of *Tremex columba* imprisoned in the bark of one young elm.

Division No. 2, Orillia District—C. E. Grant.

The season of 1910 was again, like 1909, very cold and late in spring, the warmest weather 73° in the shade occurred in March, in which month the temperature was over 70° on three different occasions (though we did not have much warm weather until near the middle of June), and several species of moths were taken by me at light in March, an unusual occurrence here.

Injurious insects were not remarkably plentiful. Complaints were made of the turnip-root maggot, in fact late sown turnips were almost a failure from the depredations of this insect. The Raspberry Cane-Girdler (*Oberea bimaculata*) was noticeably abundant; in some gardens the broken tops of the canes looked as if someone had been going through the patch with a stick. The apple crop was almost a failure here; I have reason to suppose that it was caused by the very wet weather which occurred during the time the trees were in blossom, and in consequence the bees had no chance to carry the pollen for fertilization. *Carpocapsa pomonella* should be rare next year if scarcity of food lessens their numbers.

Canker Worms were very common here this spring; the moth of these and of *Erannis tiliaria* are in great numbers around my lamp as I write this, October 25.

Nematus ribesii, the Currant Worm, was very prevalent, and the first brood coming in the wet season of this year made it almost impossible to keep any insecticide on the plants long enough to check their ravages.

On a hedge of hawthorn a species of Schizoneura was so plentiful that the trees appeared as if they had been whitewashed. On examination it closely resembled the alder louse, on which *Feniseca tarquinius* feeds.

During a wind storm in July a large quantity of maple trees, or large limbs of the same, were broken. This occurred particularly in two or three localities where the trees were full of the burrows of the Pigeon Tremex (*Tremex columba*), and many of the grubs and even parts of the perfect insect were present; there seemed to be no other reason for their rotten appearance except what might be from heavy top pruning. I have taken some moths this season which are rare to me, viz., *Fentonia martesia, Elida caniplaga, Notodonta simplaria, Plusia oxygramma, Syneda Alleni*, etc.

Division No. 6, Galt District—R. S. Hamilton.

The weather conditions in this district during the past spring and summer have not been favourable for insect life, and as a consequence fruit growers, nurserymen and the farming community in general have had little to contend against in the way of insect pests.

It is rather remarkable that plant lice, which were responsible for considerable damage in the orchard and field in 1909, were scarcely in evidence this season. The same is true of the cutworms and the codling moth.

Slight exceptions to the general freedom from insect pests were the Colorado potato beetles, which were unusually abundant. Some complaint was also made of the ravages of the Canker-worm (*Paleacrita vernata*), which did some injury to the beech, maple and apple trees. Maple trees in Galt and vicinity have been attacked by the Pigeon Tremex (*Tremex columba*), but investigation showed that no very serious injury has been done.

Division No. 3, Toronto District—J. B. Williams, Toronto.

I have been away in England most of the summer; so that the only matter on which I can report anything is the well-worn subject of the Tussock Moth.

These insects have been very numerous in Toronto during the past summer, and I have noticed quite a large number of trees that have been seriously damaged by them, nothing being left on large portions of the foliage, except the veins of the leaves.

Our Park Commissioner obtained, this autumn, a grant of $3,500 for the purpose of collecting the egg masses of the cocoons; and, I believe, he is employing three gangs of men in this work as long as the fund lasts; but the egg masses must be more generally collected in the private grounds and gardens of the city if the work is to be really successful.

Great numbers of the cocoons this year were found on two apple trees in the garden of the house where I live, though there were no signs that the caterpillars had been feeding on the leaves of these trees. I picked a large handful of the egg masses off them a few days ago; and so did a little towards the destruction of this troublesome pest.

Division No. 7, Niagara District—R. C. Treherne.

I have the honour to present my first report as representative for the Niagara District.

I regret to say that my report must be lacking in detail, for the reason that I have been absent from the district for a greater part of the summer, consequently I am compiling this report with the assistance of friends residing in the district and from a few notes I had in hand previous to leaving the district.

The fruit-growers of the Niagara district are still greatly troubled by several very serious insect pests. There are four insects which are present every year, and which, I regretfully have to believe, are yearly increasing over a larger area. These four are—

1. The Codling Moth (*Carpocapsa pomonella*).
2. The Plum Curculio (*Conotrachelus nenuphar*).
3. The San Jose Scale (*Aspidiotus perniciosus*).
4. Shot Hole Borer (*Scolytus rugulosus*).

In none of these cases am I able to give figures or statistics, showing effects of spraying or degrees of infestation. I can merely mention them as being the most serious pests with which the fruit-grower has to contend.

The Codling Moth has been more than ever abundant this year, especially so in unsprayed orchards. Even in cases where orchards have been sprayed at the

correct time and with the right mixtures two or three times during the summer, the results have been disappointing. In orchards where the trees are attended to several years in succession satisfying results with sprays have been obtained, thus demonstrating that combined and continued attack on this insect results in success.

The PLUM CURCULIO during this last summer has been more plentiful than usual, at least not perhaps in point of numbers, but in comparison with the fruit crop, which has been light. The early spring and blossoming period was cold and wet, and it was hoped that these climatic conditions, while reducing the fruit yield, would also affect the numbers of this insect. Later reports show, however, that it was as much in evidence as usual, if anything, attacking a larger proportion of the fruit crop.

This insect attacks a variety of fruits, and the members of the Entomological Society should be urged to regard this insect with more attention. More observations are needed on the best time to spray. It is considered best to use an insoluble poison in a spray and to coat the leaves and the small developing fruits with it. But whether to spray early or late is the point to be determined. If spray is applied too early the calyx cup protects the young plum and when, in course of a few days, the calyx cup drops off, the plum is left clean and free for attack.

The SAN JOSÉ SCALE is steadily increasing, despite the greater number of men who are spraying, and if my information is correct, spreading to new orchards. I saw an excellent result of a spraying with lime sulphur (commercial) on a tree well encrusted.

The SHOT HOLE BORER is well on the level with the above insects in the matter of destructibility. We have no definite practical means of fighting it, and its attack usually means death to the tree. Such injury cannot be said of the other insects which we can fight with a more reasonable hope of success. The destruction of worthless trees and the cleaning up of lumber piles and fence corners cannot be too strongly advised.

There are other insects which have been more or less plentiful this year. The PEAR TREE SLUG (*Eriocampa cerasi*) has been particularly abundant on young cherry trees throughout the entire district. The CURRANT APHIS (*Myzus ribis*), an insect causing currant leaves to discolour and fall prematurely, has been commonly seen. The SNOWY TREE CRICKET (*Œcanthus niveus*) has been more abundant than usual attacking in particular the raspberry. The GRAPE BERRY WORM is reported from St. Catharines vineyards. Aphids common to the apple, which were reported in numbers last year, were present in considerably reduced numbers this year. The WOOLLY APHIS (*Schizoneura lanigera*), considered to be one of the worst pests of the apple in more temperate climes, is fortunately by no means abundant in the Niagara District. It is present, however, throughout the entire district, making itself shown in pruning scars and cracks and crevices of the bark. Its numbers are very small, but perhaps 25 per cent. of the apple trees of the district harbour, to a greater or lesser extent, a few of these insects. My observations, in this regard, only extend over comparatively few orchards.

One other insect might be mentioned as causing considerable annoyance to certain fruit-growers who were planting out sweet cherry trees this spring. It is a species of wood-boring wasp, the name of which has not yet been determined. This spring, on my own farm, I had occasion to set out upwards of 500 sweet cherries of various varieties. After they had taken a fair hold of the ground I pruned them, leaving merely a straight stem standing. The central portion of the stem is soft and pithy, and it is not for several weeks after pruning that the

exposed surface hardens. One day, going over these trees, I noticed small, round holes bored down the soft, central pith and some castings of wood on the leaves below. Over 300 of my 500 trees were attacked in this way, the holes extending down the stem upwards of three inches. Stored snugly and tightly in some of these holes were numerous aphids. The cause of this injury was, apparently, one of the wood-boring wasps. Adults were captured and taken to Ottawa for identification.*

I heard of two other cases, within a radius of three miles of Grimsby, in which young cherry trees were attacked, and while the injury was not serious, it was distinctly annoying to have to rehead your trees. I punched out the aphids and filled the holes with a lime and lead arsenate paste as remedies.

I have to thank Messrs. Tennyson D. Jarvis and Wilfred Ryan for their assistance in this report, and also Dr. C. Gordon Hewitt, Dominion Entomologist, who has kindly allowed me to incorporate a few notes, which were obtained under his authority.

INSECTS OF THE YEAR IN ONTARIO—LAWSON CAESAR, B.A.; B.S.A., ONTARIO AGRICULTURAL COLLEGE, GUELPH.

ORCHARD INSECTS—CODLING MOTH (*Carpocapsa pomonella*). The apple crop was very light this year and, as usually happens in such cases, a large percentage of the fruit was wormy. Many would place the amount of damage in unsprayed orchards at 50 per cent. of the total crop; it will probably be safe to estimate it at at least 40 per cent. Much more spraying than usual was done and fruit-growers are gradually learning that to get the best results they must do the work not only at the right time, but also very thoroughly. In every case very satisfactory results have followed good work; in fact it is a long time since the benefits of spraying were so clearly demonstrated. This is partly because the season was so favourable to the development of Apple Scab that only in sprayed orchards in many districts could any clean fruit be purchased.

LESSER APPLE WORM (*Enarmonia prunivora*), Plate A, Fig. 1. While probably not more than 2 to 5 per cent. of the wormy apples of the Province could be attributed to attacks of the Lesser Apple Worm, individual orchards were discovered where the percentage was much higher. For instance, in one orchard near Guelph, fruit on the ground in October showed that 38 injuries out of a total of 80 had been caused by this insect; the rest were due to Codling Moth. Fruit purchased on the market from farmers in the vicinity of Guelph showed a considerable number of Lesser Apple Worm injuries. It is easy to find the larvæ in haws in this district up to almost the end of October. Specimens for class study each year are obtained from this source. The same spray as for Codling Moth seems to control this pest fairly well. It is just probable, however, that an additional spray with arsenate of lead about the first week in August would help greatly.

PLUM CURCULIO (*Conotrachelus nenuphar*), Plate A, Fig. 2 (p. 7). Observations the last two years in various parts of the Province show that the damage to apples from the fall feeding of the new adults is very great in many districts. Wherever orchards are neglected or are situated near good hiding-places for winter quarters, such as woods, a large percentage of the apples, especially of the rougher skinned varieties, are rendered unsaleable by feeding punctures made from about the middle of August up into October. Thorough cultivation of the soil and the

* This insect, through the kindness of Dr. L. O. Howard, of the Bureau of Entomology, Washington, has been determined by Mr. S. A. Rohwer as *Cemonus inornatus* Say.

removal of rubbish of every kind has been observed in many cases to be quite as important as spraying in controlling this pest.

MR. GIBSON: What is the largest hole you found?

MR. CAESAR: There are often several small holes close together which may be worked into one large hole. The injured area is usually from ⅛ to ¼ of an inch. in diameter, and quite circular.

DR. HEWITT: We have had a number of cases of where the holes are large. In some cases I think wasps have been responsible for the enlargement.

APPLE MAGGOT OR RAILROAD WORM (*Rhagoletis pomonella*). It has usually been supposed that this insect was found only in Prince Edward County and in a few orchards not far away on the mainland. In reality it is much more extensively distributed than has been suspected, and can probably be found here and there throughout most of the Province, though there are many orchards quite free from it. Infested apples have either been sent in from the following counties, or have personally been observed by the writer in them: Prince Edward, Hastings, Northumberland, Durham, Ontario and Lincoln. The insect seems to be worse on trees in villages or towns, wherever there is good shelter. In such places it has been seen to be very severe on Spy, Snow, Alexander and Tolman Sweet varieties, almost every apple being so badly attacked as to be much deformed and useless. Adults did not appear until July 15th this year east of Toronto. Methods of control in co-operation with the fruit-growers are being planned for the coming season. At present the prompt destruction of fallen fruit from August 1st to the end of the season is the remedy commonly advocated.

MR. NASH: We have found as yet that the only method of control is absolutely rigid destruction of the fallen fruit.

MR. CAESAR: Has it been proven that the larvæ never emerge from the fruit before it falls?

MR. SWAINE: The evidence points that way.

MR. CAESAR: Have all the maggots come out after the apples have fallen in your tests?

MR. SWAINE: I do not think any come out till then. Sometimes the maggots are very small, but I have always had the impression that they did not come out until a short time after the apples drop, but I am not certain about it.

MR. CAESAR: I have seen a number of cases this year that seem to me to make that doubtful.

MR. JARVIS: Have you made sure it was the Apple Maggot in the Niagara district?

MR. CAESAR: The external injury and the appearance of the larva itself corresponded so exactly with the genuine thing that I have no doubt that it was the Apple Maggot I found in that district.

DR. HEWITT: The way to breed them is to get apples that have just fallen and put them in a box containing soil, and allow the maggots to come out.

MR. CAESAR: I saw, I suppose, one hundred in Michigan that had changed to pupæ even without any soil. They came out of apples that had been placed in a vessel for another purpose. This merely shows how readily they change to the pupal stage.

MR. HOWITT: Do the apples always fall when attacked?

MR. CAESAR: They often remain on the trees until quite late. Some Tolman Sweets that are attacked might be still found on the trees, but as a rule they fall earlier than they otherwise would.

DR. HEWITT: They ripen prematurely.

Mr. Caesar: I have seen some orchards where Spies nearly all fell two or three weeks prematurely.

Dr. Hewitt: I could give you a practical illustration in regard to control by destruction of the fruit. One of the most serious places for the Apple Maggot has been in the orchards around Como, in Quebec, and Mr. Shepherd told me that he had cleared them out of his own orchard by destroying the fallen fruit.

Mr. Swaine: That case is the standard one quoted for the Apple Maggot all over the northern part of Eastern United States.

Mr. Caesar: I was aware of Mr. Shepherd's experience, and was much interested in it.

Mr. Swaine: He was particularly careful in his work.

Aphids of the Orchard.

These insects were not nearly so abundant this year as last, and only in a few cases were there any complaints of damage. Our most common species of green apple aphis is evidently *Aphis avenæ*, Fab. In a few orchards specimens of a rosy aphis, probably *Aphis pyri*, Boyer, were seen. On the sweet cherry the Black Aphis (*Myzus cerasi*, Fab.) was fairly abundant in the early part of the season, and caused considerable loss.

The Woolly Aphis (*Schizoneura lanigera*) was rather more abundant than usual. So far as I know this pest does not attack the roots to any appreciable extent. On the branches it can easily be destroyed by a spray of kerosene emulsion forcibly applied.

Mr. Caesar: Have you got the Rosy Apple Aphis at Montreal, Mr. Swaine?

Mr. Swaine: It is fairly abundant this fall.

Dr. Hewitt: *Aphis sorbi* is quite abundant in the West.

Mr. Caesar: What is your common green aphis on the apple?

Mr. Swaine: *Aphis pomi* (DeGeer).

Oyster-shell Scale (*Lepidosaphes ulmi*). This pest is rapidly being brought into subjection in all the best apple districts by the use of the lime-sulphur wash. This spray is rapidly displacing all others for this purpose, and wherever it is continued year after year it completely frees the orchard from the scale.

San José Scale (*Aspidiotus perniciosus*). Though specimens of San José Scale have been sent in this year from Northumberland County and last year from Prince Edward County, it is still doubtful whether it is capable of establishing itself firmly in these colder districts. Lime-sulphur is the standard remedy.

Blister Mite (*Eriophyes pyri*). This mite is now to be found in almost every district in the Province, although many orchards here and there are still exempt. It may prove a blessing in disguise, as it will in many cases force the farmer to spray his trees rather than let them look so unsightly and be so greatly injured. Lime-sulphur applied just as the buds are bursting has given very satisfactory results both last year and this.

Mr. Jarvis: Do you think it has spread so rapidly, or are people just opening their eyes and noticing it?

Mr. Caesar: In my brother's orchard there were only two pear trees, on which this had evidently been brought in. Those two trees two years ago were completely infested. To-day almost every tree in the whole orchard is attacked.

Mr. Jarvis: Five or six years ago I found it nearly everywhere in the Province.

Mr. Caesar: The fruit-growers tell me that in orchards where they are not spraying with lime-sulphur it has been spreading very rapidly. It certainly is all

over the Province, though not in every orchard, by any means, but in every district.

MR. GIBSON: Dr. Fletcher used to say that where you can find a pear tree you will find a Blister Mite all over Canada.

MR. CAESAR: It is probably found now more on the apple than on the pear.

ANAMETIS GRISEA. Specimens of this Snout Beetle and of apple leaves injured by it were sent this year from Albury, Prince Edward County, and Grafton, Northumberland County. In the latter place it was suspected also of feeding on the bark of apple twigs. The beetles are nocturnal in their habits, so far as could be learned. In the day time they hide under loose bark on the tree. Specimens of injured leaves obtained at Albury, early in July, showed that they fed around the margin, causing it to become very jagged.

PEAR PSYLLA (*Psylla pyricola*). It is several years since this tiny pest has been so abundant in the Niagara district as this year. In many cases the spring application of lime-sulphur should have been supplemented by the use of kerosene emulsion soon after the leaves had opened.

PEAR AND CHERRY SLUG (*Eriocampoides limacina*), Plate B, Fig. 5. Neglect to control this pest has led to its becoming exceedingly abundant the last two years. Many otherwise good cherry orchards have been rendered unsightly by the feeding of the slugs on the leaves. Young trees are most subject to attack, and are usually the ones most likely to be overlooked until the damage has been done. Plum trees were attacked in some places, as well as sweet and sour cherries and pears. Arsenate of lead readily controls the insect.

CHERRY FRUIT FLY (*Rhagoletis cingulata*), Plate A, Figs. 3 and 4. When the sour cherries were ripening I paid a visit to an orchard near Homer village, where it was said some grub, evidently not that of the Plum Curculio, was to be found in the cherries. As was suspected, the culprit proved to be the Cherry Fruit Fly. Many adults, chiefly males, were seen on the leaves and fruit, and not a few of them were captured with comparative ease. On examining the ripe fruit, maggots, very like those of the Railroad Worm, were found inside, some of them nearly or quite full grown. A few wormy cherries were brought back and put in a breeding cage. On examination of the soil in the autumn eight puparia were found about one inch below the surface. No experiments on control have been tried yet, but evidently care should be taken to gather all the fruit, so that none of it may fall to the ground and give the larvæ a chance to escape into the soil. All wild cherry trees in the neighbourhood should be cut down and burned, as these doubtless serve as breeding quarters. Discing the orchard and allowing chickens to run in it should be very helpful. Prof. Pettit, of Michigan, tells me that in that State the pest seems to disappear almost entirely from time to time. This is encouraging news, if it be true of Ontario as well as of Michigan.

MR. CAESAR: Does anyone know of any other district where this pest occurs?

MR. SWAINE: I have not heard of it down our way.

MR. HOWITT: It is in New York State, especially on cherries which have gone wild on the roadsides.

FRUIT BARK-BEETLES (*Eccoptogaster rugulosus* and *Phleotribus liminaris*). These troublesome little beetles are not nearly so abundant as they were a few years ago. This apparently is to be attributed chiefly to the numerous parasites which are found to be attacking them. There are clearly two broods of *E. rugulosus*, the adults of the first appearing about the middle of June, and of the later brood about the middle of August. This species is much more common than *P. liminaris*.

Mr. Jones has discovered that *E. rugulosus* is frequently the cause of the spread of the Pear Blight germs (*Bacillus amylovorus*). The best means of control is clearly the destruction by fire of all dead and dying branches, and of all old brush heaps early in spring. If any trees are seen to be attacked during July they should be burned shortly before the end of the first week in August, to destroy the larvæ and pupæ. After this date it is better to leave dying or attacked trees in the orchard to act as traps and entice the beetles from healthy trees. Those thus left should, of course, be destroyed next spring early.

The Blackberry Leaf-miner (*Metallus* (*Scolioneura*) *rubi*). This sawfly larva has spread over most of the Province, and in some districts has done much damage to blackberries by mining in the leaves; sometimes almost every leaf is severely attacked by one or more larvæ. This year the adults appeared in the Niagara district by about July 1st, and egg-laying at once began, the eggs being placed, so far as I could observe, just under the epidermis, and not being visible externally. When full grown the larvæ enter the earth. There are almost certainly two broods each year, living larvæ of the last being found in the leaves as late as November 16th last year. The winter is passed in the larval (not pupal) stage in tiny oval earthen cases, about one inch below the surface of the ground. (Apparently this point has not been observed before.) These earthen cases are not held together with silk, but with some mucilaginous substance. Sometimes they seem to be hard to break open, and sometimes easy. Kerosene emulsion was tested on the leaves, but was clearly useless, as it could not penetrate through the epidermis, even though this was dead. The only remedy that seems practicable where the pest is severe is to stir the soil frequently with a hoe around the base of the plants very late in autumn and in spring up to July, so as to break the cases and destroy the larvæ or pupæ inside. If there are only a few leaves attacked these can be either pulled off towards the end of July or the larvæ crushed inside with the fingers, using a leather glove to protect against the thorns.

Raspberry Sawfly (*Monophadnoides rubi*). The larvæ of this sawfly were more abundant than usual. Arsenate of lead should easily control them.

Wireworms and White Grubs. The cold, late spring retarding the growth of grain after it came through the ground seemed to give Wireworms and White Grubs a chance to do much more damage than usual. During the farmers' excursions in June I was almost constantly being asked for information on how to combat these pests. About all the remedy I could give was the old-time one of fall ploughing and rotation of crops. On enquiries I found that only in a very few cases were peas attacked. Frequently where peas and barley were sown together, the barley was destroyed and the peas left. This experience could be made use of by farmers where they feared attacks from Wireworms if they sowed oats or barley. I recommended that the new remedy originated by Prof. Fernald for preventing Wireworms from attacking seed corn be tried on a limited scale. Prof Fernald puts tar on the seed in the manner practised to keep off crows, then, to dry it so that it will go through the seeder, he places it in a large bucket containing fine dust and Paris green mixed in such proportions that the corn, after being shaken up in the bucket, shows a greenish color. The corn in his two years' experiments never failed to germinate and was quite uninjured by the Wireworms, which, he thinks, were probably repelled by the covering substance rather than killed by it.

Mr. Nash: Prof. Slingerland investigated a number of remedies and found that they were of no use.

Mr. Caesar: Yes, but he did not use the tar and Paris green combined in this way.

MR. NASH: You can understand that it will not act as a preventive, because the Wireworms will eat off the rootlets as quickly as formed.

MR. CAESAR: The Wireworms attacking the kernels have been in this way a great pest, and never give the corn a chance at all.

MR. NASH: It does not seem at all practicable.

DR. HEWITT: It protects the kernel, but will not protect the roots of the plant.

MR. CAESAR: Possibly the odor of the tar has something to do as a repellant.

MR. NASH: We know quite well that the tarred seed does not protect the plant at all.

MR. CAESAR: Prof. Fernald has been working on this for two years, and he claims that he has got excellent results. I was reading the other day results from further trials, and the writers claim that they did not care how badly the field was infested the corn would not be attacked if treated with the tar and Paris green. As for Prof. Fernald, it is well known that he is a thorough man in his work.

MR. NASH: They got hold of a susceptible breed of Wireworms.

MR. HOWITT: Have you found the Wireworm attacking potatoes to any extent? I came across a district around London where about 30 per cent. of the potatoes were bored through with the Wireworms.

MR. CAESAR: Yes, quite often. Have you known of the above method of controlling them, Mr. Swaine?

MR. SWAINE: I have known it to be reported upon favorably a number of times.

PEA APHIS (*Nectarophora destructor*). This very serious pest was only found locally, but in a few districts it destroyed whole fields of peas. One farmer thinks its presence on the vines has led to the death of some of his cattle by poisoning. This scarcely seems possible.

ROOT MAGGOTS (*Pegomya brassicæ* and *P. cepetorum*). These troublesome pests have been about as abundant as usual. Late cabbage has been almost free from them.

CABBAGE APHIS (*Aphis brassicæ*). Fortunately this species of insect is at last being brought under control by its natural foes, and this year in most parts of the Province did comparatively little damage.

SPRUCE GALLS (*Chermes sp.*,) Plate B, Figs. 6 and 7. Some attention has been given to spruce galls this year, chiefly by my summer assistant, Mr. W. A. Ross. It has been found so far that we have on spruce in the Province, *Chermes abietis*, *C. similis*, *C. pinifoliæ*, and a species that seems to be *C. pinicorticis*, but was not studied early enough in the season to get the adults, and so make sure of its identity. Of these, *Chermes abietis* is the most abundant, and is found on Norway, Black and White Spruce. *Chermes similis* is very abundant on White Spruce, and is doing much damage. *Chermes pinifoliæ* has been found by us only at Port Hope, where I saw it on one tree, which I think was White Spruce, although it might possibly have been Black. Experiments on the control of *C. abietis* showed that because of its exposed condition it could be destroyed by an application of whale-oil soap or lime-sulphur in April. Excellent results have been obtained from the latter, both this year and last.

So far we do not know when *C. similis* can be best attacked. It looks as though it would be a much harder species to combat than *C. abietis*. In spring it is so enveloped in a flocculent mass that lime-sulphur has no effect on it, and probably an oil spray would likewise be ineffective.

DR. WALKER: Did you say you found *Chermes pinifoliæ* on the White Spruce?

MR. CAESAR: I have been looking for it wherever I have gone, and only found it in Port Hope.

DR. WALKER: I have seen it at Nipigon, on the north shore of Lake Superior, confined to a single tree, and had to hunt a good deal to find as many as eight or ten specimens. I took it to be *C. pinifoliæ*, but may be mistaken. I think it was also this species that was sent to me from Snelgrove. I have found *C. similis* only on White and Black Spruce, never on Norway.

MR. JARVIS: There is a species very common in the far west; it is about half an inch in length. Do you know that one?

DR. HEWITT: I have collected that same one all through Saskatchewan, Alberta and British Columbia this fall. It seems to be a more compact and more regular species. I have got here about six different species of *Chermes*. The box has been arranged for me by Miss Patch. I find that *floccus* and *similis* are far more common than heretofore supposed. *Floccus*, I think, occurred in Quebec this year, too.

MR. CAESAR: We have not found *C. floccus* in Ontario yet.

THE MORE INJURIOUS INSECTS IN CANADA DURING THE YEAR 1910.

C. GORDON HEWITT, D.Sc., DOMINION ENTOMOLOGIST, OTTAWA.

As reference has already been made by the directors of the various districts in eastern Canada, and by Mr. Caesar, to those insects which have been brought to their notice as being more or less prevalent and injurious, it remains for me to briefly mention those insects which have occurred in other parts of Canada, or whose injuries have been more than usually serious.

In the northern districts of Saskatchewan considerable damage has been caused by the RED-BACKED CUTWORM (*Paragrotis ochrogaster*, Gn.), the injuries being chiefly to wheat. Another cereal pest, especially upon oats, which seems to be spreading is a species of Thrips. Oats which had been injured by this insect were received from Quebec, Saskatchewan, Alberta and British Columbia. It produces a characteristic whitened appearance of the ears.

The WESTERN BLISTER BEETLE (*Cantharis nuttalli*, Say) was very abundant in the western provinces of Manitoba, Saskatchewan and Alberta, where it was reported as injuring chiefly peas.

The POTATO BEETLE (*Leptinotarsa decemlineata*, Say) is gradually working its way north in Alberta, its northern limit at present being somewhere in the neighborhood of Edmonton.

The HOP FLEA-BEETLE (*Psylliodes punctulata*, Melsh.) was again serious in British Columbia, but on some of the ranches the Red Spider was a much more serious pest. The manager of one hop yard stated that it was compelling them to cease growing hops. In one locality, where a crop of six or seven hundred pounds of hops to the acre is usually produced, they were reduced to two hundred pounds to the acre by the ravages of the spider, and the resulting hops were of very poor quality. The destruction of the mite wintering in the hop poles would appear to be the best method of controlling it, as they were found there in large numbers. This can be accomplished by dipping the poles in a caustic solution, such as lye, or in coal oil.

One of our most serious pests in Canada at present is the Brown-tail Moth, now established in Nova Scotia. During the last summer we have also received the first record of its breeding in New Brunswick, a single egg mass having been found at St. Stephen, N.B. This was not surprising nor unexpected, in fact it is singular that it has not been found breeding in numbers in that locality before, in view of the fact that it extends along the coast of Maine as far north as the Ste. Croix River. In July a visit was made to the eastern States, for the purpose of studying the distribution of the Gipsy and Brown-tail Moths, and the means that were being taken to control them and to prevent their spread. One object of this visit was to ascertain to what extent nursery stock and other vegetation shipped from these States into Canada was liable to be infested with these two insects: on account of the conditions which prevailed a regulation was passed under the new Destructive Insect and Pest Act, providing that all nursery stock from the six eastern States: Connecticut, Rhode Island, Massachusetts, Maine, New Hampshire and Vermont shall be inspected at the point of destination. Reference may be made here to the passing of the "Destructive Insect and Pest Act" during the last session of Parliament. With the Brown-tail Moth and the San José Scale already within our borders there was urgent need for legislation which would enable the Federal Department of Agriculture to take such measures as would insure, so far as is humanly possible, the freedom of nursery stock and other vegetation from serious pests which are liable to enter Canada by such means. It was also necessary for the Minister of Agriculture to be empowered to carry out such eradicative measures as shall be considered necessary to combat those insects which have already established themselves in the country. Briefly, then, the new Act provides for the fumigation of imported stock when it is necessary for the San Jose Scale, the inspection of European and certain other classes of imported stock for Brown-tail and Gipsy Moths, the carrying on of such work as shall be necessary for the eradication of those pests scheduled and the compulsory treatment on the part of the owners of trees and other vegetation infested. The insects at present scheduled are the San Jose Scale, the Brown-tail and Gipsy Moths, the West Indian Peach Scale and the Woolly Aphis. Armed with this machinery we hope to be able to fight against the introduction of those pests to which Canada, as a rapidly-developing country, is specially subject. Reverting to the Brown-tail Moth, the result of the last season's inspection in Nova Scotia would indicate that, although in certain localities the winter webs were numerous, on the whole the area infested was more restricted, thanks to the energetic action of Prof. Cumming, the Secretary for Agriculture for Nova Scotia. During the coming winter season we intend to co-operate with the Provincial Government and carry on an active campaign. It was interesting to find that the only batch of eggs discovered in New Brunswick was parasitised by a small egg parasite, apparently a species of *Trichogramma*.

Another alien which, unfortunately, has been added to our gradually increasing fauna of injurious insects, is the Narcissus Fly (*Merodon equestris*, Fab.). This was reported from Victoria, B.C., and during my recent visit to the district I had the opportunity of looking into the matter. It was probably introduced on Dutch bulbs. The fly somewhat resembles the Drone Fly, belonging to the same family, the Syrphidæ, and the maggot feeds in the centre of the bulb, thereby causing its death. The bulb-grower who reported this insect to the Division of Entomology had about 50,000 bulbs of narcissus and daffodils destroyed last year by the fly. On account of the habits of the larvæ it is difficult to devise effectual preventive or eradicative measures: some benefit resulted from spraying with an arsenical. Further details of the life-history and habits of the fly in Canada must be elucidated before measures can be suggested.

Last year Mr. Gibson called the Society's attention to the outbreak of the SPRUCE BUD-WORM (*Tortrix fumiferana,* Clem.), which had been reported to the Division of Entomology as causing serious defoliation of the spruce and balsam trees in the Province of Quebec, about 100 miles north of Ottawa. During my visit to British Columbia, in October of last year, it was found to be defoliating the Douglas fir on Vancouver Island, and when that region was revisited a month ago I found that the attack had been more serious this year, many young five-year old and older trees of the second growth having been killed. The area of infestation in Quebec appears to have spread also, and reports have been received from a number of owners of timber and pulp-wood limits as to the seriousness of the defoliation, which is very conspicuous from Mattawa across to the Saguenay River in Quebec. It has also been recorded from other districts in Quebec. What the results of this defoliation will be cannot be foretold. It is known that the insect was chiefly responsible for great destruction among the spruces in Maine some years ago. Now that it has spread over so wide a stretch of country nothing of a practicable nature can be done to control it. We are, therefore, studying the parasitic means of control, to which I hope to refer to-morrow, and we are also clearing up some obscure points in the life-history of the insect.

The WHITE-MARKED TUSSOCK MOTH (*Hemerocampa leucostigma,* S. and A.) has been unusually abundant in the Maritime Provinces during the past year, especially in Nova Scotia. In Halifax and Charlottetown it has caused considerable alarm on account of its defoliation of the shade trees in those cities. The citizens appear to be fully alive to the danger of the repeated defoliation of their shade trees, and it is hoped that timely destruction of the egg masses in the winter and, if necessary, spraying in the summer will be resorted to.

Mr. Caesar has already referred to the occurrence of the FOREST TENT CATERPILLAR. These insects occurred in very large numbers in New Brunswick, and also in British Columbia, where whole tracts of country were defoliated. We also received them from Edmonton, Alberta. The great abundance of the Fall Webworm, especially in some localities, was very noticeable during the past season.

Another caterpillar, of which I do not think we have yet heard the last, is the GREEN-STRIPED MAPLE WORM (*Anisota rubicunda,* Fab.). This species was reported to the Division last year as defoliating the maples in a sugar bush, and this defoliation was stated to have caused a decrease in the amount of sap obtained from the trees. During the present year it was reported as defoliating maples in the Rideau Lakes, and along the northern shores of Georgian Bay the maples were stripped of their leaves.

MR. CAESAR: Have you seen much of the Thrips in Ontario?

DR. HEWITT: I have not had any cases of the Thrips to which I refer reported as yet from Ontario.

MR. CAESAR: Does the whole of the wheat get that silvery appearance?

DR. HEWITT: It is on oats that we have found it. The white and silvery appearance of the head and stem of wheat is usually due to the wheat-stem maggot.

MR. NASH: Is the Rose Beetle generally reported?

DR. HEWITT: I do not think that we have had many reports.

MR. CAESAR: It is fairly abundant round Clarkesville.

MR. SWAINE: I might mention, Dr. Hewitt, that I found the Spruce Budworm at Hudson, P.Q., this season. Have you had it reported as far south as that?

DR. HEWITT: We have had it reported from a number of localities in Quebec, other than those which I have mentioned. I have found it within a few miles of the Vermont boundary.

NOTES ON THE SEASON OF 1910.

Rev. Thomas W. Fyles, D.C.L., Hull, Que.

The season of 1910 has been a very fine one, interrupted, however, with heavy thunderstorms. Some interesting species of insects have come under my notice in the course of the season.

Eucosma Scudderiana, Clemens The galls of *Eucosma scudderiana* have been very abundant. They begin to appear on the Golden Rod early in June. They are somewhat irregular in shape, and are covered with a rusty-looking scurf.

The larva is greenish-white. Its head is of a dark madder-brown; and the plate on the second segment is spotted with brown. On the body are numerous oval tubercles or plates. The spiracles are small and brown.

This species continues in the larval stage through the winter, and does not go into pupa till May. I have opened galls in March and April and found the larvæ active. They feed on the pith above and below their galls. The moths appear at the end of May.

Holland, in his beautiful and very useful work, "The Moth Book," telling of *Eucosma scudderiana,* says—

"The insect is not uncommon in western Pennsylvania, and is possibly an inquiline or intruder in the galls which are produced by another species, *Gnorimoschema gallæ-solidaginis,* Riley."—*The Moth Book,* p. 418.

The author is mistaken here. The galls of *G. gallæ-solidaginis* begin to appear at the same time as those of *scudderiana,* at a time when the moths of both species have passed away. It is not likely that a *scudderiana* larva would leave its own gall to go in search of one of the other kind.

The galls of *G. gallæ-solidaginis* may be readily known: they are of the shape of a half-grown turnip-radish; and they have not the rusty apearance of the Eucosma gall. *The moths from them appear in the month of August.*

Tetrastichus gelechiae, Ashmead. I have found two galls of *G. gallæ-solidaginis* this season—one at Abercorn in the eastern townships, and the other at Hull—in which the pupæ appeared abnormally large. By aid of the microscope I found that the enlargement was caused by the closely-packed chrysalids of a parasite *Tetrastichus gelechiæ.* The flies in due time appeared.

Camponotus pennsylvanicus, DeGeer. On June 14th—a very hot day—there was a remarkable flight of the large, black Carpenter Ants (*Camponotus pennsylvanicus*). The creatures were everywhere in the streets of Hull; but they were not abundant long, for the sparrows regarded a Black Ant as a *bonne bouche,* and banquetted upon the unexpected provision to their hearts' content. Useful sparrows! May the memory of Colonel Rhodes, who introduced them to Canada, be honoured!

A Strange Butterfly. On August 8th I captured a curious melanic form of *Argynnis myrina,* Cramer. Both the primaries and secondaries of this insect were suffused on the upper side with sooty black; but in the secondaries the inner margins, and a few spots in the centre of each, were of the normal color. On the under side the primaries were dusky brick red, with sooty black patches between the veins. The marginal silvery spots appeared. The secondaries on the under side were of a rich chocolate red. The black spot towards the base of each was enclosed by a narrow silvery ring. The spots were as usual. The body was black above and yellow beneath.

Mononychus vulpeculus, Fab. At Quyon, Province Quebec, on August 17th, I found that the seed-pods of the Blue Flag (*Iris versicolor*) were much infested

with a small beetle (*Mononychus vulpeculus*), in all its stages. The larvæ and pupæ were waxen in appearance. The beetle was a trim and handsome little insect. The following is a description of it:—Length, 5 millimetres; breadth, 3 millimetres. Color above, deep seal-brown. Elytra and thorax bordered with yellow. Thorax granulated. Elytra roughly striated. Eyes small and black, close to the proboscis.

Color beneath, that of burnt sienna on the sides, and grey under the abdomen and between the legs. Femora and tibiæ furry. Femur stout, somewhat flask-shaped. Tarsi ending with two pads or cushions, side by side, with a claw between them. Joints of tarsi very distinct.

Proboscis extending between the front pair of legs, as far as the middle pair; blunt, scaly—the upper part sienna-colored; the lower, dark grey.

I am indebted to the kindness of Dr. Howard and Prof. Schwarz, of the U. S. Bureau of Entomology, for the determination of the beetle.

I obtained from the affected Iris pods a considerable number of specimens of the parasite *Pimpla inquisitor*, Say.

Hemiptera on the Milk Vetch.

On September 1st, on a small patch of Milk Vetch (*Astragalus canadensis*), growing at Aylmer, Province Quebec, I found no less than six kinds of bugs. Amongst them were:—*Alydus conspersus*, Mont., and *Megalotomus quinquespinosus*, Say.

A. conspersus is black with an orange patch on the abdomen above. This can be seen only when the wings are spread.

M. quinquespinosus is a handsome insect, of a neat ochreous color. Its abdomen has black edges marked with pale yellow spots. It was named from the five spines on the femur of each of its hindmost legs.

For the identification of these two bugs I am indebted to Prof. Heidemann.

Basilona imperialis, Drury.

On October 2nd, Miss Effie Garrioch sent me, from Marshall's Bay, on the Ontario side of the Ottawa, three larvæ of *Basilona imperialis*. They were full fed, and went into the earth on the evening of their arrival. Two of them were of the deep green of the pine foliage; the other was of a rich rosy brown. They changed to pupæ on the 10th of the month. The following is a description of these remarkably handsome caterpillars:—Length, 3 inches; diameter, 5-6 inch. Head lobed, black, with clay-yellow upright markings in front, and paler yellow marks on the sides.

Forelegs, clay-yellow with black tips. Prop-legs, dark brown with a clay-yellow bar across them.

Body color a dark green—sometimes a rosy brown—with a purple dorsal-line, and a broad faintly purple band along each side.

The second segment has a black shield with four glossy warts on the front edge of it.

On the third, and again on the fourth, segment are two prominent warts, one on each side of the dorsal-line, pale yellow at the base and tip, and black, spotted with yellow, in the middle. In line with each of these pairs of warts, and on the seven next following segments, are creamy-white, pointed warts—one on either side of each of the segments. On the twelfth segment, at the top, is a glossy black,

prominent wart, tipped with yellow; and, a little behind it, are two small black warts. On the top of the thirteenth segment is a small black wart, faced with yellow. Along the purplish sideband, from segment three to segment twelve, there is a row of creamy-white, pointed, warts; and along the base, above the legs, from segment two to segment thirteen, on either side, is a row of similar, but smaller warts.

The spiracles are conspicuous, large, creamy-white, bordered with black.

The claspers are remarkably large. They are surmounted by a large triangular shield, edged on two sides with clay-yellow, and dotted with white. The claspers are bordered and dotted in the same way.

The creature is sparsely set, with light, brownish-yellow, bristles.

PELOPAEUS CEMENTARIUS, Drury. Adjoining the Matthews' Factory at Hull there is an electrical sub-station, belonging to the Hull Electric Company. In this station, three yards from a window, a telephone is affixed to a wall. One day, in August last, the man who occasionally visits this sub-station found that the telephone was out of order, and gave notice of this at the head office. The superintendent, Mr. Alfred Gale, went to see what was wrong, and, on opening the magneto-box, found a number of Mud-Wasps at work, piling up their cells upon the bar, which terminates on the outside of the box in the hook, or fork, in which the receiver is placed. Within the box, the spring, under the bar, was not strong enough to raise the additional burden; and consequently, no pressure was brought to bear upon the contact points, and the telephone failed to work.

The wasps found ingress to the magneto-box through the slot in which the bar plays.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its report for the year 1909-1910.

The forty-sixth annual meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, November 4th and 5th, 1909. There were a goodly number present from a distance as well as a large attendance of students and others connected with the College.

During the first afternoon the reports of the Directors on the insects of the year were read and discussed, papers were read by Mr. L. Caesar on "A few insects of the season"; by Mr. A. Gibson on "Nests of the Brown-tail Moth in importations of French nursery stock"; by Dr. C. Gordon Hewitt on "The large Larch Sawfly"; by Mr. R. C. Treherne on "Nursery work in Ontario," and by Mr. F. J. A. Morris on "Some Guests at the Banquet of Flowers." In the evening a public meeting was held in Massey Hall, which was well filled with members and students from both the Agricultural College and the Macdonald Institute. A very interesting lecture on "House Flies and their Allies," illustrated with excellent lantern pictures, was delivered by Dr. C. Gordon Hewitt, the newly appointed Dominion Entomologist.

The morning and afternoon of the second day were occupied with the reading of the reports of the various branches and officers of the Society, and a number of papers on a variety of subjects, which have all been published in the Annual Report for 1909. This volume, the fortieth of the series, was issued in May last and contained 141 pages, illustrated with 6 full-page plates, 39 figures in the text and a portrait of the late Dr. William Brodie. In addition to the papers already men-

tioned, the volume contained the following articles: "The origin and diffusion of Entomological Errors," by Mr. H. H. Lyman; "Conflicts between Ants," by Mr. G. E. Sanders; "The Snow-white Linden Moth," by Mr. A. F. Winn; "Notes on Fruit-tree Scolytids," by Mr. J. M. Swaine; "Observations on Ontario insects in 1909," by Dr. Bethune; "Injurious Insects of Quebec in 1909," by Prof. Lochhead; "Adaptations in the structure of insects" and "Anisota virginiensis," by Dr. Fyles; "The Acarina, with a Host Index to the species found in Ontario," by Prof. T. D. Jarvis; "The Spruce Bud-worm" and "The Entomological Record for 1909," by Mr. Arthur Gibson; concluding with a sympathetic obituary notice of the late Dr. Brodie, by Mr. Frank Morris.

The *Canadian Entomologist*, the monthly magazine of the Society, has been regularly issued at the beginning of each month. The forty-first volume was completed in December last; it consisted of 440 pages, and was illustrated with 11 full-page plates and 13 figures from original drawings. The contributors numbered 73, and included writers in Ontario, Quebec, British Columbia, England, sixteen of the United States, the Hawaiian Islands, Panama Canal Zone; Calcutta, India; and Russia. During the year seven new genera were described and 239 new species, sub-species and varieties.

At the close of the volume, Dr. Bethune resigned the position of editor, which he had held since October, 1886, owing to the disability caused by impaired eyesight in addition to the weight of advancing years. His place has been ably filled by Dr. E. M. Walker, Lecturer in Zoology at the University of Toronto, and the magazine has continued to be issued with unimpaired excellence.

Meetings of the Society were held during the winter months at the Ontario Agricultural College on alternate Wednesday afternoons. The attendance included several of the more advanced students and much interest was taken in the papers and discussions. The following subjects were taken up during the course of the meetings: "Achievements in Economic Entomology," illustrated with lantern pictures, by Prof. Bethune; "Insects as causes of disease, with special reference to the Protozoa," by Prof. Jarvis; "The Insects of Saskatchewan," by Mr. S. J. Neville; "Aphids," by Mr. A. C. Baker; "An account of the Meeting at Boston of the American Association for the Advancement of Science," by Mr. L. Cæsar; "Notes on the Calliphorinean Genus Lucilia," by Mr. J. D. Tothill.

The unveiling of the drinking fountain erected in the grounds of the Central Experimental Farm at Ottawa in memory of our late President, Dr. James Fletcher, took place on Tuesday afternoon, July 19th, and was largely attended. Our Society was represented on the occasion by two former Presidents, Dr. William Saunders, Director of the Dominion Experimental Farms, and Dr. Bethune, of the Ontario Agricultural College, who both took part in the proceedings by giving short addresses. There were also present a number of our members resident in Ottawa and the neighborhood.

The first International Congress of Entomology was held during the month of August last at Brussels and was in every respect a complete success. Our Society was represented by our former President, Mr. Henry H. Lyman, of Montreal, who read a paper on Nomenclature. He has furnished us with an interesting report of the proceedings.

It is with much regret that the Council has learned that the members in Quebec have been unable to maintain the branch of the Society which for many years was in successful operation there. The removal of the Rev. Dr. Fyles has taken away the most active member whose enthusiasm inspired the rest of the members and kept

up the meetings with great interest. No one has so far been found to take his place, and accordingly the operations of the branch have been suspended.

A similar fate, we regret to say, has befallen the branch of the Society in British Columbia. Mr. R. V. Harvey, Headmaster of the University School at Victoria, has found his time so much occupied that he has been unable to give any attention to the work of the branch. Its operations have on this account been suspended for the time being, but it is hoped and expected that before very long its operations will be resumed. The great difficulty consists in the geographical distribution of the members, who are very widely separated from one another and consequently are unable to hold meetings.

The Council has to deplore the loss of Mr. G. W. Kirkaldy, of Honolulu, who died in San Francisco on the 2nd of February last. He was a very able and energetic entomologist and contributed frequently to the pages of our magazine. He especially devoted himself to the Hemiptera, and had begun a catalogue of the species throughout the world, the first volume of which has just been issued.

Respectfully submitted,

TENNYSON D. JARVIS, *President.*

FIRST INTERNATIONAL CONGRESS OF ENTOMOLOGY.

HENRY H. LYMAN, MONTREAL, QUEBEC.

If anyone entertained any doubts of the possibility of making a Congress devoted exclusively to Entomology a success, such doubts must have been dispelled by the results of the First International Congress of Entomology held at Brussels from August 1st to 6th, 1910.

A correspondent of the London *Times* writing of the Congress said: "Entomology is at last recognized officially as an important science. The study of insects, so long looked upon with disdain as a pastime for children and old men, has at last vindicated its claim as a valuable branch of human mental activity. That is to say, from being a purely intellectual exercise, entomology has developed a most important practical aspect that will, in the near future, have a profound and far reaching effect upon the lives and fortunes of millions. The discovery of the astonishing phenomenon that one species of mosquito, and one only, is the vehicle for the transmission of yellow fever, another of malaria, while a single kind of biting fly communicates sleeping sickness to the teeming millions of the African continent, has a direct and vital influence upon tropical medicine; and the Americans have long since realized that an accurate knowledge of the habits of one kind of beetle may save agriculturists from damage that may result in the loss of hundreds of thousands of pounds. Thus entomology has won the serious attention of practical men who, acting together with the purely academical devotees of the pure science, have demonstrated their attachment to and appreciation of their study by organizing an International Congress that has received the hearty support of institutes, departments and governments."

The following important bodies were represented at the Congress: the British Colonial Office, the Tropical African Entomological Research Committee, Cambridge University, Oxford University, the Board of Agriculture,

the Royal Colonial Institute, the Imperial Department of Agriculture in the West Indies, the British (Natural History) Museum, the Royal Society, the Linnean Society, the Zoological Society, the Entomological Society of London, the University of London, the Commonwealth of Australia, the Commonwealth of South Africa; the Royal British Arboricultural Society, the University of Edinburgh, the East of Scotland College of Agriculture, the Royal College of Science of Dublin, the Agricultural Research Institute of Pusa, Bengal; the Carnegie Institute of Pittsburg, the Entomological Society of America, the Academy of Natural Sciences of Philadelphia, the Entomological Society of Ontario, etc., etc.

Besides entomologists residing in Brussels, delegates were also present from other parts of Belgium and from Madrid, Zaragoza, Barcelona, The Hague, Leyden, Amsterdam, Berlin, Zürich, Königsberg, Vienna, Bologna, Genoa, Milan, Luxemburg, Paris, St. Petersburg, Moscow, Budapest, Pittsburg, Philadelphia, Columbus, Montreal, Tokio, Buenos Ayres, etc.

On the evening of Sunday, July 31st, a reception was held by the Entomological Society of Belgium for those attending the Congress and accompanying ladies at the Maison des Medicins, while the first meeting of the Congress was opened the following morning at the Salle des Fêtes of the Exhibition by the President of the Congress, Prof. Auguste Lameere, Rector of the Free University of Brussels, the Secretary being Mr. G. Severin.

The meetings were divided into general sessions and sectional meetings, ten sections being arranged for as follows:—

1. Systematics.
2. Nomenclature and Bibliography.
3. Museology and History of Entomology.
4. Zoogeography.
5. Bionomy, Œcology, Cecidiology and Mimicry.
6. Physiology and Psychology.
7. Economic Entomology
8. Medical Entomology.
9. Anatomy and Ontogeny.
10. Phylogeny, Palæontology and Evolution.

Members were given a very handsome silvered bronze badge of Gothic design, having on the obverse an illustration of the Hotel de Ville and "Bruxelles," "1910," and on the reverse "1r Congrès International d'Entomologie," and, by the courtesy of the Exhibition Committee, passes to the Exhibition for the term of the Congress.

The more serious work of the Congress was varied by visits to the Exhibition, museums, excursions and receptions. At the Royal Museum of Natural History an excellent portrait group was taken.

Among the most important papers read may be mentioned a lecture by Dr. R. Blanchard, of Paris, on Medical Entomology, dealing with the transmission of malaria, yellow fever and sleeping sickness, and it may be mentioned that there was a most interesting exhibit in connection with these subjects in the Exhibition. Mr. Theobold, of Wye College, gave a lecture on the distribution of *Stegomyia fasciata*, the conveyer of yellow fever. Sir Daniel Morris described the methods employed by the Imperial Department of Agriculture in the West Indies to prevent the introduction of insect pests by fumigation and quarantine. Dr. G. H. Carpenter, of the Royal College of Science, Dublin, gave an instructive account of the warble fly, *Hypoderma bovis*. He declared the so-called preventive washes quite useless, but had not concluded his investigations.

Dr. R. Stewart MacDougall, of Edinburgh University, described the ravages of a small beetle, *Galerucella lineola,* that has done an immense amount of damage to the osier beds in the Midland and Eastern counties of England, and recommended arsenical sprays for its control.

Good lectures on Ants and their guests and enemies were delivered by Father Wasman, S.J., of Luxemburg, and Mr. H. S. K. Donisthorpe, of London, with lantern slides, showing the various domestic animals kept and used by the ants.

The highly interesting study of mimicry was dealt with by Prof. E. B. Poulton, of Oxford, who exhibited a large number of boxes of butterflies, all caught in one small patch of forest in Uganda, showing the common species which are distasteful to birds and other enemies, and the rarer species which, though belonging to a totally different group, and in no way related structurally, enjoy a relative immunity from attack by a very close resemblance to the distasteful forms. Dr. F. A. Dixey, Mr. Frederick Merrifield, and Dr. K. Jordan also spoke on the same subject.

Prof. Y. Sjostedt, of the Natural History Museum, of Stockholm, gave an account of the Swedish expedition of twelve months to Kilimandjaro and its prolific results.

Mr. J. N. Howlett, of Pusa, Bengal, described the difficulties of preserving collections of insects in the climate of India. Dr. Holland spoke on the preservation of type specimens, and Dr. Henry Skinner read a paper on One Hundred Years of Entomology in the United States, but ignoring the influence exerted upon it by the *Canadian Entomologist.* He referred to the steady and great growth of Economic Entomology during recent years and the very large sums appropriated by the Federal and State Governments for the control of injurious insects.

On the last afternoon a brief paper was read by Mr. Lyman, urging the importance of an authoritative pronouncement upon the correct use of such terms as type, co-type, etc., and of universal adhesion to such use and protesting against changes by some authors in the spelling of scientific names.

The number of adherents reported was 270, but the list of those reported as attending the Congress gave 141 names of gentlemen, many being eminent in the science, and 32 ladies accompanying delegates. And of all countries represented the British Empire had the largest number of delegates.

The representatives of the United States were Dr. Holland, Dr. Skinner and Mr. Osborn, while Mr. Lyman was the only representative from Canada.

At the last General Session on the morning of Friday, August 5th, the election of a Permanent Committee took place, and it was decided to hold the next Congress in the summer of 1912, and on the invitation of the gentlemen from Oxford that ancient seat of learning was selected as the next place of meeting, and Prof. Poulton was chosen President.

The Permanent Committee for the United States consists of P. P. Calvert, T. D. A. Cockerell, J. H. Comstock, H. C. Fall, C. P. Gillette, W. J. Holland, A. D. Hopkins, L. O. Howard, C. W. Johnson, V. L. Kellogg, H. Osborn, J. B. Smith, C. W. Stiles, C. Wellman, W. M. Wheeler, and for Canada C. J. S. Bethune, C. G. Hewitt, H. H. Lyman; while the Permanent Executive Committee consists of M. Burr, K. Jordan, W. Horn, P. Lesne, G. Severin and H. Skinner.

The conclusion of the Congress was celebrated by a grand banquet on Friday evening at the Taverne Royale, participated in by the ladies accompanying some of the delegates, when after the inner man (and woman) had been satisfied with the excellent repast served in the best style, many speeches were made and good fellowship prevailed. The gathering broke up before midnight, as all-day excur-

sions had been arranged for the next day, the majority going to Bruges and Ostend.

The concluding reception was the grand one given at the old and wonderful Hotel de Ville by the Burgomaster, Mons. Max, on Sunday evening, August 7th, when that magnificent building, so rich in beautiful architecture, tapestries, pictures, frescoes and bric-a-brac, was thrown open to the guests of the city. Thus, amid scenes of brilliance and splendour in this stately mediæval building, came to an end this First International Congress of Entomology, all looking forward with pleasure to the next meeting at Oxford in 1912.

ANNUAL REPORT OF THE MONTREAL BRANCH.

The thirty-seventh annual meeting of the Montreal Branch was held at 74 McTavish Street, on Saturday evening, May 14th.

Members present: Messrs. H. H. Lyman, in the chair; G. A. Southee, G. Chagnor, E. C. Barwick, Geo. A. Moore, A. E. Norris, W. G. Gerth, and A. F. Winn.

The minutes of the April meeting, and of the last annual meeting, were read and confirmed.

Mr. H. Earby was elected a member of the Branch.

The Secretary read the following

Report of the Council.

Nine meetings have been held during the season 1909-'10, the average attendance being a fraction over 9, which is an improvement on the previous year; but, considering that the population of Montreal is over 600,000, there should be more than a score of persons interested in Entomology. Three new names have been added to our roll, but three others have resigned.

Below is a list of the papers read (most of which were illustrated by specimens), and the discussions following them were of interest.

Annual Address of the President, Geo. A. Moore.
A Spring Outing, H. H. Lyman.
Lepidoptera taken at St. Hilaire, May 24th, 1909. A. F. Winn.
Notes on Coleoptera taken at St. Hilaire, May 24th, 1909, G. Chagnon.
Life History of Philometra metonalis, H. H. Lyman.
How can we increase the interest in our meetings? H. H. Lyman.
My Best Captures in 1909, G. Chagnon.
Occurrence of Ennomos subsignarius at Montreal, A. F. Winn.
Hemiptera taken at St. Hilaire, G. A. Moore.
Proposed List of Insects of the Province of Quebec. A. F. Winn.
Account of Annual Meeting and a Visit to Trenton, A. F. Winn.
On Panthea and Demas, H. H. Lyman.
A New Scolytid Enemy of White Spruce, J. M. Swaine.
The Winter Quarters of Doryphora clivicollis, A. F. Winn.
Our White Butterflies, A. F. Winn.
Calligrapha rowena, G. Chagnon.
Paonias astylus at Biddeford, Me., A. F. Winn.
The Berytidæ, or Stilt-bugs, G. A. Moore.
Random Notes on Lepidoptera, A. F. Winn.
An Hour at Montmorency, H. H. Lyman.
The Noctuidæ and how to Collect Them, I., A. F. Winn.
Butterfly Collecting in British Columbia (by John Russell, Hope, B.C.), read by A. F. Winn.
The Cydnidæ or Burrowing Bugs, G. A. Moore.
The North American Copper Butterflies, H. H. Lyman.

The annual outing at St. Hilaire, on Victoria Day, was well attended, but the backward season made the captures of insects much smaller than usual, but among the Coleoptera several good catches were made and the Lepidopterists had the pleasure of finding two specimens of a little Heliothid moth, probably undescribed, closely resembling *Heliaca nexilis* of the Rocky Mountains. No species of the genus have hitherto been recorded from the East.

At the January meeting we had the pleasure of a visit from Mr. F. H. Wolley Dod, of Millarville, Alberta, who gave an account of his visits to collectors of Noctuida throughout Canada. It was hoped that the Rev. Dr. Fyles would be able to attend our meeting this evening, but it could not be arranged.

The annual meeting of the parent Society at Guelph was attended by the President and the Secretary.

The report of the Treasurer shows a balance on hand of $76.79.

The Curator reports that the specimens in his charge are in good condition but that no additions have been made to the collection and that the members have made little use of either the specimens or the books. It is probable in connection with the preparation of the List of Insects of the Province of Quebec that a considerable number of specimens of the more neglected orders will be collected, determined and eventually find their way into our collection. The books added to the library consist of a copy of Pierce's "Genitalia of British Noctuidæ," the current volume of the *Canadian Entomologist,* and the entomological publications of N.Y. State.

Respectfully submitted on behalf of the Council.

(Signed) ALBERT F. WINN, *Sec.-Treas.*

Mr. Lyman then read his annual address, after which the election of officers for the ensuing year was proceeded with, and last year's officers were all re-elected, namely: Henry H. Lyman, President; G. A. Southee, Vice-President; A. F. Winn, Secretary-Treasurer; L. Gibb, Curator and Librarian; Members of Council—G. Chagnon, G. A. Moore, E. C. Barwick, F. Parkins, jr.

ANNUAL REPORT OF THE TORONTO BRANCH.

The 51st regular and 14th annual meeting of the Toronto Branch was held in the Biological Department of the University of Toronto, on June 9, 1910.

During the year eight meetings have been held with an average attendance of seven members. The place of meeting has been changed from the Normal School to the Biological Building, and library and collections have been moved.

The following papers were read:—

White Pine Weevil, Dr. E. M. Walker.
Structural Peculiarities of Galls, A. Cosens.
A Month at the Biological Station at Go Home Bay, J. B. Williams.
The Relation between Parasitism and Structure in Insects, Dr. Walker.
Wing Venation, Arthur Smith.
The Work of Scolytid Beetles in Queen's Park, Toronto, Dr. Walker.
The Oriental Moth, H. H. Lyman, of Montreal Branch.
A Hunt and What Came of It: Discovery of *Copidosoma Lymani*, H. H. Lyman, of Montreal Branch.
Some Types of Saw-flies, A. Cosens.
The Larch Saw-fly, Dr. Walker.

The following officers were elected for the next year:—

President—Dr. E. M. Walker; Vice-President, A. Cosens; Secretary-Treasurer, Arthur Smith; Librarian-Curator, J. B. Williams; Council—Messrs. Wood, Laing, Ivey, and Dr. Abbott.

The Treasurer's report shows a balance on hand of $0.20.

ARTHUR SMITH, *Secretary-Treasurer.*

REPORT OF THE LIBRARIAN.

During the year ending September 30th, 1910, eighteen bound volumes have been added to the Library, making the total number on the register 2,018: there are besides a number of volumes of periodicals in the hands of the bookbinder, which should have been ready for inclusion in this report. The Library continues to receive by exchange a large number of serial publications, bulletins, and pamphlets from many different countries and in a variety of languages, many being of great scientific value. A card catalogue of the bound volumes was made during the winter, but has not yet been finally completed for reference: to make it entirely useful it will be necessary to rearrange all the books in the Library on a definite system; it is hoped that this may be accomplished before very long.

Among recent additions may be mentioned the following works: Sir George Hampson's Catalogue of the Lepidoptera Phalænæ in the British Museum, volume viii.; Rothschild and Jordan's Revision of American Papilios; Needham's General Biology and Lefroy's Indian Insect Life.

The Library is constantly made use of by the senior students and members of the staff during the College year and is highly appreciated by them.

Respectfully submitted,

CHARLES J. S. BETHUNE, *Librarian.*

THE CURATOR'S REPORT.

The Society's collections have been carefully examined from time to time throughout the year and the necessary precautions taken against injury from museum pests or from other causes. Since the last annual meeting, 268 new specimens have been added. Of these 262 were contributed by Mr. John D. Evans, of Trenton, 134 belonging to the order Hymenoptera, and the remainder to the Hemiptera. As these orders are not at all fully represented in the Society's collections, Mr. Evans' gift is very valuable and will be much appreciated by the members. The remaining 6 specimens were contributed by the curator from insects of some economic importance not found in the collections.

Respectfully submitted,

L. CAESAR, *Curator.*

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

Rev. Thomas W. Fyles, D.C.L., Hull, Que.

I have the honour to present the following report from the Entomological Society of Ontario:—

This Society held its forty-sixth annual meeting in the Ontario Agricultural College, Guelph, on the 4th and 5th days of November last. There was a large attendance—members from Ottawa, Toronto, Montreal, Port Hope, Trenton, Grimsby and Guelph being present. Important subjects were brought before the meeting by the district directors and discussed: The destruction of cut-leaf birch trees by the Red-necked Borer; attempts to control the Tussock Moth; the extension of the San José Scale to Prince Edward County; the work of the Blackberry Saw-fly; that of the Spruce Gall-louse; the importation of Brown-tail Moth larvæ on French nursery stock; and other matters of interest to fruit-growers and foresters.

In the evening a public meeting was held in the Massey Hall auditorium, which was well filled with students of the College, both male and female, and a number of visitors from the town, together with members of the Society gathered in session. "Dr. C. Gordon Hewett, the newly-appointed Entomologist at the Experimental Farms of the Dominion, gave a highly interesting and instructive address, illustrated by a series of admirable lantern pictures, on 'House Flies and Their Allies.' The College orchestra added much to the enjoyment of the evening by the musical selections they rendered." (*Can. Ent.*, vol. xli., p. 429.)

In the forthcoming Annual Report of the Society, the papers read before the meeting will be found in full. The titles of them denote their interest to naturalists and to the agricultural community. They are:—

Observations on Insects of the Season, L. Caesar.
Injurious Insects of Ontario, C. J. S. Bethune.
Injurious Insects of Ottawa, A. Gibson.
Injurious Insects of Quebec, W. Lochhead.
The Origin and Diffusion of Entomological Errors, H. H. Lyman
Some Guests at the Banquet of Blossoms, F. J. A. Morris.
Nests of the Brown-tail Moth, A. Gibson.
Nursery Inspection Work in Ontario, R. C. Treherne.
House-flies and their Allies, C. G. Hewitt.
The Larch Saw-fly, C. G. Hewitt.
Conflicts between Two Species of Ants, G. E. Sanders.
Snowy White Linden Moth, A. F. Winn.
Adaptations of Insect Structure, T. W. Fyles.
The Life-history of Anisota virginiensis, T. W. Fyles.
The Acarina found in Ontario, T. D. Jarvis.
Notes on Fruit-tree Scolytids, J. M. Swaine.
Entomological Record for 1909, A. Gibson.
The Spruce Bud-Worm Tortrix, A. Gibson.
Memoir of Dr. Brodie, F. J. A. Morris.

The Report is illustrated with a portrait of the late Dr. Brodie and with five half-tone plates. There are also thirty-nine illustrations in the text.

The *Canadian Entomologist*, the monthly organ of the Society, maintains its well-earned reputation. From its mail list for last month it appears that the magazine is not only circulated in Canada, but is taken in the United States, in fourteen countries of Europe, in India, Japan, the Philippine Islands, Egypt, Cape Colony, Natal, Portuguese E. Africa, Australia, New Zealand, Tasmania, Brazil, the Argentine Republic, Uruguay, Hawaii, and in five of the West Indian Islands.

The volume for 1909, the forty-first volume, contains articles from seventy-three contributors. Amongst these are correspondents in Calcutta, Honolulu, Panama, and St. Petersburg. These facts show how widely the influence of the Society extends. In this volume no less than two hundred and twenty-eight newly discovered species of insects are brought into notice and named, together with fourteen sub-species and eight varieties. The following are the titles of some of the more important of the articles that appear in the volume:—

Preparation of Beetles for the Microscope, H. F. Wickham, Iowa City.
Lepidopterous Galls collected in the Vicinity of Toronto, Dr. Wm. Brodie.
Notes on Tenthredinoidea, with Description of New Species, S. A. Rohwer, Boulder, Colo.
New Histories and Species in Papaipema (Hydrœcia), Henry Bird, Rye, N.Y.
The Fruit-infesting Forms of the Dipterous Genus Rhagoletis, with One New Species, J. M. Aldrich, Moscow, Idaho.
Some North American Jassidæ, E. D. Ball, Logan, Utah.
On the Orthoptera of Northern Ontario, E. M. Walker, Toronto.
New Coleoptera from the South-West, H. C. Fall, Pasadena, Calif.
Some New Bees, and Other Notes, T. D. A. Cockerell, Boulder, Colo.
Some Curious Californian Leaf-hoppers, E. D. Ball, Logan, Utah.
The Hepialidæ, or Ghost-moths, Albert F. Winn, Westmount, Que.
Some New Species of N. A. Geometridæ, John A. Grossbeck, New Brunswick, N.J.
List of Siphonaptera of California, M. B. Mitzmain, San Francisco, Calif.
A Summer with Chrysophanus Dorcus, William W. Newcomb, M.D., Detroit, Mich.
New Geometrids of the Genus Hydriomena, L. W. Swett, Boston, Mass.
Notes on Pachybrachys, and Descriptions of New Species, Fred. C. Bowditch, Brookline, Mass.
Studies in the Caraboidea and Lamellicornia, Thomas L. Casey, Washington, D.C.
Some Recent Contributions to Hemipterology, J. R. De la Torre Bueno, White Plains, N.Y.
Coccidæ from the Society Islands. R. W. Doane and Evelyn Hadden, Stanford University, Calif.
New Pseudoscorpionida, Nathan Banks, East Falls, Church, Va.
Notes on the Larva and Pupa of Sthenopis thule, J. M. Swaine, Macdonald College, P.Q.
A New Genus and Some New Species of Tenthredinidæ, Alex. D. Macgillivray, Ithaca, N.Y.
Notes on the Preparatory Stages of Philometra metonalis, Henry H. Lyman, Montreal.
Synonymical and Descriptive Notes on North American Heteroptera, Edward P. Van Duzee, Buffalo, N.Y.
Notes on Lachnus caryæ, H. F. Wilson, U. S. Dept. Agr., Bureau of Entomology.
Hemiptera, Old and New, G. W. Kirkaldy, Honolulu, Hawaiian Islands.
Some Guests at the Banquet of Blossoms, F. J. A. Morris, Trinity College School, Port Hope, Ont.
Phylogeny of the Lithocolletid Group, Annette F. Braun, Univ. of Cincinnati, Ohio.
The Eupitheciæ of Eastern North America, George W. Taylor, Nanaimo, B.C.

The volume also contains obituary notices of Mr. G. W. Peck and Professor M. V. Slingerland, and a memoir of William Henry Edwards—all well-known entomologists.

Eleven plates and thirteen other illustrations add interest to the volume.

At the close of last year the Rev. C. J. S. Bethune, who had conducted the *Canadian Entomologist* for many years with great care and ability, found it necessary to retire from active editorial work, much to the concern of the members of the Society, who have highly appreciated his services. However, a worthy successor in the editorship of the magazine has been found in Dr. E. M. Walker, of the Biological Department of Toronto University.

Dr. Bethune has been appointed *editor emeritus* by the executive of the Society.

In the Society's library at Guelph there are more than two thousand bound volumes and a very large number of unbound publications, bulletins, proceedings of societies, etc.

The Society's cabinets contain a very complete collection of the Lepidoptera and Coleoptera of the Provinces of Ontario and Quebec and a good number of representatives of the other orders. In addition there are many very beautiful specimens of exotic Lepidoptera.

The Branch Associations connected with the Society are doing excellent work. They spread the knowledge of economic entomology to the great benefit of the farmers, horticulturists, and fruit-growers, in their several localities.

EVENING SESSION—THURSDAY, NOVEMBER 3RD, 1910.

A public meeting was held at 8 o'clock p.m. in the Massey Hall Auditorium, at which there was a good attendance of students and representatives of the College staff, as well as of members of the Society. The chair was taken by Mr. C. C. James, Deputy Minister of the Ontario Department of Agriculture. The proceedings were enlivened by some musical selections given by members of the College Philharmonic Society. After a few remarks by the Chairman congratulating the Society on reaching its forty-seventh annual meeting, and referring to the amount of good work that it has accomplished, he introduced the speaker of the evening, Professor James G. Needham, of Cornell University, Ithaca, N.Y., who occupies the chair of Limnology in the Department of Entomology. His subject was "The Role of Insects in Water-life," illustrated with many beautiful lantern pictures. The following is an abstract of his remarks:—

THE ROLE OF INSECTS IN WATER-LIFE.

PROF. JAMES G. NEEDHAM (*Abstract*).

Aquatic insects are not found in all the waters of the earth, but are mainly restricted to shoal parts of fresh water and to the shelter of rocks and vegetation. There are but few found inhabiting even the bottoms of our deeper lakes and streams, a few blood worms, caddis-worms and the burrowing nymphs of May-flies, and there is but one, *Corethra*, that is strictly free-swimming in habits and a constant denizen of the open water. Moreover, it is mainly the larval stages of insects that are aquatic; only these breathe by gills, and the larvæ are tied by parentage to the shores.

Alongshore, however, insects constitute a very important part of the submerged population, being present often in inconceivably vast numbers. Sometimes a species, like the great May-fly, *Hexagenia*, that is synchronous in its habits of transformation, comes forth in swarms that darken the air on a midsummer evening, but the vast majority of aquatic insects are not thus concerted in habits and give us no visible demonstration of their abundance. Yet they abound in all aquatic situations in shoal water. Some groups, like the stone-flies, are fitted for life in rapid waters only, but most of the larger groups, like the flies and the beetles and the dragon-flies, contain representatives expressly adapted to situations of the utmost diversity. The rapid-water forms are usually flattened and depressed in body for attachment to the surface of stones where the water glides over them. And, on the other hand, those in stagnant waters usually possess devices for protecting their delicate gills from the accumulation of sediment.

The collector who knows something about the habits of the insects he gathers alongshore is usually struck with the apparent preponderance of carnivorous forms. All of the dragon-flies and bugs, nearly all of the beetles and the larvæ of many flies, are of strictly carnivorous habits and are very much more in evidence than the herbivorous May-flies or midge larvæ or those algæ-feeding beetle larvæ of the family Haliplidæ that has recently been demonstrated to be herbivorous.

The lecturer then showed many lantern slides illustrating species of May-flies, beetle larvæ and caddis-worms that are being studied especially at the Biological Field Station of Cornell University. He discussed the varying reproductive capacity, length of life, food and shelter requirements of these species, and showed in conclusion the possibilities of artificial increase by rearing in pure cultures and the possibilities of conservation of the natural supply of these excellent items of fish food by providing proper shelter and by protecting the foraging grounds.

The Chairman, Mr. C. C. JAMES, expressed the pleasure that all present had derived from the address and the surprise that all shared in at the importance of aquatic insects as regards the provision of food for fishes. A vote of thanks to Prof. Needham was moved by President Creelman, seconded by Dr. C. Gordon Hewitt, and heartily adopted by the meeting.

SECOND DAY'S SESSION—FRIDAY, NOVEMBER 4TH, 1910.

The first portion of the morning was spent in the Society's part of the College Museum, and was devoted to an inspection of the extensive collections of Lepidoptera and Coleoptera and the specimens brought by the members. Among the various interesting examples presented may be mentioned a large collection of beetles captured upon foliage in illustration of Mr. F. J. A. Morris's paper; these specimens were beautifully mounted and carefully labelled. Prof. J. M. Swaine exhibited a series of specimens of Scolytid beetles and their work as wood-engravers and timber destroyers.

Dr. Hewitt exhibited a case containing the partial life-history of the Spruce Budworm (*Tortrix fumiferana*). This contained moths, larvæ, chrysalids, and several species of parasites, as well as drawings of the mature larva and end of twig showing the winter shelters of the young larvæ. In a separate case was exhibited the characteristic work of the caterpillars. Dr. Hewitt also placed on view a case containing the work of six different species of *Chermes* which had been donated to the Division of Entomology by Miss Edith M. Patch, of Orono, Maine, and specimens of the parasite, *Tropidopria conica,* reared from *Eristalis.*

Mr. Gibson exhibited a case containing rare Noctuids and Arctians. Among these were *Stretchia plusiiformis* and *Apantesis michabo* from Hymers, Ont.; *Momophara comstocki,* from McNab's Island, N.S.; *Sphinx perelegans,* from Wellington, B.C.; and a series of moths of the genus *Xylina* from the Ottawa district. An inflate of the mature larva of *Estigmene prima* was also shown, which had been reared from eggs obtained at Shawville, Que., by Mr. A. F. Winn.

The following were noted among the specimens exhibited by Mr. Lyman:—

Grapta gracilis, from the White Mountains.

Argynnis montinus, Chinobas semidea, Colias interior, Parchnobia wockei? and *Anarta schoenherri* from Mt. Washington.

Hepialus gracilis from the White Mountains.

Also the following from Hymers, Ont., received from Mr. Horace Dawson:—

A beautifully suffused specimen of *Argynnis atlantis.*

A curious completely suffused specimen of *Argynnis bellona.*

Phragmatobia assimilans, var. *franconia* Sloss.

Hyphoraia parthenos, the outer brown band on secondaries reduced to dots.

Graptolitha hemina. (This specimen was compared with Grote's type in the British Museum by Mr. Lyman and positively identified.)

Leucobrephos brephoides.

Cossus centerensis.

Cossus undosus?

Sthenopis argenteomaculatus.

Hepialus hyperboreus.

Dr. Walker exhibited a case containing the nymphs or larvæ of the following species of Canadian Aeshninae (a group of large dragon-flies): *Boyeria vinosa, B. grafiana, Basiaeschna janata, Nasiaeschna pentacantha, Anax junius, Aeshna juncea, eremita, interrupta (?), clepsydra, canadensis, palmata, umbrosa, constricta, californica and multicolor.* This includes all the known nymphs of North American species of Aeshna. He also showed an aberrant specimen of the butterfly *Charidryas nycteis* and the galls of three species of *Chermes* from black and white spruce in Ontario.

At eleven o'clock the election of officers for the year 1910-1911 was proceeded with and Dr. E. M. Walker was unanimously elected President and Dr. C. Gordon Hewitt Vice-President. The complete list is given on page 9.

The following resolution, moved by Mr. Henry H. Lyman and seconded by Mr. Arthur Gibson, was adopted:—

"That Past Presidents of the Society be invited to present to the Society framed photographs of themselves taken on a plate 10 by 8 inches with mat or border not over 3 inches wide, and that in the case of deceased Presidents the Council endeavour to have similar portraits prepared where photographs can be obtained for enlargement."

Professor J. M. Swaine, of Macdonald College, St. Anne de Belleville, P.Q., addressed the Society as follows:—

Mr. Chairman and gentlemen,—I have the honour this afternoon to represent officially the Quebec Society for the Protection of Plants. Two years ago, at a meeting at Macdonald College, we formed a society which we called The Quebec Society for the Protection of Plants from Insect Pests and Fungus Diseases. The name is rather long but it expresses very well our purpose. The Society receives financial assistance from the Quebec Government, and is thereby enabled to publish an annual report. Prof. Lochhead has been our President since the organization of the Society. We hold two meetings annually—a winter meeting, so far held at Macdonald College, at which papers are read, and business is transacted; and a summer meeting at La Trappe. This summer meeting lasts for two days and is devoted chiefly to collecting and discussions. La Trappe is an excellent collecting ground, and we have always a delightful outing among the beautiful orchards and vineyards and fine farms of those most hospitable gentlemen, the Trappist Fathers and Brothers.

Our members are few as yet, but we are ambitious, and hope to do something in the way of investigation and distribution among the Quebec farmers of a knowledge of the methods of controlling injurious fungi and insects which will justify our existence as a society.

I have then, sir, the privilege this afternoon of presenting to you and your Society the greetings and the good wishes of the Quebec Society for the Protection of Plants.

BEETLES FOUND ABOUT FOLIAGE.

F. J. A. Morris, Trinity College School, Port Hope.

During my five years or more of collecting, I have captured, on and about foliage, species belonging to eight or ten of the great families of beetles. Some of these have been merely incidental and I know of nothing in their habits to connect them with the tree or herbaceous plant on which I found them. For instance, there is a species of Lagriid, a family closely related to the Tenebrionidæ or Darkling Beetles, which I have often taken on foliage—*Arthromacra ænea*; usually the beetle is found feeding in blossoms of the dogwood, occasionally on the foliage of that shrub, but quite often I have seen it on the leaves of the May-apple (*Podophyllum peltatum*), the New Jersey Tea (*Ceanothus americanus*), and the Sweet Fern (*Comptonia asplenifolia*); it appears to have a special fondness for this last shrub and on bright, hot days of July is often abundant in patches of Sweet Fern.

So far as I know it does not eat the leaves, but contrary to the general habit of the Tenebrionids it certainly courts bright sunshine. There is an allied genus in Great Britain (*Lagria hirta*) said to be found on blossoms and in hedges, which even in the larval stage is remarkable for its habit of wandering openly about foliage. Most of the Tenebrionid larvæ feed obscurely on vegetable matter, preferably in a dry condition; probably the best known, in domestic economy, is *Tenebrio molitor*, the famous meal-worm, which I have occasionally had served to me at breakfast in a plate of porridge.

There are three families of beetle in particular, many of whose members are extremely fond of sunshine. The Elaters or Click Beetles, their next of kin, the Buprestids or Metallic Wood-borers, and the Cerambycidæ or Long-horns.

I have often captured some of the smaller species of Elaters, chiefly of the genus Corymbites, resting on the upper side of leaves, apparently indulging in the luxury of a sun-bath. Early in May two seasons ago I took a magnificent specimen of *Buprestis striata* basking on the tip of a branch of white pine, and in August of the same year I saw darting about in the mid-day heat and settling from time to time on the foliage of a spruce the gorgeous little Buprestid, *Chrysobothris harrisii*. This dazzling vision in peacock blue was vouchsafed to me for a moment only and then withdrawn, but in my mind's eye I have been "following the gleam" ever since. Altogether that proved a red-letter day in my calendar, for I captured on the trunk of a newly-felled balsam fir at the same spot my sole specimen of *Monohammus marmorator*.

A great many of the Cerambycidæ or Long-horns are fond of this sun-basking: and I have made occasional captures on foliage of species that usually seek the shade: once a specimen of *Callidium antennatum* on a blade of grass by the road-side, and once a fine specimen of *Calloides nobilis* on a stalk of sedge by the rail-way track. But of those that are active by day, many of them feeding in blossoms, I have found many species on leaves, especially of the two tribes *Clytini* and *Lepturini;* in one or two cases, the insect seems to prefer one foliage to all others and perhaps such captures ought not to be regarded as merely incidental: for instance, I have found *Clytanthus ruricola* show a decided preference for the leaves of the thimbleberry, though it does not often feed in the blossom of this plant.

The capture I look back upon with greatest pride was that of a small specimen of *Eupogonius subarmatus* in my first season of collecting. I was going through a belt of basswood on the look out for various things, but chiefly "Walking Sticks" and the larvæ of *Chrysomela scalaris*: by "Walking Sticks" I mean the

Phasmid, *Diapheromera femorata,* an Orthopterous insect next of kin to the Praying Mantids; it occurred not infrequently that season about the Rideau on basswood; still more abundant on basswood leaves were the larvæ of *Chrysomela scalaris,* and I was rearing some in captivity. While scanning the underside of the foliage just above my head I noticed a leaf through which the sunlight passed imperfectly; there was a small opaque area near the centre, in short, something rather smaller than a house fly was casting its shadow on the upper surface. I drew the leaf cautiously down and surprised a diminutive longicorn sunning itself in the middle of the leaf; unfortunately, I surprised it in more senses than one, for, in response to a stimulus of self-preservation, it instantly collapsed and, tumbling down the leaf in a series of somersaults, like the clown in a pantomime, disappeared from the stage. For nearly half an hour I hunted among the *débris* at my feet and at last discovered the little harlequin playing 'possum under a twig.

At first I took this beetle for *Amphionycha flammata,* to which superficially it bears an extraordinary resemblance; but I found the ungues or claws (which are divaricate) simple instead of cleft; as they are distinctly cleft in *Amphionycha,* the foot appearing to end in four minute claws, it became certain my capture was *Eupogonius subarmatus.*

Another form of incidental capture is where beetles of a carnivorous habit resort to foliage in search of food. I have once taken *Calosoma scrutator,* and several times *Calosoma calidum* on the foliage of the white pine; these enterprising ground beetles poaching on the arboreal preserves for caterpillars; many of the diurnal fireflies, which are carnivorous, may be found resorting to foliage for the same purpose, and the *Coccinellidæ* or Lady-birds are regularly so taken. One July I found two or three species of Lady-bird resorting in large numbers to an asparagus bed where they were doing yeoman service in devouring larvæ as they fed on the foliage; on the *menu* of their banquet if not the *pièce de résistance* was *Crioceris asparagi,* and they were feasting royally.

Passing from incidental captures to those where the insect was found on its food-plant, I shall begin with an insect I saw in July three years ago which did not devour the leaves, but using its jaws as a pair of scissors, cut them and rolled them up into cylinders. I mean the weevil, *Attelabus analis,* the oakleaf roller.

I was examining the leaves of various plants, herbaceous and woody, along the railway track some 12 miles north of Port Hope—especially willow shrubs and oak-seedlings whose foliage was lush and tender, the leaves being, many of them, still pink and soft—when I noticed a curculio with black head and snout, the thorax and elytra of a shining chestnut red. I recognized it from having seen cabinet specimens as one of the oak-leaf rollers, and on diligent search I found it fairly abundant and always on young leaves, which no doubt proved more pliable and easily worked by this ingenious little artificer. It was not easy to see much work done, as the beetle is easily alarmed and drops from the leaf if approached too closely. I was able in one case, however, to watch the actual process of rolling and in another some of the preliminary work of cutting. Observations published in an American journal of entomology go to prove that though the act is instinctive and involves neither practice nor imitation, it is not absolutely perfect; leaves have been found cut in more than one place and then abandoned as unsatisfactory.

There is a very interesting account of a British leaf-roller (*Rhynchites betulæ*) given by Sharpe in the Cambridge Natural History. The female beetle goes to the margin of the leaf—at the base, but some way out from the stalk—and cuts through the leaf from the margin to the mid-rib somewhat in the shape of an upright letter S; it then crosses the mid-rib and cuts through the other half

of the leaf to the margin somewhat in the shape of a prostrate letter S. The beetle then returns to the margin where it began cutting and, much as a grocer makes a paper funnel for sugar, rolls the edge over round an ideal axis till it brings it to the mid-rib; here it holds the funnel in position with the legs of one side while, with the other three, it draws the further side of the leaf towards it and wraps it around the part of the funnel already formed. When it finds the material stiff to work with it bites the surface of the leaf with its mandibles or pushes it into position with its feet, adjusting means to ends like a sailor at work in the shrouds furling canvas. It then enters the funnel, bites two or three small pits into the leaf, deposits an egg in each and then emerging completes the funnel by folding over and tucking in the tip of the leaf.

Mr. Sharpe, in comment, points out that the insect has never seen a funnel in its life and yet manages to make one perfectly the very first time of trying. But the author's perplexity is partly due to his confusing a purely instinctive act with an act of intelligence (*vide* the Peckhams' book on Wasps). How can an insect be a highly-skilled engineer, working with mathematical accuracy and on a scientific plan? It is an insoluble problem if you try to state your answer in terms of intelligence and individual consciousness. But place it among impulsive acts, involuntary and more or less mechanical, common to all members of the species, and you can give a fairly satisfactory explanation in terms of instinct.

Among insects especially are found instincts whose perfection is simply diabolical, often involving a highly complex series of acts performed but once in the whole life-time of the individual and therefore admitting of neither practice nor imitation. To look upon such acts as the result of conscious intelligence is absurd; the intellect has no place here and would be simply a meddler, likely to bungle and make a botch of the artificer's work. On the other hand a whole-hearted Darwinian like Weismann has no difficulty in applying his great principle of selection to such an act and seeing in it one more beautiful illustration of how all things living in the world, whether flora or fauna, are adapted to their environment.

As I have begun with one of the weevils, which come at the end of the Coleoptera in classification, I shall pass to a family not far removed from the weevils, the Blister Beetles (*Meloidæ*), many of which in the mature state occur abundantly on foliage and are very destructive. Four species of the genus *Epicauta* are known in Ontario; some of them occasionally attack the leaves of the potato, but more usually they feed harmlessly on flowers like golden rod and helianthus or the low herbage by river banks. I have not seen any of this genus and think it uncommon east of Toronto, or at least in the neighborhood of Port Hope. One species of an allied genus (*Macrobasis unicolor*), which also attacks the potato, I have found in great abundance about Port Sydney in low grounds feeding and breeding on the foliage of meadow-rue. The family consists of two tribes, *Cantharidae* and *Meloidae;* the former all have power of flight and are frequently found about foliage or flowers; in the latter the wings are abortive or entirely absent, and the beetle's most daring excursion into the realm of air consists in crawling up a grass-blade or the stem of some herbaceous plant. One or two species of *Meloe* or Oil-beetle are frequently found early in the spring and late in the summer, but the insect does not appear to eat foliage. Both tribes of this family are famous for their possession of a principle known as cantharidine, whence they are called Blister beetles, some of the species being of great medicinal value.

A more remarkable feature about them which they share with some of their neighbours, the *Mordellidæ*, is the phenomenon of hyper-metamorphosis. They

are all parasitic in the larval stage, their hosts being usually bees, occasionally wasps and (in the case of *Epicauta*) locusts. The normal form of the larva is preceded by a very active louse-like insect known as a triungulin (each leg terminating in a triple set of hooks). The larva that succeeds the triungulin is inactive and almost legless; moreover, in some cases the true pupa is preceded by a sort of preliminary pupal form from which emerges a larva of habit almost as active as the original triungulin, though it does not feed.

The triungulin is a monomaniac; I mean a creature of but one idea, one single goal of ambition, and its six active legs enable it to get there. The loadstone that draws the triungulin like a steel-filing to a magnet is the egg of its host. In the case of *Epicauta vittata* this is the egg cluster of a locust, and the parent beetle takes the precaution of laying its eggs near where the locust has hidden its egg-batches in the ground. Among the Cantharids whose host is a genus of bee (*Anthophora*), the beetle oviposits near the bees' nest, but in order that the triungulin may reach the egg of the bee, it has to be carried into the nest by a queen bee; its instinct impels it to seize the first hairy object within reach. This frequently proves to be the leg of a drone and in some cases the triungulin manages to transfer itself to the leg of a queen bee during the nuptial flight and so reaches its goal, the egg-cell in the hive. But hundreds of triungulins must perish from seizing a wrong object, and in order to compensate for this, selection has enormously increased the fertility of the female beetle, which lays as many as 2,000 eggs. In the *Meloe* or Oil-beetle the instinct is even more imperfect; the beetle does not lay her eggs near the home of the host and the triungulin mounts to the top of grass stems or enters a blossom and waits there for a hair (any hair will do); this more often than not proves to be growing on the leg of a fly, or if a bee, the wrong kind, and thousands of the triungulins, instinctively seizing the first hairy object that offers, are carried into space to perish miserably. All that saves the *Meloe* from utter extinction is the stupendous fecundity of the female, the clutch of eggs laid by this Apteryx among insects producing a brood of no fewer than 10,000 triungulin chicks.

Apart from the great Phytophagous group of beetles, easily the best known family of leaf-eaters is the Scarabæids. One section of this family consists of scavengers pure and simple, the larva being nourished in manure or rotting wood, and the female laying her eggs in such material. But an important branch of the family is phytophagous, the larvæ feeding on living vegetable matter, usually the roots of grasses and herbaceous plants, and the mature insects often feeding voraciously on leaves of trees or soft vegetable tissue.

In this family of beetles, structurally so different from the Phytophagous Beetles, strictly so called, it is interesting to note how far one group has diverged from another in response to conditions entailed by their chosen food material. Among the *Coprini* you find the larval stage completed in a few weeks or at most months, while the life of the mature beetle (as in Scarabæus) extends over a period of two or three years. Among the *Melolonthini* almost the converse obtains; the larva takes two, three or even five years to mature, and the beetle, after emerging from the ground, lives for only a week or two.

In Ontario the most familiar of these phytophagous scarabs are the leaf-chafers popularly known as June bugs. After three years passed in subterranean obscurity the beetles emerge, often in vast quantities; they are inactive during the day and remain hidden in the grass at the foot of trees or on the foliage itself, but at dusk they rouse up from their lairs and fly about among the trees in irregular flight, noisy and blundering; before midnight their activity on the wing ceases.

The life of the individual beetle after emerging from the ground lasts little more than a week or two, and you would naturally expect its chief concern to be the perpetuation of its kind.

But often Melolonthinus, like Launcelot Gobbo, is a huge feeder, sometimes entirely stripping fruit trees and ornamental shade trees of their foliage. There are one or two genera in this group containing species a good deal smaller than *Lachnosterna,* the true June bug, which are also very destructive in some parts and seasons. The Rose-chafer (*Macrodactylus subspinosus*), not content with eating the buds and petals of rose blossoms, frequently attacks the grape-vine and the foliage of various fruit trees; it is also sometimes a pest on young corn; it does not seem so far to have made its way east of Toronto in any serious numbers.

A closely allied genus is the *Dichelonycha,* one species of which (*D. elongata*) I have often seen eating the foliage of basswood. Three seasons ago it was very abundant in the woods near Port Hope, and responsible for a good deal of damage done in July to the foliage of forest trees; it shows a decided preference for basswood, eating its foliage more readily and more rapidly than other leaves, though I have found it on hawthorn and on maple.

Another genus, that of *Hoplia* (*trifasciata*), occurs often on hawthorn leaves, but it is almost entirely a pollen-feeder like *Trichius piger* and *Euphoria inda. Hoplia,* which occurs often on choke cherry, early elder and hawthorn, the males appearing at the beginning of May and the females a fortnight later, disappears at the beginning of June. Another species of *Euphoria,* a beautiful beetle, called *E. fulgida,* I suspect of eating forest leaves; I have picked it up several times under trees in open rocky hardwoods on the north shore of the Rideau.

Among Scarabs that frequent foliage are also two species very destructive in the tribe *Rutelini,* large handsome beetles—*Pelidnota punctata,* found on grape-vines, and *Cotalpa lanigera,* chiefly on pear trees, but occasionally on elm, poplar and oak. I have never found this beetle, but the *Pelidnota* has been taken occasionally in the neighbourhood, usually on the cultivated grape-vine, but once or twice on wild vines, some miles north of the town; it does not appear to be at all frequent east of Toronto.

I mentioned at the outset of my paper the Buprestids as a family peculiarly fond of basking in the sun. There are two genera of Buprestid that eat leaves, *Agrilus* and *Brachys.* The first of these is a long, narrow beetle, taken occasionally on the leaves of basswood, but more common on the foliage of raspberries. The larva bores in the stem of the raspberry. A curious feature about the Agrilus is that in appearance and shape, as well as in some of its movements for escape or to elude observation, it closely resembles the longicorn beetle Oberea; moreover, the habits and life-history of the two beetles are almost identical; they both lay their eggs in raspberry stems, where the larva bores and feeds, and they both in maturity resort to the leaves of the plant as a resting place and occasionally for food.

The genus *Brachys* is a short form of beetle, almost as broad as it is long, the species I have most commonly found being *Brachys ærosa;* it is not uncommon on basswood and two or three other forest leaves, but I have usually found it feeding on the foliage of a hazel (*Corylus rostrata*), where it is sometimes abundant. It is stated in Sharpe's article on insects in the Cambridge Natural History that some of the smaller kinds of Buprestid have been discovered to feed on the parenchyma of leaves. I know nothing about the larval habit of *Brachys,* but arguing on analogy from *Agrilus,* I would hazard the guess that the larva is a leaf miner on hazel or other forest leaves.

In drawing a parallel between *Agrilus* and *Oberea* I referred to both form and habit. The form of *Brachys,* short and broad and somewhat flat, suggests the form of *Odontota,* a leaf-miner among the *Chrysomelians;* in habit, since the mature beetle of *Agrilus* responds to the same food-stimulus as its larva, the eating of hazel and other leaves by the *Brachys* beetle may mean that the larva mines in such leaves. (*Vide* Can. Ent., 1887, xix, 159.)

I have found a great many instances among the Coleoptera where the mature insect seems to be affected in a greater or less degree by the same stimulus as the larva. Perhaps the sight of the larva's food-plant strikes on some happy chord of childish recollection in the mature beetle.

To the student of animal instinct it is no doubt far more wonderful that an insect in its comparatively short life should at different stages respond to two quite distinct food-stimuli. The syrphus fly (*Eristalis tenax*), whose larva feeds in liquid manure, is at maturity a honey-sucking haunter of blossoms; in extreme cases, like that of the parasitic oil-beetles, as many as three distinct food-stimuli occur in the life of the individual.

But in my rambles through the realm of Coleoptera, it is the opposite phenomenon which has struck me most. I mean the number of beetles that are attracted to the food of their larva. I have noticed this especially among the Cerambycidæ. In many of them the smell of fermenting sap (where a tree is newly felled or has been injured by the lopping of branches or the mutilation of bark) seems to act as a direct and powerful stimulus in liberating the instinct of reproduction. This is specially noticeable in the Monohammi. In others, again, where perhaps the smell of sap has first drawn the insects to the tree for breeding purposes, the sight of the foliage seems to impel the beetles to eat the leaves. This is particularly the case in some genera that approach most nearly to the Chrysomelians. We have a familiar illustration of it in *Tetraopes,* the Milkweed beetle, whose larva feeds in the stem of the plant while the beetle resorts in large numbers to the leaves, on which it feeds freely as well as breeding. Less conspicuous examples of the same phenomenon are the *Oberea,* and still more the *Saperda.* I have several times captured *Saperda vestita* feeding on the sheaf of leafy twigs surrounding the basswood stumps, under whose bark the eggs are laid. I have found *Saperda moesta* eating the leaves of the poplar, where its larva develops, and on a single willow I once counted over 200 specimens of *Saperda concolor* breeding on the leaves and eating the foliage with evident relish.

These last few paragraphs have brought me right into the great group of Phytophagous beetles, properly so called; whose larvæ, without exception, find support on living vegetable tissue. They comprise three families, the Bruchids which devour seeds, the Cerambycids which attack the woody tissue of trees and shrubs, and the Chrysomelids which feed at all stages on foliage and the more succulent parts of vegetation.

The Bruchids form only a small group, and the genus *Bruchus* is the only one of much importance; besides the Pea and Bean Weevils (so called), the only species I have found at all abundant is a minute insect, *Bruchus discoideus,* sometimes plentiful in the blossoms of the white convolvulus or Morning Glory.

The Cerambycids appear to have been in their origin scavengers, rarely attacking sound wood; but the larvæ of many of them, before reaching full growth, eat right into solid timber; while others appear to eke out their existence by draining the afflux of sap to the part they have wounded; yet others again have deserted the forest tree that formed their ancestral home and taken up their abode in the fruit trees of our orchards. The larvæ develop slowly, and must greatly reduce

the vitality of the tree they infest. They are exceedingly tenacious of life, and many instances are on record to show that the larval stage is capable of enormous extension.

The imago of *Monohammus* has been known to emerge from chairs and tables years after the manufacture of the furniture. Mr. C. O. Waterhouse, an English naturalist, heard one of these larvæ at work in a boot-tree (an implement for stretching top boots), which he had in his possession for 14 years; he then presented the implement to the Natural History Museum at Kensington, where for 6 or 7 years longer the larva continued to saw wood. The entire absence of sap had, of course, arrested the development of the larva, and it was unable to complete its transformation. Sereno Watson, the American botanist, relates another case (Packard, U. S. Ent. Comm., 1890, p. 689) that seems to prove the life of one longicorn to have lasted 45 years. When you add to this tenacity of life the larval obscurity which makes even detection difficult, it will be seen how serious a pest the longicorns may and often do become.

The Chrysomelians, on the other hand, live openly on foliage, which they devour as beetles no less than as larvæ. The larval stage is short, and the insect, as a rule, helpless and easily destroyed. They more than compensate, however, for their exposure to attack by their rapid breeding, many genera producing two broods every season. There are 11 tribes of the family in boreal America, all of them represented in Ontario. But the great bulk of our Chrysomelidæ belong to the four consecutive tribes—*Cryptocephalini, Eumolpini, Chrysomelini* and *Galerucini;* the last of these is far the greatest, and contains more genera and almost as many species as the other three combined. Together these four tribes contain more than two-thirds of the entire genera and species in the family.

As, geologically, the woody fibred vegetation preceded the leafy and succulent plants, it is probable that the Cerambycidæ attained their greatest development far earlier than the Chrysomelidæ. But the two families are undoubtedly closely akin, and the Donacias may be regarded both in form and in habit as in many respects intermediate between some of the less highly specialised genera of Cerambycids and the Chrysomelids.

THE POOL.

Rev. Thomas W. Fyles, D.C.L., Hull, Que.

Within an easy distance of my present place of abode there is, in the landscape, an abrupt descent, clothed with forest trees, and extending for a considerable distance.

Such a descent would have been called in England, in the olden times, a "hanger."

In that delightful book, "White's Natural History of Selbourne," such a hanger is described; and the word itself is found in the names of places, such as Oakhanger, Westonhanger, etc.

It may be that the appellation is an Anglicised form of the Norman French *hangar,* a shed—a word common in Quebec Province, but almost obsolete in England. Thackeray, however, makes use of it in his "Life of Henry Esmond."*

At a spot under the elevation I have in mind, the Trenton limestone of the

*"Mademoiselle, may we take your coach to town? I saw it in the hangar, and this poor Marquis must be dropping with sleep."—*The Hist. of Henry Esmond.* Bk. III., Ch. 13.

district crops out, around a hollow some yards across and always containing water. A projecting slab on the edge of the pool affords me a welcome place of rest. When I am seated upon it, my attention is naturally drawn to the creatures inhabiting the limpid water at my feet. I have found them a numerous and interesting assembly.

One day, early in June, I noticed a number of Newts (specimens of *Diemyctylus viridescens*), asprawl, and motionless on the bottom of the pool. Presently a small fly, either by accident or design, touched the water: immediately one of the newts, that had seemed so inert, rose to the surface and swallowed it. The propelling guiding powers of the newt were in its tail. A few undulations of this, and the creature ascended directly to its mark—its feet hanging motionless by its sides.

I much desired to examine the newt more closely; but how was I to secure it without injuring it? I called to mind that when I was a boy in England, I made a visit to friends in Surrey; and my young companions there took me to a pond to shew me how to catch "effets"—those formidable, saw-backed creatures that bear the name of *Triton cristatus*.

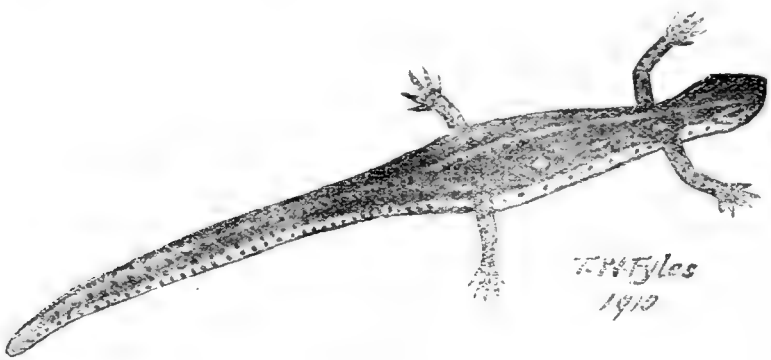

Fig. 1 *Diemyctylus viridescens*. Natural size.

My friends took with them a stick, a piece of string, and some worms. On reaching the pond they fastened one end of the string to the stick, and tied a worm by the middle to the other, and then dangled the bait before the eyes of a Triton. The little reptile seized it with the greatest avidity; and, so tenacious was its hold, that it allowed itself to be lifted from the water, and landed on the bank, without relaxing it.

I tried this plan with my newt; but it was a failure—the creature would not bite. It wriggled away. But a handsome Leopard Frog—cream-breasted, green-coated, and adorned with jet-black markings—which was sitting near with its head out of water—could not resist the lure, but swallowed it incontinently. I tightened the line to see if the frog would allow itself to be drawn from the water. It sat, as Mark Twain's "Jumping Frog" sat, after the shot had been poured into it; but it let the worm come from its maw with a slobbering gasp.

It may have been imagination, but I thought that a look of astonished disgust passed over the visage of the frog.

While I was considering how to secure a specimen of the newt, a mosquito lit upon my knee, and proceeded to present its little bill; but I brought a weighty argument to bear upon it, and put it out of occupation. I pitched its remains

upon the water, expecting to see a newt rise to them; but instantly a hungry Water Strider (*Hygrotrechus remigis*, Say) seized them and glided away. At the same instant another newt rose to a fly. I had my Entomological net in my hand, and, on the impulse of the moment, I slid it into the water and caught the reptile.

What a beautiful little creature it was! Its back and sides were olive green; its under parts chrome yellow; and it was dotted all over, down to its toes, with jet black spots. In a row, on either side of its body, were some oval spots, crimson-lake in colour, and each inclosed by a black ring. Its tail, set edgeways, was broad and thin, and as long as its body. It moved with easy grace. I took the little creature home with me, made a drawing of it, and then carried it back to its companions in the pool.

The newts all disappeared at the end of July.

The Water Strider deserves our attention. It is a wonderful object. It stands and moves *upon* the water: its body does not touch the surface. Do you want a proof of this? It is before us. Notice on the rocky bottom of the pool, the little cluster of six black spots, that moves as the insect moves above. It is a group of shadows from the creature's feet. There is no shadow from its body—the light passing under it and the sheen on the water cut off that—but the feet, being in actual contact with the surface, cast their shadows below.

How can the Strider stand and walk upon the water? The length of its limbs, and the adjustment of its weight, enable it to do so.

A needle dropped lightly on still water will float; but a shot of the same weight will sink instantly.

If you place the living Strider upon water in a basin, it will at first dash about wildy, for it is possessed of an excess of energy; but, if you remain motionless, it will soon quiet down; and then, strange to say, you will easily perceive that at each foot the water is slightly depressed—the surface is not broken but bent in. The long legs of the insect stretch out like rays, and its body is suspended between them, distributing its weight to six points. It weighs barely one grain—I have had it carefully weighed by a chemist's scales—so one-sixth of a grain only impinges at one point upon the water (or one-fourth, when the insect is employing its front legs against its prey), but this is sufficient to cause a slight depression.

The dimensions of the Strider are as follows:—Length of body, 15 millimetres; breadth, at widest part, 5mm.; thickness, at thickest part, 3mm.; length of antennæ, 6mm.; length of proboscis, 3mm.

Front Legs: Length of femur, 5mm.; length of tibia, 3½mm.; length of tarsus, 2mm.

Middle Legs: Length of femur, 10mm.; length of tibia, 8mm.; length of tarsus, 4mm.

Hindmost Legs: Length of femur, 8mm.; length of tibia, 6mm.; length of tarsus, 2½mm.

These further particulars may be interesting:—The legs are densely clothed with short bristles—these, stretching backwards, must aid the creature's movements. The tarsi are two-jointed, and terminated with sharp claws. The antennæ have four long joints (that next the head being the longest), and a ring-joint between the second and third. The eyes are jet black, closely reticulated, and so prominent that they seem to be starting out of their sockets. The front legs are much stouter than the others and are formed for clasping—they are weapons of offence. The body beneath has the appearance of fine glossy leather.

The Striders are cannibals. I saw one of them leap upon a smaller relative,

grapple fiercely with it, clasp it tightly to its chest, and then drive its proboscis into its body—the victim soon succumbed.

While sitting by the pool I learned, with other facts, that wasps resort to the water to drink. I do not think that this should occasion surprise, for the mastication of wood pulp. for the construction of their nests, must be thirsty work for the wasps.

At the edge of the pool some broken pieces of rock had fallen in, and a little water found its way between them. I saw a specimen of *Vespa diabolica,* Sauss, alight on the edge, walk down to the water, take a drink, and then fly away. Soon a second came to the same spot, and did likewise. Then there was a flash of brighter yellow; and a very bustling object came on the scene, and took the same course. I caught this insect to make sure of its identity—it was *Vespa germanica,* Fabricius. Soon afterwards a fourth insect, a specimen of *Polistes pallipes,* St. Farg., came to the same place for refreshment. No doubt all these wasps had nests not far away, and that this drinking-place was one of common resort for them.

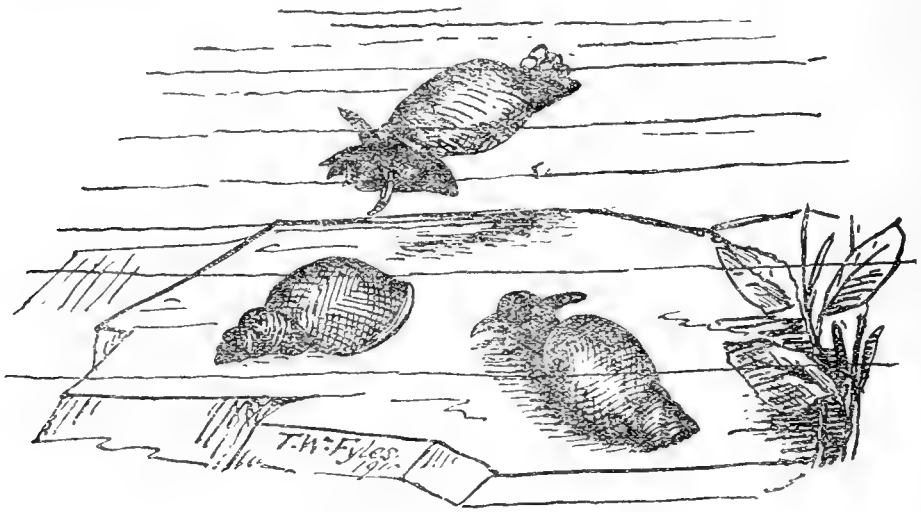

Fig. 2. Water Snails.

Another species of the wasp that frequented the pool was the Mud Wasp, *Pelopæus cementarius,* Drury. It came to gather material for the construction of its—we may well say—*orphanages.* These are built of mud, in snug nooks of houses, or other buildings. They consist of cells—each of about the capacity of a pea-nut—closely packed in masses which are smoothed on the outside. Before closing up a cell, the mother wasp fills it with spiders paralyzed by its sting, and drops a solitary egg amongst them. The mud castle contains no chamber for its builder—she soon dies.

Clinging to the rocky sides and bottom of the pool, I found a number of Water Snails, belonging to the genus Limnæa. Their shells appeared larger than those of *Limnæa palustris,* and not so large as those of *Limnæa stagnalis.* The snail itself was an ungainly object, dull black in colour, and with flat horns, the shape of brush-scythes. These probably aid the creature to steer its course in the water, when it loses its foothold.

Of Water Beetles three kinds were to be seen in the pool, viz.:—*Colymbetes sculptilis,* Harris, *Dytiscus fasciventris,* Say, and *Acilius fraternus,* Harris. *Gyri-*

nus borealis, Aubé, which was very abundant in a neighbouring stream, was not to be seen in the pool.

On one of my last visits to the pool, I drew from the bottom of it a broken limb of a tree that had lain there, water-logged, for the whole season. Attached to the under surface of this piece of wood, I found a strip of some kind of spawn. It was three-quarters of an inch long and about three-sixteenths of an inch thick, and so firm that I was able to loosen it from the wood without damaging it. It was translucent, and I counted in it sixty minute eggs. I placed it in water, and shifted it to fresh water frequently. The jelly-like matter surrounding the eggs, whether designed to nourish or protect them, gradually dissolved, and the eggs became free. At this stage the embryo, curled round within the egg, could be easily seen with the naked eye. The eggs began to hatch in the beginning of the present month (November). This is a description of the larvæ in their first stage:—

Length, two millimetres. Translucent and colourless throughout—except that the tips of the mandibles were ochreous and the eyes were small brown dots. The head was large in proportion to the body. The antennæ were straight and tapering. The thoracic segments were slender, and angulated where the limbs were attached. The femora—especially of the hindmost pair of legs—were remarkably large. The segments of the somewhat enlarged and flask-shaped abdomen could be easily counted. At the end of the body were two respiratory tubes.

Were these the larvæ of *Dytiscus fasciventris,* Say?

On August 3rd an American Bittern (*Botaurus lengtiginosus*) flew up as I approached the pool. I think the bird was merely a passing visitor, for, in my frequent walks around the spot, I did not see it again.*

One day in September, while occupying my favourite seat by the pool, I became aware of a dozen heads protruding from the water, and a dozen pairs of eyes fixed intently upon me. The position struck me as ludicrous, and I laughed aloud. Immediately a dozen pairs of heels turned up with a splash, and my interviewers disappeared. In less than five minutes they showed themselves again, and resumed their watchful gaze, as much as to say, "What will you do next?" They were half-grown Leopard Frogs.

I made the acquaintance of these creatures early in May, when they were dirty-brown tadpoles, about the size of our hazel nuts, and possessing long tails. They developed hind-legs in the beginning of July, and, before the end of that month, had absorbed their tails, and become possessed of fore-legs.

About the time of their metamorphosis, the full-grown frogs disappeared from the pool: they were gone probably in search of land adventures; for their kind were plentiful in the low-lying meadows near.

Not the least interesting of the frequenters of the pool were the Dragon-flies.

The first of these to attract my attention was *Tetragoneura canis,* MacLachlan. I had not met with it previously, and am indebted to Dr. E. M. Walker for its identification. The following is a brief description of it:—

Tetragoneura canis, MacLachlan: Length of body 1⅝ inches; expanse of wings, 2 3-8 inches. Colour brown. Face and thorax hairy, with a white gloss. On either side of each segment of the abdomen there is a clay-yellow patch. Abdomen somewhat spatulate, widest in the middle, tapering towards the end. Venation of wings pale brownish red. Stigmata dark brown. At the base of the secondaries are some small brown blotches.

*On the 10th of June, 1904, I found a Bittern's nest containing three eggs, at the "Gomin," near Quebec. It was merely a depression in the herbage. The eggs were 1 7-8 inches long and 1 7-16 inches broad, of a pure oval, and fawn-coloured.

In the course of the season the pool was visited by representatives of the five species undermentioned:—

Basiæschna janata, Say.
Libellula quadrimaculata, Linneus.
Libellula pulchella, Drury.
Plathemis trimaculata, De Geer.
Æshna umbrosa, E. M. Walker.

The last named was a particularly brilliant object. It was seemingly set with jewels. It flashed in the sunshine with the glories of emerald, sapphire, and topaz. It hovered over the pool, as a kestrel hovers over an English meadow.

The whole scene in the bright autumn days was very lovely. The Golden Rod grew thickly around, its colors relieved by the blue of the Michaelmas Daisy. Here and there a clump of the Glaucous Willow gave an air of seclusion to the spot; and a few yards away the stately forest trees ascended, with foliage already tinged with russet, crimson, and gold.

It was a spot in which the contemplative man might hold communion with his Maker, and muse upon all His works, and "rejoice in giving praise for the operations of His hands."

On October 17th—the day being bright and warm—I visited the pool again, but could detect no living thing within it. All its frequenters had lived out their lives, or sought their winter retreats.

The ground was covered with dead leaves, brown and sear; and silence reigned —"*Sic transit gloria mundi.*"

THE BEAN MAGGOT IN ONTARIO IN 1910.

J. E. Howitt, M.S.A., Ontario Agricultural College, Guelph.

It was the writer's privilege and pleasure to attend the inaugural meeting of the Bean Growers' Association of Kent County, at Ridgetown, in May. At this meeting the fungus diseases and insects injuring beans were discussed at some length. During the discussion many of the growers asked about a little white "weevil" which they claimed was their worst insect pest. Most of them had the idea that it was the bean weevil, but, from the descriptions given of it, the writer came to the conclusion that the pest was not the bean weevil. It was, however, impossible to say what the insect was from the accounts given by the growers at the meeting. An arrangement was, therefore, made for the Biological Department of the Ontario Agricultural College to investigate the insect and fungus diseases of beans which might become prevalent in Kent County during the summer of 1910.

About the 10th of June word was received at the College that "the little white weevil" was doing serious harm in Kent County. Many fields of beans had failed to germinate properly owing to the ravages of the pest. On June 21st the writer went down to Ridgetown, in Kent County, to investigate as fully as possible the cause of the trouble. At Ridgetown Mr. W. E. Galbraith, President of the Bean Growers' Association, met the writer and a start for a trip of inspection was made. The farm of Mr. Galbraith was first visited. On looking over the bean fields, here and there in the rows were seen plants which were little more than blackened stubs. The plumule and cotyledons had come above the ground, then withered and discolored. When some of these stubs were examined the coty-

ledons were seen to have little holes eaten in them, usually many holes in a single cotyledon, and very often the plumule had a little hole bored in it from above downwards for a short distance, less than one-sixth of an inch. It was quite evident that some insect had done the damage. Many of the other plants in the rows which were more advanced in growth were also noticed to be unhealthy and dying. The first pair of true leaves were limp and hanging down around the stem, instead of erect and spread out in their natural horizontal position. On digging up some of these plants a discolored hole was noticed in the stem usually just above the root, but sometimes in the root. When these stems were cut open they were found to have a little tunnel running up through the centre, and at the end of each tunnel a little white maggot was usually found. These maggots were evidently killing the plants by boring in the stems.

At the next farm visited a field was examined in which the beans had failed to germinate properly. Only a very few plants had come up in the rows and the owner was about to resow the field. The beans in this field had been planted just before a cold rainy spell lasting about three days. On uncovering some of the beans it was found that they were badly eaten by the same little white maggot that had been found in the stems. Half a dozen or more of the maggots were often found feeding upon a single bean. They were generally beneath the seed coat and between the cotyledons. Many more bean fields were examined and in all the maggots were found in greater or less numbers. Sometimes the seeds had been so badly eaten that they had failed to germinate, but in many instances though the cotyledons had been attacked by the maggots, the seed had germinated and pushed the damaged cotyledons above the ground and the plants appeared in the rows as discolored stubs. Though the maggots caused many blackish stubs in the rows and killed many of the more advanced plants by boring in the stems, the chief damage done by them was undoubtedly the destruction of the seed in the ground, making replanting necessary. The writer was informed that in some seasons many hundreds of acres had to be replanted on account of the work of the maggots.

While looking over one of the fields a large number of small flies were noticed hovering over and lighting on the bean plants. Suspicion was at once aroused that these these flies were the adults of the maggots. After some little trouble a number of them were captured and put on one side for closer examination than could be made in the field. At the same time a large number of the little white maggots, with the beans they were feeding on, were collected and placed in tin tubes and covered with a little moist earth.

The maggots were collected on June 21st, and on June 23rd, the day the writer returned to the College, they were all removed from the tubes. They had not apparently suffered from their journey, as they all seemed active and healthy. Two lots of the maggots and beans were put in large glass vials, the mouths of which were closed with plugs of cotton batting. A third lot was placed in a pot of moist sand in a breeding cage. On June 25th it was noticed that four or five of the maggots in the vials had pupated, and by June 27th practically all the maggots had transformed. On July 4th two flies emerged in one of the vials, and a week later it was found that flies had emerged from nearly all the pupæ, both in the vials and in the breeding cage. These flies appeared to be identical with those taken in the fields near Ridgetown. In order to make certain as to their identification some of the flies taken in the field and some of those bred in the vials were sent to Professor Coquillett of Washington, who identified both lots as *Pegomya fusciceps*, the adult of the seed corn or bean maggot.

The seed corn or bean maggot (*Pegomya fusciceps*) has been known for years as a destructive pest of seed corn and of beans. In the Entomological Society Report of 1900 Professor Lochhead mentions this pest among the insects of the year as doing serious harm to beans in Lambton County, Ontario. In Kent County, according to the reports received by the writer from the bean growers, it is by far the most serious insect pest of beans. Up to the present time the growers have apparently not known exactly what it was, nor have they had any exact knowledge of its life history, habits, or measures for its control. A brief account of these is, therefore, given here.

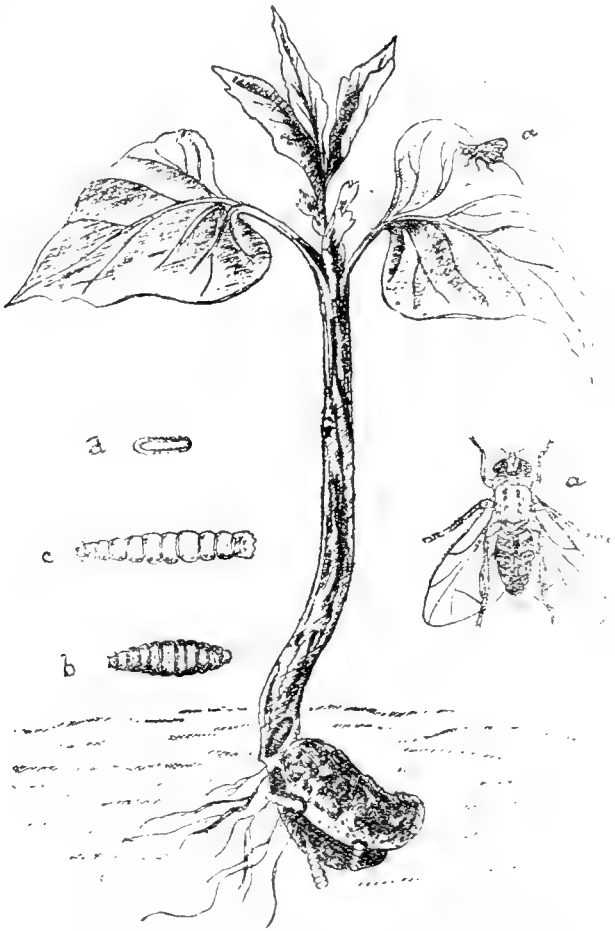

FIG. 3 The Bean-Fly—(*a*) adult fly, (*b*) pupa case, (*c*) maggot, (*d*) egg.—After Lugger.

DESCRIPTION.—The parent fly of the bean maggot looks very much like a small house fly. The maggots are white or yellowish white in color, footless, cylindrical in form, tapering towards the head, and about one-third of an inch in length. The puparia are light brown, barrel-shaped or elliptical in outline and about one-fourth of an inch in length.

LIFE-HISTORY.—It is thought that this insect passes the winter as the fly or pupa. In the spring the flies lay their eggs on decaying matter in the soil, and, when the maggots hatch, they find their way to the seed beans or seedling plants.

After the maggots cease feeding they change to the puparia from which the flies emerge in about two weeks. It is probable that there are two broods each season in the bean fields in Ontario.

Means for Control.—While investigating this pest in Kent County the writer found that in every case where the maggot had done serious harm its presence in large numbers could be accounted for by one or other of the following conditions: Planting the seed just before a prolonged cold rainy spell, planting the seed too deeply, the heavy application of farmyard manure, or the neglect to follow the usual three years' rotation of crops. Means for control are, therefore, chiefly methods of prevention. Planting the beans at the right time and at the proper depth in order to insure a quick start seems to be one of the best means to prevent the ravages of this pest. Anything which retards germination, such as cold wet weather shortly after planting, or covering the seed too deeply, gives the maggots a chance to get started in the seed and to prevent its proper germination. As the eggs are deposited in decaying matter the application of farmyard manure increases their number, and the substitution of commercial fertilizers is often advised but not always practicable. If the maggot becomes very serious in a field, it will often be advisable to stop growing beans in that field for a number of years, in order to get rid of the pest.

THE HORSE-RADISH FLEA-BEETLE (*Phyllotreta armoraciae*, Koch).

A. F. Winn, Westmount, Que.

About the middle of May last I purchased at Bonsecours Market, Montreal, a few roots of horse-radish, which I cut up and planted. In due course they began to put up their leaves.

Early in June, when the leaves were only four or five inches long, holes appeared, evidently the work of flea-beetles, but as it was the first time I had grown the plant, I did not know what species was likely to be the culprit. A glance shewed the beetles in abundance, and also that they were something quite new to me.

They were about 3 mm. long, oval, and very convex. Head and prothorax black, elytra creamy white with a black sutural stripe, broadest in the middle, and a narrower black marginal line. Both prothorax and elytra dotted over with punctures. Many of the beetles were mating.

There was no difficulty in identifying the insects, as in Insect Life, Vol. vii., pgs. 404-406, 1895, there is an article by Mr. F. H. Chittenden giving an excellent figure and an account of its first captures in the U.S.A., at Chicago, Ill., and Guttenburg, Iowa. Whether this well-known European species has spread to the districts about Montreal overland eastward from Chicago, or whether we have had a direct immigration via the St. Lawrence route is a question, but not a very important one, as the fact remains that it has settled down in Canada, and will have to be entered among our insects injurious to vegetables. It seems remarkable that these little beetles could find my new plants so quickly and in such numbers. Doubtless someone within a few blocks of our house has been growing horse-radish, and has been harbouring a rather interesting beetle, perhaps for several years, all unknown to the Montreal Branch of the Entomological Society of Ontario.

Towards the end of June a plant of horse-radish was noticed by the roadside about a mile from my house, and on examination was also found to have its leaves riddled with holes, and scores of beetles were ready to hop off when approached too closely.

Although our common species of Phyllotreta, *P. vittata,* has a wide range of food plants among cruciferous plants both wild and cultivated, *P. armoraciæ* seems to have restricted itself to the horse-radish (*Nasturtium armoracia*) and marsh cress (*Nasturtium palustre*). If it should develop a liking for cabbage, it will be able to find an abundance of food in this part of the Island of Montreal. There was no sign of either eggs or larvæ on leaves or stems of the horse-radish plants at any time during the summer; if the larvæ attack the plants they must do it below ground among the roots.

THE MIGRATION OF SOME NATIVE LOCUSTS.

NORMAN CRIDDLE, TREESBANK, MANITOBA.

We read from time to time, and have done so for many years past, of vast hordes of locusts darkening the sky, as they sweep onward from unknown breeding grounds. How they devastated the crops and ate up every living leaf in any locality they happened to make a stopping place, and in fact left behind a desolate and leafless waste where a few hours previous all had been luxury and beauty. Such is said to be the case, at times, in parts of Africa, India, and certain South American countries. There is, however, no longer any mystery connected with these visitations. Science has explained all that; has discovered the breeding grounds and is doing much to eliminate the injury by guarding against attacks and providing for them when they occur.

We are not, as a rule, apt to associate our common grasshoppers—many of which, however, are true locusts—with those devastating species. In fact of all our many different kinds we usually claim but one as truly migratory, namely the Rocky Mountain Locust, *Melanoplus spretis,* the locust made famous by having a special Commission appointed to investigate its ravages. This species in the past, has done immense damage to vegetation mostly in the United States, but it also invaded a great portion of Manitoba in the seventies, and is specially remembered on account of its having practically swept the Red River Valley clear of vegetation. Since then there have been two minor outbreaks confined to Southern Manitoba, the locusts having evidently flown from somewhere south. In spite of the prevalence of this species in Manitoba, at times, it is very doubtful whether it can be classed as a native, a distinction which, after all, we are not anxious for.

Leaving out *M. spretis* we have still several distructive species, foremost among them being the lesser Migratory Locust *Melanoplus atlanis,* with several minor lights such as *M. gladstoni, M femur-rubrum, M. angustipennis, M. packardii, M. minor M. bivittatus* and others, all of which are very injurious at times and migrate regularly during the months of July and August.

It is a wonderful thing this migration. Few animals are free from a desire or instinctive stimulus to move to other parts and so spread the species. Plants, also, are constantly doing it by means of their seeds and those that cannot go far by their own exertions, fasten themselves to such as can, and so, as with ourselves, air, land and water are all made use of for the purpose of travel

With regard to grasshoppers, it is strange that their regular periodic movements have been largely overlooked, though no doubt this is partly due to a lack of knowledge as to where to look. At Aweme, Man., where locusts have been troublesome of recent years, one instinctively looks up towards the sun, taking care to get behind some building, or in some way hide the sun's disc and then, if there are any flying, they will be easily observed within a radius of from one to fifteen diameters from the sun.

When a locust has the instinctive incentive to fly, it is said to inflate the air sacks along the side of its body; it then rises with a spiral movement, round and round, higher and higher, until reaching a height of some hundred feet or more and feeling the resistance of the wind it sails slowly away, usually flying with its head facing the breeze if it is at all strong, and gradually getting higher as it moves along with it until it becomes a mere speck of glistening whiteness, when close in line with the sun and invisible elsewhere. When there is no breeze it will return obliquely to earth to await a more favorable opportunity.

That this desire or instinct to fly elsewhere is no sudden impulse is shown by the fact that a locust when disturbed seldom flies any great distance and in fact seems incapable of doing so, while those that are prepared rise easily. Nor is the movement due to lack of food as one often sees them rise in the midst of plenty. No! it is Dame Nature's way of spreading her children over the country and she has taught them through the law of natural selection to go and also how to prepare for the journey.

The migratory season commences soon after the locusts reach maturity, that is when they have passed their final moult, and some three or four weeks before they commence laying eggs. It lasts almost a month. There is not, however, a continual movement, only hot sunny days are chosen and even then the locust is dependent on the wind which not only carries it along but indicates its direction also. The days most preferred are days when the breeze averages some fifteen miles an hour, though lesser winds as well as higher, are used to advantage; locusts seldom fly, however, when the wind is blowing hard.

It is interesting to watch these movements on a gusty day, when calm one moment and breezy the next. Then every fresh gust is taken advantage of and one sees hundreds of locusts rise on such occasions, as if having waited their opportunity. It is the same while looking up towards the sun, one moment will only discover a few, the next a perfect swarm moving at different angles owing to the breeze having slightly different directions at different heights, and so the journeys continue first east, then west, south or north as the wind varies. At night they apparently drop to earth * to infest new neighborhoods or perchance rise and move elsewhere next day. But not all go. Among the Orthoptera especially, nature has made a wise provision. Some are endowed with long wings; these are built especially for locomotion and conveying the insect long distances. Others of the same species have short or rudimentary wings which obliges them to stay at home. So that while the long-winged forms seek new homes, there are enough short-winged brothers and sisters to carry on the family at home and incidentally the work of destruction also.

*It is well known that some grasshoppers travel throughout the night. Such an instance is related by Prof. S. J. Hunter of *Dissosteira longipennis*, and though I have no direct evidence, it is possible that some of the Manitoba species are also nocturnal during the migratory season.

SOME OBSERVATIONS ON THE PRACTICAL IMPORTANCE OF THE STUDY OF PARASITIC INSECTS.

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This subject of the practical significance of a study of the parasitic species of insects is becoming increasingly important each year, and my reasons for bringing the subject forward are chiefly two, first to reiterate the significance of this study; and secondly, to give an account of a little of the work that we have begun at Ottawa, some of which is a continuation of the work I was carrying on in England. We are all acquainted with the importance of parasitic insects in the natural control of serious outbreaks of injurious insects; so much so, in fact, that the sudden disappearance of an injurious insect which has attained very large proportions is not infrequently attributed to the work of parasites, upon the slightest, and often in the entire, absence of evidence in support of the supposition. Nevertheless we have a very large number of instances on record when such disappearances are due to the enormous increase of parasites. These sudden disappearances of serious outbreaks usually occur when man would be perfectly powerless and on that account, therefore, it is of great importance that we should study, so far as is possible, the course of such outbreaks, with the idea of learning the methods by which control is obtained and a balance regained in a state of nature. This is becoming increasingly necessary. Our own present methods of combatting insect attacks are comparatively inadequate. They are practicable only when the area attacked is not large, where the vegetation makes the expense entailed justifiable and where the insects have certain definite types of life-histories. But take an insect devastating a large area, as the Larch Sawfly has done in Canada in past years, no means could be adopted to control it, the area under attack was too large. Our cut-leaved birches are being killed by the Bronze Birch Borer, *Agrilus anxius*, nothing can be done at present on account of the peculiar life-history and habits of the insect. Many other instances may be quoted of cases similar to these where we are powerless at present to adopt practicable remedial measures. The reason for this is that we know so little. Our knowledge of the natural means of control, the parasitic insects and also the parasitic fungi which under natural conditions frequently obtain control, is still very meagre. One reason for this is, I think, that economic entomologists have been too much occupied in devising sprays and other mechanical means of attacking injurious insects, and the study of parasitic means of control, the natural means of control has been unduly, though on account of instances well-known to all, one cannot say entirely neglected.

The impossibility of using ordinary methods of insect control in the case of the Gipsy and Brown-tail Moths in Massachusetts has resulted in a great stimulus being given to the study of parasitic means of control and I firmly believe that the work now carried on under the Bureau of Entomology of the United States Department of Agriculture under the direction of Dr. Howard, who was responsible for its initiation, is the real beginning of the study and the practical applications of that study of parasitic and other natural means of control. This type of control will increase in importance as the importance of the conservation of our forests, for example, increases, as it is doing year by year.

During the last few years an interesting instance of the value of this kind of work occurred in connection with my investigations upon the Larch Sawfly, *Nematus erichsonii*, in England. I had the pleasure of bringing to your notice last year some

of the results of this work and the different natural means of control which had been discovered were described.* The chief of these was the ichneumon, *Mesoleius aulicus,* Grav., which was found emerging from the cocoons about the same time as the adult sawflies were emerging. In the spring of 1908, during which year the defoliation of the larches was very serious, a beginning was made in studying the course of the chief factor in the natural means of control, namely *Mesoleius aulicus,* and the average number of cocoons parasitized by this insect in 1908 (strictly speaking one should say 1907, as 1908 is the year of their emergence from the hibernating larvæ,) was six per cent. In the following year, 1909, the percentage of ichneumons emerging had increased to twelve and fifteen per cent, showing that the parasites were increasing in number, though not very rapidly, and there did not appear to be any falling off in the abundance of the sawfly. In 1909, I relinquished charge of the English work on coming to Canada. As this investigation was of considerable interest to me and as I was continuing my study of the insect and its parasites, arrangements were made for a shipment of the cocoons collected in the English districts in which the investigations were previously carried on, to be sent to Canada. During the spring of this year the percentage of cocoons parasitized with *M. aulicus* was again counted and to my great pleasure and surprise I found that they had increased to over 60%. This was confirmed, in England, by Mr. J. Mangan, who continued the work on my departure; he found 62% parasitized. What was originally considered to be of theoretical importance only, is now seen to be of practical importance. We know that in about another year the sawflies will be practically controlled by the parasite in those localities so severely infested previously; where trees had been killed by repeated defoliation and the owners were cutting and contemplating cutting down immature timber to save it. This is now unnecessary and Mr. Mangan informs me that in those localities where the sawflies were so abundant previously it is almost impossible to find them. The trees which in previous years had all the appearnce of having been burnt, so complete was the defoliation, this year appeared almost normally green. Other localities, however, were more severely infested, and the Board of Agriculture, I understand, are adopting the recommendation in my paper to which reference has already been made, namely the collection of cocoons from localities where the percentage parasitized is very great and their distribution in localities where the outbreak is first beginning. In this way the practical application of natural means of control is made and we are able to assist nature in gaining this control and to hasten on the control far more rapidly than would be the case if affairs ran their natural course. This accelerating of natural eradicative measures will prevent also the loss of trees which occurs in the natural course of events. Several hundreds of the chief parasites *Mesoleius aulicus* which I reared at Ottawa were liberated there, and some were sent to Algonquin Park.

A further parasite of *N. erichsonii* and which appears to be abundant both in Canada and the United States is a small Chalcid, which Packard was the first to figure as *Pteromalus nematicida,* although he did not describe it. We found this parasite very abundant in some cocoons collected on the Experimental Farm, at Ottawa, in 1909. This year, through the kindness of Mr. Fiske, of the Gipsy Moth Parasite Laboratory, Melrose Highlands, Mass., I was able to secure a further supply of cocoons from Wellesley, Mass., infested with the same parasite, the life-history of which we are now studying, as I believe it is one of the most important natural means of control that we find. It is very easy to get them to oviposit under laba-

*These have already been described in my paper, "The Large Larch Sawfly, *Nematus erichsonii*, Hartig." Journal Board of Agric. (London), Vol. XV., pp. 649-660. 1908.

tory conditions and as a comparatively large number of eggs are laid in each cocoon, it should be possible to breed this parasite in large numbers. This work is still in progress but I have a number of drawings of the parasite in different stages which may be of interest, and I think that one of the most important functions of these meetings is to report and discuss work that is being carried on, as such discussion is frequently of the greatest value to the investigator.

(Specimens and drawings were passed round.)

THE COCCIDÆ OF CANADA.

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Like a great many other families of minute insects the Coccidæ have been comparatively little studied in America, but to the fruit grower, forester, florist and others, the scale insects are of very great economic importance. Most of the species found in Canada have been introduced from other countries, only a few species being native to Canada. It is the imported species that give most trouble to agriculturists. It almost invariably occurs that when the balance of nature is disturbed, as is the case of introducing new form of life into a new country hitherto free from that form, unusual increase in numbers immediately follows. The habits of the Coccids are interesting and varied, and they are one of the most cosmopolitan insects known. They are found in the north as far as the 60th degree and equally as far south. In the tropics they are most at home, but when exported abroad they readily adapt themselves to nearly all conditions of temperature and climate. In some instances the spread is gradual, as in the San José; spreading northward the covering of the scale must undergo a thickening to protect it from the severer weather. Sometimes the spread is limited by the lack of suitable host plants, but in many cases, such as New York Plum Scale (*Eulecanium cerasifex*) the insect readily adapts itself to almost any kind of plant food, scarcely a tree, shrub or vine being immune. The writer has found many different species of herbs under badly infested trees literally covered with this pest.

A study of the habits of the Coccidæ furnish some very interesting phenomena of animal life. In Australia some species produce galls of all shapes and sizes on the eucalyptus trees. In Africa a large species found underground (*Margarodes*) are collected by the natives to make necklaces, bracelets, and other ornaments. Another species (*Tachardia lacca*) forms a useful product known as lac. The cochineal insect is noted for its commercial value as a dye, and numerous other scales are important from a commercial standpoint.

Gall-Makers.

Perhaps there is no more interesting species than those belonging to the genus *Brachysceles*, which are found in the land of anomalies, Australia. Mr. Claud Fuller, has published a bulletin on Gall-making Coccids in which he describes the galls as follows:—

"*Galls of the Male Coccid.*—These are invariably short cylindrical tubes, two to six inches in length, generally growing upon the leaves; they are mostly of a purple claret colour, but often brown or green. Some are simple tubes with a notched rim at the summit, others have the rim dilated forming a saucer-like top. The male

gall of *B. rugosa*, Froggatt, is emerald green, cylindrical, constricted at the base, stout with thick, soft walls, the apex truncate; length, four lines; breadth one line. In several species these male galls grow upon the female gall; *B. munita*, Shrader, has the males separate and springing from the horns; in *B. phratrata*, Shr., *B. thorntoni*, Frogg., and *B. nux*, they are congregated together in a cup-like growth. This growth expands like a flower, and is, I am afraid, rather inaptly described by Shrader as a cockscomb, and as a mushroom-like growth by Froggatt. There is generally only one cup-growth attached to a female gall, but *B. nux*, as a rule, has two and often three. They are attached at one side of the summit of the female gall, which they often exceed several times in size.

The Female Galls exhibit a great variety of forms, which are the easiest means of distinguishing the different species, varying in size from one-half to six or seven inches in length. In the shape there is as great a variety as in the size; many of them resemble cone-like fruits, others nuts and fruits, whilst the lateral growths of *B. duplex* are not unlike leaves. Occasionally growing on stalks, they more often sit close upon either the twigs, branches, or leaves, from which they spring.

The Formation of Galls.—The number of various gall-making insects which have the remarkable power of diverting the forces of nature, as represented in the growth of a plant, to their own advantage, has given rise to a deal of speculation and experiment to discover the inherent element of property possessed by the insect by means of which it operates. Up to the present we can go no further than to say that the galls are due to an irritation set up by the insect, yet each individual species must have some peculiar properties or how would we find such widely differing results when in their initial stages the producers are as alike as the two proverbial peas? Mr. Tepper asserts that the larvæ always select an embryo-bud, and by the context he evidently wishes an undeveloped but true bud to be understood. This, is, however, not the case; it may hold good in some instances, but certainly not in all. Whether upon stem or leaves the gall-growth originates from the cambium ring; the developmental activity of the cells is released by the insect, and a shoot forms over the growth of which the animal maintains direction. This is proved by the cessation of growth when the coccus, in a young stage, is killed by parasites.

The rudimentary gall, according to Dr. Alder, draws its nourishment from the surrounding tissue; later on, however, processes are driven into the gall from the spiral vessels of the cambium ring, which form a new element to assist in its development, and it thus becomes an independent structure, having individual powers which regulate its shape, position, etc. These remarks, whilst referring to galls formed by wasps, apply equally to coccid galls."

Secretions.

One of the main characteristics of the Coccidæ is their habits of secretion. Like the Aphids the insects secrete a sweetish substance known as honeydew, which is the sole food of several species of fungi and the chief food of many species of Ants. This fluid is excreted entirely by the females by a special organ, a cylindrical tube exserted from the genital orifice after the manner of the telescope. Honeydew is attractive to many other nectar feeding insects besides the ants, such as the Hive Bee and Bumble Bee and many species of Wasps.

A species known as *Physokermes abietis* found at Guelph, gives off a wax-like secretion which is collected and used by the Hive Bees in constructing their cells. This species is very abundant on Norway Spruce, and although causing considerable harm in the tree is very beneficial to the bee in supplying material for the foundation of its cells.

Another species, *Ericerus pela,* secretes a pure white wax, which in China is collected and made into candles for special use. In India similar use is also made of a wax obtained from a species of *Ceroplastes ceriferus.*

In India a species known as the Lac insect (*Tachardia lacca*) furnishes us with the useful product known as lac, which forms a basis for varnish, French polish and other important products. It is collected in its native home, India or Ceylon, and sent abroad on the twigs and branches upon which the insect has worked and deposited the substance. This raw material is then subjected to a process of refining by which the material is gathered in the form of shell-lac and is then ready for use. It may be interesting here to offer a brief life history of the insect itself which produces this very valuable material. Mr. Robert Newstead, quoting from the Royal Horticultural Journal in his work on the Coccidæ of the British Isles, writes as follows on the species:—

"Like all other Coccids, the young (larvæ) are active; they are at first very tiny creatures, resembling mites, and are generally spoken of by the horticulturist as 'lice.' These young arrange themselves in groups of various dimensions round the twigs of the food-plant, and, having settled matters satisfactorily as to space, insert their thread-like sucking-tube (mouth), into the plant tissues, and pump up the sap of the tree. At the same time they commence covering their bodies with the peculiar 'lac' which, by the time they are fully developed adult females, assumes the form and size shown in the illustration. By taking a hot knife a transverse section of the material may easily be made, when it will be seen that the covering material or 'lac' is not a solid mass, but is honeycombed by large, somewhat ellipsoidal cells, each of which was once tenanted by a single female . . . If we examine a female we find she is shaped somewhat like the cavity in which she lives, with the cephalic portion bearing the mouth parts touching the bark at the narrow end of the cavity, and the abdominal extremity at the opposite end, having connection with the exterior by means of a minute perforation; and she is destitute of legs antennæ, etc. Where she has lived she dies, leaving as a legacy the wonderful product which she manufactured during life, and which all the world over is of so great importance in commerce. And this is not all; the bodies of the females also furnish an excellent dye, which in former times was of much value also."

Dissemination.

The female scale is wingless, hence they must be borne from place to place by agencies outside themselves, such as wind, water, plants and animals. It is very noticeable that with such scales as the San José the spread is always greatest in the direction of the prevailing winds. This, however, is possible only when the insects are in the active moving stage; as soon as they come to rest and attach themselves to their host no further spread occurs in this way. Rain too is supposed to help spread the scale when they are in the egg or young active stage, by washing them from the upper to the lower parts of the trees, but it is animals that effect the greatest dissemination from tree to tree. Birds frequenting orchards and forest trees undoubtedly carry numbers of scale insects attached to their feet and beak. A very wide distribution may occur in this way, even across bodies of water or mountain ranges. The insects and Acarids also assist in the local distribution of the scales. Lady Bird beetles and Ants among the insects and the predaceous species of mites are responsible for a great deal of the spread of the injurious scales. Another probable factor in distributing scale insects is the careless handling of the infected fruits, such as apples and pears. Refuse fruit is often allowed to come

in contact with unaffected trees and thus cause the free plants to become infested. The spread from one province or country to another is due almost entirely to the interchange of plants by nurserymen and florists. There is always the possibility of introducing scale wherever a shipment of shrubs or trees is made from one place to another. If the trees can adapt themselves to the new environment and become thrifty under the new condition, there is hardly any question about the scale surviving. In nearly all cases the scale undergoes the change without any apparent inconvenience.

Nature of the Injuries.

As nearly all scales derive their nourishment from the juices of the plant it is evident that a considerable weakening in its vitality must result. When only a few insects are present as we found on trees attacked by our native species, there seems to be very little injury to the tree, but when swarms of these occur in the case of the imported species the health of the tree is so impaired that in some cases death occurs. In cases where the trees do not actually die, but are rendered weak, a corresponding weakening is shown in the quality and quantity of the fruit. Some of the characteristics of the injury are seen in discolorations of the leaves and tissues, malformed and discolored fruit, and to some extent early maturing and falling of the leaves.

Life-History.

Most of the Homoptera have incomplete metamorphosis, but in the Coccidae only the females have incomplete metamorphosis; the males pass through the four stages. The eggs are seldom laid in exposed situations as is the case in their allies, the Aphids and Aleyrodids, but various means are provided for their protection from predaceous animals and from the weather. The Cottony Maple Scale lay their eggs in sacks formed of a cottony-like substance, which surrounds them. Others, such as *Physokermes abietis,* are deposited in a very peculiar pouch-like organ formed by the folding in of the outer epidermis. In Orthezia the female carries the eggs between the long waxen plates at the posterior extremity of the body. The most common color of the egg is yellow or pink, but a few are crimson, such as that of *Chionaspis salicis* and in some species of *Paralatoria* they are dark mauve. The number of eggs laid by an individual varies from 25 to two or three hundred.

The larvae, upon hatching, in the majority of species, remain for a few days within the covering provided for them. Soon they leave this house and become quite active, seeking the new and tender tissues, where in most cases they settle down and immediately insert their long sucking apparatus into the tissues, and in the case of the female, remain stationary until death.

The pupal stage occurs only in the males. After a few days of active larval life they withdraw their tubes and undergo marked changes characteristic only of the Coccidae.

Most of the adult males being destitute of mouth parts live only a few hours, or at most a few days.

The female adult is characterized by the absence of wings and by its well developed mouth parts. They are usually flat and pyriform in shape and covered with scales made from the secretions of their bodies. There are sometimes one and sometimes several generations in a season.

Characteristics and Classification.

The Coccids belong to the order Hemiptera and to the suborder Homoptera, which includes the Aleyrodidae, Psyllidæ Jassidæ, Membracidæ, Aphididæ and Cicadidæ. These females bear a striking resemblance to each other, which is especially noticeable in the immature stages of development. The larvæ of the Aleyrodidæ are often mistaken for the female adult scale insect. Among the Aphididæ, *Ceratophis lintaniæ* is frequently mistaken for a Coccid and is known by horticulturists as the "black seed scale." All the insects of this order have sucking mouth parts, and with few exceptions, incomplete metamorphosis. In the larval stages the male and female bear a close resemblance to each other, but in the adult stages they are readily recognized. In the female the wings are always absent; the metamorphosis is incomplete, with a mouth or rostrum placed on the ventral surface. In the male the metamorphosis is complete, the mouth is obsolete, usually a pair of wings, the posterior pair represented by a pair of halteres.

Ortheziinæ.

90. *Orthezia americana* (Walk.). This scale has been found at Grimsby, Ontario, on Golden Rod; at Woodstock, Ontario, on Ragweed. It has also been recorded by Dr. Fletcher at Ottawa, and several places in Quebec.

98. *Orthezia insignis* (Dougl.). This species was first found at the Fruit, Flower and Honey Show, Toronto, in 1906. It was next seen in the conservatories at Guelph in 1907, and since that time the writer has collected it in many parts of Ontario.

103. *Orthezia occidentalis* (Dougl.). This interesting and beautiful species was found by J. Wm. Cockle, Kaslo, B. C., on roots of grass and trees amongst rotten wood. He remarks that he has found them in great numbers on several occasions on the roots of apple trees, which had grown wild amongst a pile of chips. The specimens were identified by Prof. J. G. Sanders of Washington.

Dactylopiinæ.

192. *Asterolecanium variolosum* (Ratz). This species was found by Dr. Fletcher in 1900, on young oak trees at Ottawa, Canada, which were set out in 1895, and came from a nursery in Pennsylvania. It has been found destructive to oaks at Niagara Falls, Ontario.

242. *Kermes galliformis* (Riley). These scales occur either singly or in clusters on the twigs and branches of Red Oak (*Quercus rubra*). It is beautifully variegated with yellowish, gray and black, and nearly always accompanied by a Lepidopterous parasite. It is found all through the Niagara District, in the city of Toronto, and to some extent in the south-western corner of the Province.

254. *Kermes pettiti* (Ehrh). This species was first found at Jubilee Point on Rice Lake, near Peterborough, Ontario, by Dr. Fletcher, in 1899. The writer has found this species at Guelph, Toronto, Ottawa, and other places in Ontario. It is very common and has a wide range in Ontario.

255. *Kermes pubescens* (Bogue). The writer has found this species on oak at Guelph, Toronto and Perth, Ontario, and is probably wide spread over the Province. It was found abundant on each infested tree and undoubtedly does considerable injury. It is usually found in the cracks of the bark on the trunk and branches.

279. *Gossyparia spuria* (Modeu). This species was found attacking a few Elm trees in the city of Toronto in 1906, and since that time it has spread to nearly all parts of Toronto and has proven to be a very destructive pest.

293. *Eriococcus borealis* (Ckll.). This is a native species found on Willow (*Salix*) at Dawson City, 64 degrees North Lat., by Mr. John Morley, in 1899. As far as I am aware this species has not been found in any other locality.

391. *Phenacoccus aceris* (Sign.). It has been received from Amherstburg and St. Catharines, Ontario. So far it has confined its attacks to the Soft Maple (*Acer saccharinum*). *Several* trees were badly attacked by this scale and the writer ordered the destruction of the infested trees.

401. *Phenacoccus dearnessi* (King). This species was found by John Dearness on Hawthorne (*Crataegus sp.*) at London, Ontario.

454. *Pseudococcus citri* (Risso). It is found in conservatories on many species of plant throughout Canada. Closely related species or varieties are found on the Apple and other Rosaceous plants in the open, at Guelph and Toronto, Ontario.

490. *Pseudococcus longispinus* (Targ.). Very abundant on many species of indoor plants in all parts of the Dominion.

529. *Pseudococcus trifolii* (Forbes). The writer found this species very abundant on the roots of cultivated clover at Collingwood, Ontario.

572. *Ripersia lasii* (Ckll.). This species was found in Ants' nest (*Lasius americanus*) at Toronto, Canada, in 1897, by Mr. R. J. Crew. The writer has found this species in Ants' nest at Guelph, Ontario.

Coccinæ.

661. *Pulvinaria floccifera* (Westw.). This species was found in a greenhouse at Ottawa, Canada, December 15, 1894, on leaves of *Brassia verrucosa.* King described this as a separate species, *P. brassiae.*

675. *Pulvinaria occidentalis* (Ckll.). This species was found infesting in a serious manner a whole plantation of Red and White Currant at Chilliwack, British Columbia, by Rev. G. W. Taylor, in the spring of 1899. In July (the same year) Dr. Fletcher visited the plantation and found these scales to be in enormous numbers, the white flocculent threads giving the bushes the same appearance as if a light fall of snow were upon them. It has also been found by Dr. Mackay, June 14, 1901, on Gooseberry bushes at Dartmouth, Nova Scotia.

699. *Pulvinaria vitis* (Linn.).—*P. innumerabilis* (Rathvon)—*P. tiliæ* (King and Ckll.)—*P. viburni* (King). This species is commonly known as the Cottony Maple Scale and is found all over the Western part of the Province at least, and also in the woods at Aylmer in the Province of Quebec, nine miles from Ottawa. As the name indicates it attacks the Maple chiefly, and in cities often does much damage to maple shade trees. It is, however, rarely abundant for many seasons in succession, because of the attacks of parasites. Although the maple trees are the ones most commonly attacked, the scale is found on many other trees and shrubs as well. It has been found at Guelph on *Acer saccharum, A. saccharinum, A. nigrum, A. rubrum,* and *A. negundo, Tilia americana, Ulmus americana, Crataegus sp., Populus alba, Salix sp., Cornus stolonifera, Ilex verticillata, Spiræa salicifolia,* and *Vitis cordifolia.*

724. *Eriopeltis festucæ* (Fonse). The Cottony Grass Scale was found by Mr. A. H. Mackay, on grass in large numbers in Cumberland Co., Nova Scotia, in 1889. It has occurred in conspicuous numbers several times in Nova Scotia and

New Brunswick. This species has been recorded at Ottawa, Ontario, but Dr. Fletcher says, it was a mistake and, if so, we have no record of this species in Ontario.

848. *Coccus hesperidum* (Linn.). Commonly known as the Soft Scale, is found abundantly in conservatories in Oleander, Orange, Lemon, etc., in all the provinces of the Dominion.

860. *Coccus pseudohesperidum* (Ckll.). This is a very large species found on Orchids in the conservatories at Guelph and Ottawa. It is usually most abundant on *Cattleya sp.* These are the only records for this species. Its nativity is unknown.

902. *Toumeyella pini* (King). This species was found by Mr. J. Dearness on Austrian Pine (Pinus austriaca), at London, Ontario.

902b. *Toumeyella liriodendri* (Gmel.). This species was first reported by Dr. Fletcher on Tulip at Ottawa, Ontario.

911. *Eulecanium persicæ* (Craw).—Fab. 1.—*E. armeniacum*). In Mr. King's account of the scales of British North America he reports this species infesting orchards at Sherbrooke, Quebec, in 1899. This species has also been reported from Prince Edward Island.

918. *Eulecanium caryæ* (Fitch). This species is said to be the largest known species of Eulecanium. It has been in Ontario for at least 12 years, having been first found by Dr. Fletcher in the Niagara district in 1898. Judging from the fact that it has been found in that district on Peach trees and that we have found it plentiful on forest trees at Guelph, it probably occurs at least all over the southwestern part of Ontario. The scale is seldom sufficiently injurious enough to cause any alarm. It has been found on *Crataegus sp.; Ulmus americana; Ulmus racemosa; Ostrya virginica; Carpinus caroliniana* at Guelph, Ontario, and on the Peach (*Prunus persica*) at St. Catharines, Ontario. It has also been reported from Nova Scotia on forest trees. It is usually accompanied with parasites in Ontario.

921. *Eulecanium cerasifex* (Fitch).—*E. canadense* (Ckll.); *E. caryarum* (Ckll.); *N. corylifex* (Fitch); *E. cynosbati* (Fitch); *E. fraxini*, (King); *E. quignardi* (King); *E. juglandis* (Bouche); *E. maclurarum* (Ckll.); *E. websteri* (Ckll. and King); *E. fitchii* (Lign); *C. pruinosum* (Cqul.). The New York Plum Scale has become the most common scale in Ontario and Quebec. The writer has found this scale on a great range of trees, shrubs, vines and herbs, the following being a list of those so far recorded: *Acer nigra, Acer saccharum, Acer saccharinum, Acer spicatum, Acer negundo,* and many varieties of the above mentioned species, *Aesculus hippocastanum, Staphylea trifolia, Rhamnis cathartica, Psedera quinquefolia, Vitis cordifolia, Tilia americana, Tilia europea, Carya ovata, Carya glabra, Corylus americana, Ostrya virginiana, Carpinus caroliniana, Betula lenta, Betula lutea, Alnus incana, Fagus grandifolia, Castanea dentata, Quercus robur, Quercus macrocarpa, Quercus rubra, Quercus coccinea, Ulmus americana, Ulmus campestris, Ulmus fulva, Ulmus racemosa, Celtis occidentalis, Juglans nigra, Juglans cinerea, Salix sp., Populus alba, Populus tremuloides, P. balsamifera, Populus deltoides, Crataegus sp., Rubus occidentalis, Rubus strigosus, Prunus serotina, Prunus virginiana, Prunus nigra, Prunus persica, Pyrus malus, Pyrus japonica, Pyrus communis, Amelanchier canadensis, Sambucus canadensis, Sambucus racemosa, Ribes nigrum, Ribes vulgare, Hamamelis virginiana, Ribes cynosbati, Cornus stolonifera, zanthoxylum americanum.* In addition to these many species of herbs near infested trees. It is spread over practically the whole of Ontario and the eastern provinces. Though not so destructive as the Oyster Shell Scale, it is often quite injurious where abundant and sometimes kills the infested tree.

935. *Eulecanium fletcheri* (Ckll.).—*E. pallidor* (Ckll. and King). In 1907, the writer found this species on White Cedar at Guelph. It was originally described from specimens found by Dr. Fletcher abundant on a hedge of *Arbor vitæ* and on trees of the same species at Stittsville, Ontario, fifteen miles from Ottawa. This species is nearly always parasitized by a Chalcid. In 1908, *E. fletcheri* was found on the Red Cedar (*Juniperus virginiana*) at Guelph and Hamilton, Ontario.

946. *Eulecanium lymani* (King). Recorded by Mr. King on a young Oak at Quebec city and North Hatley, Quebec. This may be the same as *E. cerasifex.*

950. *Eulecanium nigrofasciatum* (Perg.). This strikingly marked species has been received from Walkerville on Soft Maple and on Peach at St. Catharines, Ontario. In both cases the trees were badly infested and no parasites were found. As far as I am aware it has not spread to any other parts of the Province.

958. *Eulecanium pyri* (Schr.). King records this species on Apple trees in Prince Edward Island.

959. *Eulecanium quercifex* (Fitch).—*E. quercitronis* (Fitch); *E. antennatum var.* (Ckll.). This species occurs on Oak (*Quercus coccinea*) at Ottawa, Ontario and on Oak (*Quercus rubra*) from Jubilee Point, Rice Lake, Ontario.

965. *Eulecanium rosæ* (King). Recorded by Mr. King in his account of the Scales of British North America. I have not found *E. cerasifex* on any cultivated or wild species of rose. The species was found in Rosebush at Sherbrooke, Quebec.

974. *Eulecanium vini* (Bouche). This species has been found by the writer on Grape vines in the Niagara district and to some extent on Grape vines in the City of Toronto. Mr. King received specimens from Dr. Fletcher at Ottawa, on *Spiraea salicifolia.* These scales have in all probability been imported on nursery stock from Germany.

993. *Saissetia hemisphæricum* (Targ.). It is a very common scale in conservatories in all the Provinces. Its favorite hosts are Oleander, Cocos, Sago Palm, Croton and Orchids.

1008. *Physokermes piceæ* (Schr.). The Spruce Physokermes was found attacking the Norway Spruce on the College grounds at Guelph. The domesticated bees collected wax from this species. This species has been reported from one or two other parts of Ontario.

DIASPINÆ.

1036. *Chionaspis americana* (Johnson). This species was found on American Elm (*Ulmus americana*) at Guelph.

1055. *Chionaspis furfura* (Fitch). The Scurfy Scale, though widely distributed through Ontario and the Eastern Provinces, is seldom found in so great abundance as the Oyster Shell. Badly infested trees or other plants are very much weakened and not infrequently killed as a result. Many kinds of trees and shrubs are attacked by this scale, but the most common are the Apple, Mountain Ash, Japan Quince, Horse Chestnut, Hawthorn, White Ash, Currant and Gooseberry.

1062. *Chionaspis lintneri* (Comstock) is found at Guelph on Alder (*Alnus incana*) ,Dogwood (*Cornus stolonifera*). It has been received from Ottawa and Rondeau in Ontario.

1073. *Chionaspis pinifoliæ* (Fitch). The Pine-leaf scale is very common in many parts of the Dominion. It has not, however, so far as we know, caused any perceptible injury to the trees, although reports from New York State go to show that whenever it is abundant on a tree it does much damage. This scale confines its attacks solely to Conifers. The writer has found it at Guelph on the following Pines: White, Bull, Austrian, Scotch, Jack and Dwarf Mugho, and also on the Norway and White Spruce.

1081. *Chionaspis salicis* (Linn.).—*C. Salisnigrae.* This species is found on Leatherwood (*Dirca palustris*), White Ash (*Fraxinus americana*) at Guelph, Ontario.

1096. *Aulacaspis boisduvalii* (Sign). This species has been found in the conservatories at Guelph and Ottawa. At Guelph the writer found it very abundant on several species of Palms, and at Ottawa Dr. Fletcher found it on the Orchid belonging to the genus *Cattleya.*

1127. *Aulacaspis rosæ* (Bouche). Here and there all over the Dominion we find this rose scale attacking rose bushes and Blackberry and Raspberry canes. The plants attacked are nearly always in damp, shady places, such as overcrowded gardens. Dr. Fletcher has found it common in British Columbia and Nova Scotia.

1143. *Hemichionaspis aspidistræ* (Sign). It is found in conservatories at Ottawa on *Pteris serrulata.*

1198. *Aspidiotus abietis* (Schr.). The Balsam Aspidiotus has a wide range in Western Ontario. It is found on Hemlock (*Tsuga occidentalis*) and Balsam (*Abies balsamea*). In the woods at Guelph this species is very abundant.

Aspidiotus hybridum? This peculiar scale is found very abundantly on Willow and Balm of Gilead at Collingwood, Ontario. This species very closely agrees with *Aspidiotus juglans-regiæ and Aspidiotus ostræformis,* although it is not exactly like either one of them, and Prof. Marlatt, believes that it is a hybrid or cross between these two species. Judging from the infestations, I believe that this species has several generations in a season. It is a very destructive pest and nearly every tree around the fair grounds at Collingwood was attacked and many limbs and trees were dead.

1199. *Aspidiotus æsculi* (Johnson). This species is very common in Western Ontario. It has been found at Guelph, Brantford and Toronto on Basswood (*Tilia americana*) and Horse Chestnut (*Æsculus hippocastanum*).

1200. *Aspidiotus ancylus* (Putn.). The Putnam Scale is distributed fairly widely throughout Ontario. Quebec and Nova Scotia. It has not, however, been known to do much damage, although in some of the States across the boundary it is said to have been quite destructive. It is recorded from Ottawa on Elm; from Toronto on Willow; and St. Catharines on Plum: from Guelph on Cherry and Apple; from East Essex Co. on Plum and Shell-bark Hickory.

1220. *Aspidiotus diffinis* (Newst). This was found in the woods on Basswood (*Tilia americana*) at several places in Western Ontario. Mr. King thinks that this species may prove to be a variety of *A. diffinis.*

1229. *Aspidiotus forbesi* (Johnson). The Cherry Scale, although found in several localities in Ontario, has not yet, with one or two exceptions, been reported as doing much damage. It has been found in Ontario, at Ottawa, London, St. Catharines, Grimsby and Prince Edward County. It is also recorded for Nova Scotia and Quebec. The host plants so far discovered are Cherry, Apple, Hawthorn, Fragrant Currant and Beech.

1233. *Aspidiotis hederæ* (Vall.). This species has been reported from nearly all the Provinces of the Dominion. It is confined to conservatories and house plants. It is a common species on Palms, Ivy, etc.

1239. *Aspidiotus juglans-regiæ* (Comst.). The English Walnut Scale has been found in Ontario in only two or three localities, although it probably exists in several other parts and also in the other provinces. The host plants so far discovered in Ontario are Apple, Willow and Poplar.

1250. *Aspidiotus osborni* (Newell and Ckll.). Osborn's Scale is found on forest trees in northern and western Ontario. It has been found on Paper Birch

(*Betula papyrifera*), Yellow Birch (*Betula lutea*), Cottonwood (*Populus deltoides*), White Oak (*Quercus alba*), White Pine (*Pinus strobus*). It is undoubtedly a very destructive scale.

1252. *Aspidiotus ostræformis* (Curt.). The Curtis Scale is much more widely distributed throughout Ontario than has been hitherto supposed but, in spite of its prevalence, it does not seem to be very destructive. It has been found at Collingwood in Western Ontario and as far east as Trenton in Eastern Ontario. It has also been reported from Chilliwack, British Columbia, and from several places in Prince Edward Island.

1256. *Aspidiotus perniciosus* (Comst.). Wherever it occurs the San José Scale is considered, and rightly so, the most destructive insect in the Dominion that fruit-growers have to combat. Almost every kind of fruit trees and bush fruits are liable to be attacked by the scale. Many shade trees are also attacked. It has become established in the following counties: Peel, Halton, Wentworth, Welland, Lincoln, Haldimand, Norfolk, Elgin, Kent and Essex.

1270. *Aspidiotus ulmi* (Johnson). The Elm Aspidiotus has been found by the writer in several localities in Western Ontario. It is most abundant at Guelph on the Soft Elm (*Ulmus americana*).

1294. *Chrysomphalus aonidum* (Linn.). This Coccid occurs in conservatories on *Ficus elastica*, at Guelph, Ontario.

1295. *Chrysomphalus aurantii* (Mask.). This species has been found on fruit imported from California.

1300. *Chrysomphalus dictyospermi* (Morg.). This Coccid has been found on Cinnamon in a conservatory at Ottawa.

1305. *Chrysomphalus obscurus* (Comst.). This species has been found in Ontario, but my notes on habitat and host plant have been lost.

1330. *Targionia dearnessi* (Ckll.). This interesting species was found by Mr. John Dearness, on Bearberry (*Arcostaphylos uva-ursi*) in the Bruce Peninsula Ontario.

1377. *Lepidosaphes beckii* (Newm.). This species only occurs on imported fruit, oranges, etc., from the South.

1431. *Lepidosaphes ulmi* (Linn.). The Oyster-shell Scale is generally distributed over Ontario, Quebec, British Columbia, Nova Scotia, and Prince Edward Island. It is one of the most injurious scales found in Canada. It is found on a host of plants, some of which are Apple, Pear, Plum, Cherry, Mountain Ash, Hawthorn, Red-osier Dogwood, Black and White Ash, Aspen, Prickly Ash, Mulberry and Horse Chestnut.

1422. *Inchinaspis longirostris* (Sign.). A palm (*Kentia sp.*) was badly infested at the Fruit, Flower and Honey Show, Toronto, 1908.

1442. *Parlatoria pergandei, var. theæ* (Comst.). This species was found on Lemon plants in the Ontario Agricultural College greenhouse at Guelph.

Undetermined Species of Pseudococcus. Specimens have been found on a host of plants, roots, stems, and leaves, but the species have not yet been determined.

Enemies of the Coccidæ.

There are upwards of seventy species of Scale Insects found in the Dominion of Canada at the present time, and these are held in check very largely by other forms of predaceous or parasitic plants or animals which by feeding upon them prevent them from increasing to such an extent as to be uncontrollable. As transportation has developed and commerce and international trade have taken place

between different countries, we have introduced not only many useful plants, but the insects which prey upon them. Often in the case of scale insects we have imported the scale and left behind some of the enemies which attack it. This gives the scale a tremendous advantage and often before the balance is restored very great damage is done. To restore the balance more speedily the entomologist looks to the native home of the scale to ascertain its most effective enemies. These are then imported and bred and liberated in various parts of the infested areas. In some cases, such as the Lady Bird Beetle, belonging to the genus Pentilla, has rendered excellent service to the fruitgrower. The chief enemies in Canada are birds, Acarids, insects and fungus parasites. The most effective of these are the Acarids and insects.

It is difficult to calculate accurately the amount of good service rendered by many of the insectivorous birds. Warblers and Vireos, on account of their aesthetic value and also the fact that they are insectivorous are rarely taken and subjected to examinations of stomach contents. Furthermore their minute size render it almost impossible to observe their actual work. The larger birds, such as the Hairy and Downy Woodpecker, have been secured, stomach contents examined and found to contain, in some cases, hundreds of scales in a single stomach. This is especially noticeable in the case of the very destructive New York Plum Scale. It is highly probable that these insectivorous birds rank first in the control of the larger kinds of scale insects, such as Eulecanium, Coccus and Kermes.

The mites again deserve a great deal of credit for their very efficient service to the fruit grower, in that they consume large numbers of scale insects all through the season. Some confine their attacks to one particular species, while others are general feeders, attacking a large variety of insect life. There are about eight known species of Acarids in Canada that are in some way associated with injurious forms of scale insects. There are at least, three species working upon the San José Scale:*Hemisarcoptes malus* is commonly found in the St. Catharines district. Species of *Monieziella* and *Rhyncholophus* were found feeding upon San José at Grimsby, Ontario. Four species were found either feeding upon the eggs or the adult of New York Plum Eulecanium. Three of these species belong to the genus *Rhyncholophus,* and the other to the genus *Gamasus.* All four undoubtedly help to keep this scale in check. Two species are found attacking the eggs of the Oyster-shell Scale. *Tyroglyphis longior* is very common at Guelph, and *Hemisarcoptes malus* at St. Catharines, Ontario. Another species belonging to the genus *Galumna* was found feeding upon the scale known as *Eulecanium fletcheri.*

Insect Enemies.

These, if not the most destructive are at least the most numerous of all Coccid enemies. They represent four orders of insects: the Hymenoptera, Coleoptera, Lepidoptera and Diptera. Mr. Alfred Eastham investigated the parasites of scale insects in Ontario and found twenty-three species belonging to the Hymenoptera.

Host Relations of Species of Aphelinæ Reared During the Summer in the Vicinity of Guelph.

Parasite.	*Host.*
Aphelinus mytilaspidis	Lepidosaphes ulmi.
	Chionaspis pinifoliæ
	Chionaspis salicis
	Aspidiotus perniciosus.
	Aspidiotus ostreæformis.

Parasite.	*Host.*
Aphelinus diaspidis	Aulacaspis rosæ.
Aphelinus fuscipennis	Aspidiotus perniciosus.
Coccophagus lecanii	Pulvinaria innumerabilis.
	Eulecanium cerasifex.
	Eulecanium fletcheri.
Coccophagus cognatus	Eulecanium fletcheri.
	Coccus hesperidum.
	Eulecanium cerasifex.
Coccophagus flavoscutellum	Pulvinaria innumerabilis.
	Eulecanium cerasifex.
Coccophagus fletcheri	Eulecanium fletcheri.
Ablerus clisiocampæ	Chionaspis furfurus.
Physcus varicornis	Chionaspis pinifoliæ.

Host Relations of the Species of Encyrtinæ Reared During the Past Summer in the Vicinity of Guelph.

Parasite.	*Host.*
Comys fusca	Eulecanium cerasifex.
Comys bicolor	Eulecanium fletcheri.
Comys scutellata	Eulecanium caryæ.
Chiloneurus albicornis	Eulecanium fletcheri.
	Eulecanium cerasifex.
	Eulecanium caryæ.
Aphycus jarvisi	Eulecanium fletcheri.
Aphycus pulchellus	Kermes pubescens.
Aphycus pulvinariæ.	Eulecanium fletcheri.
	Eulecanium cerasifex.
Aphycus johnsoni	Eulecanium cerasifex.
Aphycus flaviceps	Eulecanium cerasifex.
Blastothrix longipennis	Eulecanium cerasifex.
	Eulecanium fletcheri.
	Kermes pubescens
Encyrtus cyanocephalus	Eulecanium caryæ.
	Eulecanium cerasifex.
Encyrtus flavus	Eulecanium fletcheri.
Encyrtus sp.	Eulecanium fletcheri.
Encyrtus sp.	Kermes pubescens.

In the Coleoptera the Coccinellids are most conspicuous in combatting the more injurious species of scale insects. A small species known as *Hyperaspis signatus* in the larval stage has been found feeding upon the Curtis Scale at Guelph, Toronto, Grimsby and St. Catharines. In Toronto the same species was found in large numbers feeding upon the Forbes scale on a Hawthorn tree. The larva has also been found at Guelph feeding upon *Aspidiotus æsculi* and the New York Plum Scale. They probably do their most effective work upon the Cottony Maple Scale as it is estimated that they devour about eighty per cent. of the total scales produced in a season. Other species of Coccinellidæ are also beneficial in destroying a number of different scales. Two of the most common species are *Chilocorus bivulnerus* and *Seymus punctatus.*

In the order Diptera only one species is found to be effectual. This is the one known as *Leucopsis belulila* which parasitizes the Grass Scale (*Eriopeltis festucæ*) in Nova Scotia. There are also two species of Lepidoptera which are parasitic upon scale insects. One species is found attacking *Kermes galliformis* and the other species has been taken on the Cottony Maple Scale (*Pulvinaria vitis*).

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ALEYRODIDÆ OF ONTARIO.

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There are at the present time three species of Aleyrodidæ found in Ontario: ALEYRODICUS ASARUMIS (Shimer) on the Wild Ginger (*Asarum canadense*) and the White Baneberry (*Actea alba*); ALEYRODES FORBESII (Ashmead) on Soft Maple (*Acer saccharinum*) and Red Maple (*Acer rubrum*); ALEYRODES VAPORARIORUM (*Westwood*) on Salvia, Solanum, Coleus, Coreopsis, Cucurbita, Cuphæ, Fuchsia, Hibiscus, Lycopersicum, Monarda, Rosa, Rudbeckia, Helianthus, Tropæolum, Verbena, Zinna, Digitalis, Pelargonium, Phlox, Cobea, Dahlia, Ribes, Fragaria, Solidago, Aster, Smilax, Polemonium, Delphinium, Achillea, Calliopsis, Chrysanthemum, Callistemma, Campanula, Antirrhinum, Berberis, Aquilegia, Lonicera, Nicotiana, etc.

Those who have made a special study of this group believe that the White Fly had its origin in some part of South America, the Neotropical region, where they formed the genus Aleurodicus, which except through human agency have remained there ever since. A branch belonging to the genus Aleyrodes has spread over the greater part of the world.

Aleyrodicus asarumis is a very common species in Ontario and was noticed in 1902 on a species of Wild Ginger at Guelph. *Aleyrodes forbesii* was first observed in the fall of 1907 up the River Speed from Guelph where the nymphs were found rather abundantly on the leaves of Soft Maple. *Aleyrodes vaporariorum,* which is most interesting and of greatest economic importance, is believed to be a native of Florida or Mexico; though it was first described and named by Westwood after it had reached England in 1856. Since reaching the United States it has spread gradually through the North-eastern part principally; and wherever introduced has multiplied very rapidly. Previous to 1900 there are only one or two reports of the species in Ontario. In 1903 it had appeared at the Ontario Agricultural College greenhouse and by 1906 had become fully established.

The White Fly or Mealy-wing Fly belongs to the Homopterous division of the order Hemiptera, in which the four similar membranous wings are held roof-like over the body. It is a member of the family Aleyrodidæ, which consists of small, active insects, easily recognizable by a characteristic, white, wax-like secretion, completely covering the wings and giving them the popular name Mealy-wings and White Fly. The young Mealy-winged Flies look much like scale insects and have the same general habits. The larvæ are flattened, oval, scale-like creatures found stationary on the lower sides of leaves. Most species of them bear numerous wax rods and copious secretions of wax all over their bodies. The pupa, also are characterized by their secretions of wax; and the amount and disposition of the rods and fringes on them are made use of very largely in the distinction of species in this family.

In their relationship with other insects the Aleyrodidæ come nearest the Aphididæ and the Coccidæ; from the former they differ most markedly in being stationery during their immature stages, and from the latter in being winged in both sexes of the adults and therefore capable of moving about rapidly.

The life-history of the White Fly (*Aleyrodes vaporariorum*) covers a period of approximately five weeks; and the broods succeed each other constantly, the year round. The eggs are oval, light green, changing to almost black in color, smooth and with a short stalk from one end raising it off the leaf. They are deposited irregularly on most kinds of leaves; but on smooth leaves it is quite characteristic for

many of them to be deposited in more or less nearly complete circles. The female has been observed by different persons to accomplish this arrangement of them by inserting her beak into the leaf and rotating around this as on a pivot. The eggs hatch in about ten days, and the young larvæ move about for a short time and then insert their mouth parts into the tissues of the leaf and assume their scale-like form. When fully grown, which is in about two weeks, the larvae are less than a millimetre in length. After about two weeks longer in the pupal stage the adults emerge. It is difficult to say how long they may live in the mature form.

It is only a small family consisting of two genera and about 150 species. Like many of the other families of insects of small size it has been much neglected.

The two species attacking the Maple and Wild Ginger have a wide distribution in Ontario, especially in the Western portion of the Province. *Aleyrodicus asarumis* have been found almost everywhere that the Wild Ginger grows. It is sometimes found on the White Baneberry at Guelph, but it seems to have a decided preference for the Wild Ginger. It confines its attacks to the lower side of the leaves and is usually so numerous as to almost cover this side of the leaf. Large quantities of honey dew are given off by this species and the honey dew fungus nearly always accompanies the insect. The life-history in Canada has not yet been fully determined, but sufficient is known to prove there are at least two broods during the season. It passes the winter in the mature form, but the writer has not yet been able to find the hibernating quarters. Shortly after the Wild Ginger leaves have expanded in the spring the White Fly may be found in the egg stage on the leaf. In the course of a few weeks the affected leaves turn yellow and myriads of the creatures may be seen at work. No insect parasites have been observed at work on this species and from this we may infer that it has been somewhat recently introduced.

Aleyrodes forbesii has been found as far east as Toronto, as far north as Gravenhurst, and as far south as London, Ontario, and the indications are that it is almost as widely distributed in Western Ontario as the maple itself. It is the largest of the three species under discussion. The adults are rarely seen and the large, box-like larvæ are sparingly scattered over the under surface of the leaf. The larvæ are pale green or whitish, somewhat the same color as their surroundings or environment and it is probably due to these two things that this species has not been reported more often. The work of insect parasites has been observed on several occasions in connection with this species and this probably accounts for the comparatively small amount of injury done to the host. The ravages are much less some seasons than others.

It is interesting to note that the above two species are both found in the State of Illinois.

Aleyrodes vaporariorum is of very great concern to people engaged in greenhouse work. From enquiry made to florists in all parts of Ontario it would appear that not a single section is free from the pest. As it cannot, so far as is known, winter in any stage out-of-doors, at least in its northern part of its range, it is recognized principally as a greenhouse pest, but it is sometimes very common and destructive to gardens and small fruits, especially in the vicinity where it is carried over the winter in greenhouses. It appears to be very partial to members of the family of plants known as the Solanaceæ, i.e., tomato, tobacco, etc. Several reports have been received from gardeners in different parts of the Province where crops had been ruined by this pest. It is sometimes very abundant on the strawberry and currant plants. In the fall when the temperature lowers they seek

shelter in green houses or homes where plants are kept and a constant reproduction is kept up the year round.

Another way in which these species do injury is due to the supply of honey dew given off where a fungus grows and spreads over the surface of the leaf, interfering with the nutrition of the plant.

The insect is not a good flyer, but can go considerable distances with the wind, and whole neighborhoods are often infected in this way. The flies are often carried from place to place on infested plants or parts of plants for identification purposes. They cling tenaciously to clothing and are sometimes carried from greenhouse to garden in this way.

So far very few parasites have been found at work on the Aleyrodidæ of this country and these have not yet been identified. In South America and other tropical countries many species have been found, notably the families Trichogrammatidæ, Aphelinidæ, Eupelinidæ, Mymaridæ, Platygastridæ, Diapridæ, Formicoidæ of the Hymenoptera, Chrysopa of the Neuroptera, Thrips, belonging to the Thysanoptera; Mites of the Acarina. In addition to the above-mentioned families of insects and acarids two genera of fungi, Aschersonia and Sphaerostilbe also assist in the control of the White Fly.

It is my experience that considering all kinds and conditions of plants and greenhouses cyanide of potassium, although perhaps used the least, is the cheapest and most effective means for fumigation. The best results are obtained by using ¾ of an ounce of potassium cyanide at a cost of 2½ cents, and 1½ ounces of sulphuric acid at a cost of about ¼ cent, per thousand cubic feet. This method, besides costing only about 2½ cents per thousand feet, is thoroughly effective and requires little labor in its application.

As this means has heretofore been considered by a great many florists as dangerous to human life in its application, it has been but sparsely used. The solution, however, is so weak that there is not the least danger to human life or health if only the simplest precautions are taken.

The formula recommended is as follows:

Potassium cyanide, 1 ounce by weight;
Sulphuric acid, 1½ ounces by volume;
Water, 3 ounces by volume.

The cyanide should in all cases be chemically pure, 98 per cent pure cyanide, and the sulphuric acid should be the best commercial, or 85 per cent. grade. It is always best to have the cyanide broken up into small pieces. Generators should always be earthen or glass vessels, never metal, having a gallon capacity. In order to distribute the gas equally throughout the greenhouse it is well to place the generators at equal distances apart along the walls. The greenhouse should be as much as possible airtight, with dry atmosphere and a temperature of below 60 degrees Fahrenheit, and the generation of gas should be done after darkness has set in. After having placed the generators properly, with water and sulphuric acid, the packages of cyanide are then added, commencing at the generator farthest from the place of exit, and the operators should then leave as soon as possible and close the door. The dropping of the packages of cyanide into the generators by means of a cord operated from a position outside of the greenhouse is entirely unnecessary and is now quite obsolete, as the fumes from the composition are too weak to do any injury. The quantity of the doses must, however, always be regulated by the florist from the condition of the greenhouse, the plants, and the insects to be destroyed.

It is the confidence I have in the remedy which prompts me to highly recommend it as the cheapest and most effective means for destroying the White Fly in

greenhouses, without, however, destroying or endangering the health or life of plants or of the operator of this remedy, and I would encourage in every way possible the use of this means that these insects, if not totally destroyed, are still so kept in check as to do but the minimum of harm.

SOME INSECTS OF THE LARCH.

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It is my intention to describe to you this afternoon rather briefly an attack made this summer upon a small clump of larch by a series of scolytid beetles; and to use this attack as an illustration of the breeding habits of Scolytidæ in our great forests of pine and spruce.

The larch bush to which I refer is situated at Hudson, about ten miles west of Ste. Anne's. The trees were fine specimens of Larix of medium size, with an average height of perhaps 40 feet, and until this season had been particularly healthy. Previous to this season I had not taken a scolytid from larch in that immediate neighborhood. Last winter a wide section was cut through the bush, and a plank walk laid through it, about three feet from the ground. The stumps were left rather high; the greater part of the rubbish was removed: several untrimmed larches were left lying in the clearing and one was lying well shaded by standing trees; and the trunks which had not been removed were piled in the clearing and left to dry through the summer.

The scolytids which attacked the dying bark, thus provided, belonged to five species: *Dendroctonus simplex, Dryocoetes autographus, Dryocoetes* n. sp., *Ips caelatus* and *Ips balsameus*. In the wood of the stumps an ambrosia beetle, *Gnathotrichus materiarius,* bred in large numbers.

I wish first to discuss the habits of these species very briefly.

D. simplex, Lec. This species is the common Dendroctonus of larch and is probably to be found wherever that tree is abundant. It is recorded from West Virginia northwards to Ungava and west to Michigan, and I have seen specimens in Mr. Evans' collection from Mackinak, Man. As the larch is found throughout all Eastern Canada excepting Northern Ungava and westwards to the Rockies, excepting the Barren Grounds, this beetle will probably be found throughout all that region. It is not a particularly injurious species. It prefers the bark of stumps and recently cut and dying trees, but will attack apparently healthy trees when dying bark is not to be obtained. It occurs chiefly in the bark of the trunk.

This species was first noticed this season on July 10th in the bark of larch stumps. The trees had been cut the preceding winter, and cleared away, leaving stumps about 1½ feet high. The place was swampy, and although the stumps were in the open sunlight, they remained sappy throughout the season. Only a part, perhaps half, the stumps of the clearing were attacked by this species. On July 10th—the date on which they were first noticed—the egg-tunnels contained eggs in the outer ends: and larvæ of all sizes, from those recently hatched up to nearly full-grown, were boring in the bark. There were no pupæ and no young adults.

About a month later (August 6th) the tunnels in these stumps contained full-grown larvæ, pupae, recently transformed, light coloured adults, and older, darker adults; and many adults had escaped, as evidenced by the holes through the bark above the ends of the larval tunnels. The larvæ were in tunnels coming from the

distal end of the egg-tunnel; the pupæ in the ends of larval tunnels arising nearer the entrance hole; the light-coloured adults in tunnels arising still nearer the entrance hole; and, lastly, the darker adults in tunnels coming from the proximal end of the egg-tunnel.

On the same day, August 6th, this species was found in large numbers starting tunnels in a felled larch which lay near the stumps just referred to, but shaded by standing trees. A few felled larches lay in the open clearing, but these were not attacked. Egg-tunnels of this second brood were also found in many of the stumps. A standing larch, evidently dying, contained many fresh tunnels of *Ips balsameus* but none of *D. simplex*.

The tunnels of *simplex* in the fallen larch were, on Aug. 6, usually well started, with numbers of eggs already laid, but no eggs had hatched. Very evi-

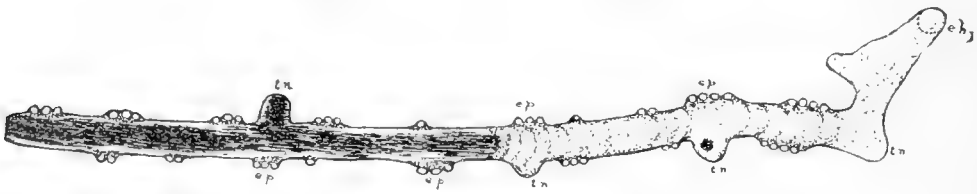

Fig. 4. *D. simplex*, Lec. An egg-tunnel showing egg-pocket, e.p., containing eggs; turning niches, t.n., and entrance-hole, e.h.

Fig. 5. *D. simplex*. Development of larval galleries; larvæ half-grown. e.t., egg-tunnels; l.g., larval galleries; larvæ were working in the clear spaces.

dently we had there a second brood, although I did not actually trace the newly transformed beetles from the stumps to the felled tree, and one brood a season has hitherto been recorded for this beetle.

The egg tunnels are about 1/8 inch wide, although the width is very irregular in the different parts of the tunnel. In an egg-tunnel recently started, the half nearest the entrance hole will be packed tightly with chips and excrement, and in the distal—empty—half will be found the beetles, a pair or more. In some I have found one female and as many as three males. As the tunnel is lengthened, the refuse, chips and excrement, is packed towards the entrance, leaving always a short, clear space at the distal end. As the tunnel increases in length, shallow pockets

are cut in the bark along the sides, and in these the eggs are deposited, on end, and packed in dust. Usually three eggs are found in a pocket, but sometimes 4, 2 or 1. The pockets are cut at the end of the tunnel on the side, so that the female must reverse her position to oviposit. The diameter of the tunnel will not admit of this, so along the sides of the tunnels are found wide niches, as wide as the tunnel, which may be called turning-niches. These seem to be used by the beetles in turning about and in passing each other in the tunnel. Very rarely an egg or two will be laid on their sides. The eggs of one pocket being laid, the female lengthens the tunnel and cuts another egg-pocket, and so on until all her eggs are deposited.

The chips resulting from the boring operations, together with the excrement of the beetles, are packed firmly backwards towards the entrance hole, and not uncommonly eggs are found packed in this mass. By the time the tunnel has neared completion, we find usually a female in a clear space at the tunnel's end, and behind her the dust packed firmly with one or two clear spaces at intervals, in each of which will be a male completely walled in and contentedly feeding on the chips or on the sides of the tunnel. Not infrequently there will be an egg-tunnel branching from the first, cut by a female which had entered the first tunnel before the entrance was blocked with chips. These side tunnels often open into neighboring egg-tunnels, so that adjoining tunnels appear to anastomose. Occasionally ventilation holes are cut in the bark forming the tunnel roof, but very few of these were noticed.

The larvæ which hatch from the eggs along the tunnel sides bore into the bark away from the egg-tunnel, cutting the larval galleries, which at first very tiny and entirely in the bark, gradually increase in diameter as the larvæ grow, and finally score the wood. The larval galleries are extremely irregular, crossing and recrossing each other until the bark of that part is almost entirely reduced to powder, which packs the galleries. The larvæ which hatch from eggs laid in the chips packing the egg tunnel feed upon the mass of chips for a time, and later enter the bark from the tunnel sides.

Egg-laying lasts over a considerable period. Eggs and newly hatched larvæ of the second brood were found as late as August 26th. This second brood matured in sticks in the laboratory early in October, and emerged through holes in the bark.

Polygraphus rufipennis. This common bark beetle of spruce and pine seems quite as ready to attack dying larch bark, for we found it this season in great numbers in the piled larch trunks and tops and the felled larches lying in the clearing. I have never found this species in healthy trees. It is very common in dying bark of spruce, and, in our section, in red and white pine. This is a small bark beetle, 3mm. long, of a uniform dark brown or nearly black colour. It is readily distinguished by the combination of divided eyes and undivided, distally pointed, pubescent antennal club. Its work is well illustrated in the collection exhibited. An entrance hole is cut through the bark and a shallow chamber, called the nuptial chamber is excavated therein. From this chamber are cut in a radiating fashion, and between the bark and wood, from three to five egg-tunnels. The females cut the tunnels and in the nuptial chamber will be found the only male busy ejecting through the entrance hole the boring dust which the females have brought to the tunnel entrances. The eggs are laid singly along the sides of the tunnels, each in a tiny pocket called an egg-niche, and firmly packed in dust; so that the sides of the tunnel are smooth and the eggs completely hidden. From a few to twenty eggs will be found on each tunnel side. The larvæ which hatch from the eggs bore into the bark directly away from the egg-tunnels. When the larvæ are not much crowded their tunnels are fairly regular, but when many egg-tunnels lie close

together, as is usually the case, the larval galleries cross and re-cross, completely riddling the bark eventually. The larvæ pupate in the ends of the galleries and emerge by cutting each a round hole through the overlying bark. Often, as with many bark beetles, the young adults feed for a short time on the bark before cutting through to escape.

We have two broods of this species. The tunnels of the over-wintered beetles were started the last of May this year in the larch. By July 10th in these tunnels could be found well-grown larvæ, pupæ and young adults; and light coloured, and therefore recently transformed adults, were busy starting tunnels in felled larches lying in the clearing. The adults continued to emerge for several weeks, and on August 6th egg-tunnels were being cut and eggs laid in the fallen larch before referred to in connection with *D. simplex*. So far as my observations go, the tunnel is started by a female, and a male, and other females, join her later. The egg-tunnels are usually kept clean in this species, although more or less boring-dust is at times found in them. They seem to start their tunnels, at times, from the sides of a *simplex* tunnel, where they are sometimes found exploring during the entrance season. This second brood will apparently mature completely this fall, and hibernate as adults.

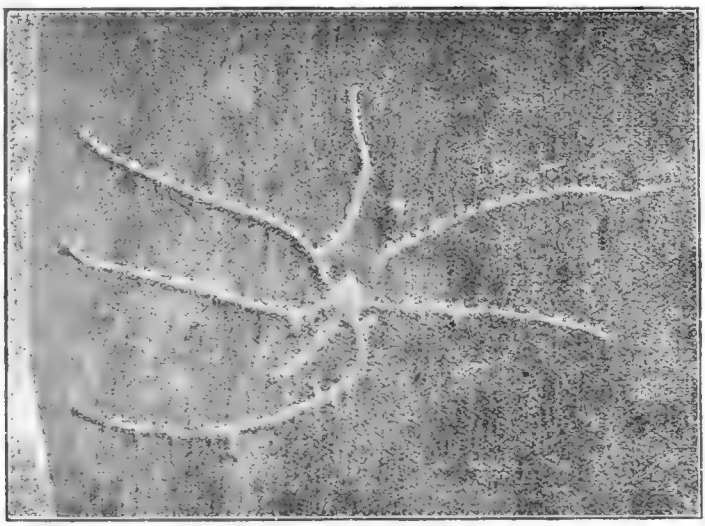

FIG. 6.
Work of *Ips balsamcus* in Abies, showing nuptial chamber, egg-tunnels, and egg-niche. The eggs were removed before hatching.

Ips balsameus was found on the 10th of July, starting tunnels in a diseased larch in the same bush. I could not be sure that this species had been the primary cause of the injury, apparently not, but certainly *balsameus* was helping things along merrily. This species breeds chiefly in the fir, sometimes also in the pine; and it frequently attacks and destroys trees, which, while certainly unhealthy at the beginning of the *balsameus* attack, might otherwise survive. It is to be considered an injurious species in fir and larch. There are two broods each season with us; the first eggs were laid in pine this season in the middle of May, and the second was, in larch, as just stated, early in July.

Ips cælatus—a larger but closely allied species—was numerous in the larch stumps. Its entrance hole is deep, and the nuptial chamber is often entirely in the

thick bark. From the nuptial chamber come off the winding, irregular egg-tunnels. The eggs are laid in groups of two to eight, in deep pockets along the sides of the egg-tunnel. The borings of the larvæ are very irregular and penetrate the bark in all directions. The larvæ pupate in their tunnels in the bark, and appeared through their exit holes early in July to start tunnels for a new brood. Egg-laying for the second brood was well advanced in the bark of the stumps on July 10th of this season. This species is common in our district in red and white pine. It works in the bark towards the base of dying trees; particularly it is found in stumps cut the preceding winter. I have never noticed it in healthy trees, although it might injure them when no dying bark was available. The first brood was egg-laying in white pine at Ste. Anne's, the second week in May this year, and when first noticed in larch, May 24, the eggs were practically all laid.

Dryocoetes autographus was breeding in the bark of the larch stumps. Its egg-tunnels are irregular, anastomosing, and when numerous difficult to follow.

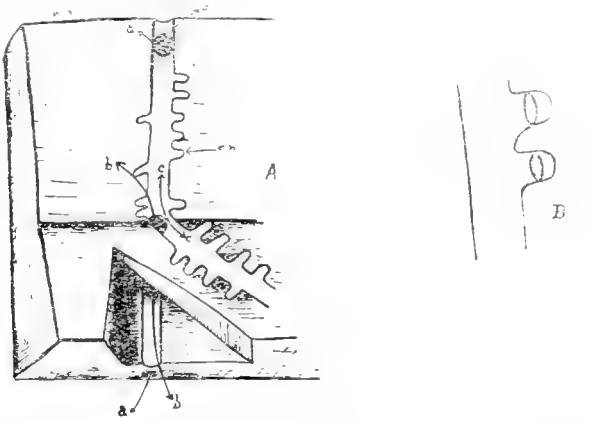

FIG. 7.
G. materiarius. Work in larch wood.A.—w.s., wood surface; e.n., egg-niche; d., a tunnel ending blindly behind a. In this tunnel the fungus develops rapidly. Eggs and larvæ have been removed from the niches. B.—Two eggs in position in the niches.

The eggs are laid side by side in shallow niches along the side of the egg-tunnel, and packed in dust. The longer axis points away from the centre of the tree. Frequently the eggs are sunken irregularly into the bark of the tunnel roof and packed in dust. The larval galleries are very irregular, usually destroying the bark. Both egg-tunnels and larval galleries are often entirely in the bark. There are two broods each season with us. By July 10th this season the egg-tunnels were about completed in the larch stumps, with the eggs practically all laid and many larvæ working into the bark. By the first of August these larvæ had matured in part and eggs were being laid in new tunnels from the sixth to the twentieth of that month. This insect prefers dying and dead bark of pine, spruce and larch, and works mostly at the base of the tree. It is not particularly injurious. A smaller, undescribed species of *Dryocoetes* was working with *autographus,* and has very similar habits.

This completes the list of the true Bark-beetles found in those larches. There was also present another scolytid—*Gnathotrichus materiarius*—one of the Ambrosia

beetles. This species bores well into the wood, cutting several side tunnels; each tunnel is cut, usually, by a separate female. The eggs are laid in shallow niches cut in the wood along the sides of the tunnels. The eggs are spindle-shaped and wedged into the niches, one in each, a little above the bottom, and a mass of chips and excrement, on which the ambrosia starts, is plugged into the opening. The larvæ deepen the niches until the depth is slightly greater than the length of the larvæ when full-grown. In these niches the larvæ pupate, and from them the adults push their way through the wall of dust and fungus which has previously blocked them in from the tunnel. The chief food of both adults and larvæ seems to be a fungus which grows on the walls of the tunnels and niches. The fungus is carried from tunnel to tunnel by the beetles, and stains the walls deep brown or black. The habits of the Ambrosia beetles are very interesting, but I shall not discuss them further at this time. There are two broods of this species in our district. The first brood was egg-laying this season on May 24th, and matured late in July. By the 6th of August new tunnels were being started in the stumps, and eggs laid for the second brood. Many eggs of the second brood were apparently destroyed by minute nematode worms.

This species breeds in pine and spruce as well as larch and its tunnels often injure lumber for the most valuable uses.

Only two of these beetles, *D. simplex* and *I. balsameus,* can be considered as serious larch enemies, and this is the first time that I have taken *balsameus* from that tree. *D. simplex* is known to attack and destroy but slightly diseased larches under certain conditions, and those conditions I wish to discuss now very briefly. Previous to this season *D. simplex* had been rare in that neighborhood, but it came in in fairly large numbers this spring, attracted from a considerable distance by the dying larch bark. Only half the stumps were attacked by the spring swarm, but the progeny which matured in midsummer numbered thousands of individuals. These parents of the second brood entered the bark of the remaining stumps, and of the felled larch in the shade in great numbers. They did not attack the dried bark of the cord-wood, nor of the felled trees in the clearing. The individuals of the second brood at present in that swamp must number many thousands. Whether or not they are of sufficient number to successfully attack standing trees is a problem which I shall watch with interest next season.

If, after the available dying bark has been utilized by the beetles next spring, there are but few individuals left, they will gradually scatter in search of a further supply of bark in such condition. If, however, there are immense numbers in the swamp unable to find bark in the condition which suits them best, they may succeed in ovipositing in the bark of but slightly injured, or even healthy, trees, in which case the larvæ would probably mature and the trees be killed. When a few scolytid beetles attack a healthy tree, usually the vigorous flow of sap drives them back before the eggs are laid, and the tree suffers but little. When the number attacking a tree is very great, the many entrance holes and started tunnels check the sap flow so that the beetles succeed in laying their eggs and the resulting larvæ develop in the devitalized bark.

The level of numbers at which a species, usually not injurious, will attack healthy or but slightly diseased trees is known as the Pest Level.

It will be seen that a slight modification of the method of cutting would have averted any danger from these beetles. If the stumps had been cut lower a few blows of the axe would have removed most of the bark from each. If then all the trunks had been trimmed and left in the open sunlight of the clearing there would

have been but little sappy bark for the parents of the second brood, and they would have scattered from the region, leaving a very small and harmless second brood.

The pest level of *D. simplex* is high. It is perhaps rarely injurious. But the pest level of certain species attacking pine and spruce is low, and when that level is reached the finest trees of the region are in danger.

It can be easily seen from this that careful destruction of wastes from cutting is of utmost importance in lumbering operations, the more so that many other forest insects breed in such dying bark and wood.

The conditions which obtained in this larch bush will be found everywhere in Canada, in the woodlots, in the lumbering districts, and in our virgin forests.

In the great forests under natural conditions we find that when, through the agency of forest fires, heavy storms or the attacks of other insects, scolytid beetles find much dying bark in a suitable condition, they breed in this until they reach their pest level for those conditions; then they attack and kill the healthy trees. Witness the terrible destruction of *D. piceaperda* in the spruce of Maine and New Brunswick, as described by Dr. Hopkins.

In the lumber woods the present careless method of cutting leaves culls and refuse to breed these beetles and other forest pests by myriads.

I pointed out a few moments ago that scolytid beetles followed forest fires, breeding in the dying bark of injured trees. Dr. Hopkins, the leading forest entomologist of America, has shown that the relations are at times reversed; so that fires which would otherwise have caused no considerable injury, gain headway in districts of forest devastated by these beetles, and sweep as great conflagrations over square miles of territory.

It is well to discuss the injury which these forest insects are known to do, but can anything be done to check them in our timber limits and in our great forests?

The control of certain forest insect pests, e.g., the larch saw-fly, is, so far, beyond man's ability. But a method of control has been worked out whereby many forest pests, chiefly Scolytidæ, can be effectively kept below the pest level. Such methods have been successful in European forests, and in certain sections of the United States, and will most surely be followed in Canadian forests in years to come. They consist in modifications of the methods of cutting. Injured trees, with the bark filled with thousands of these beetles, are cut, and either barked or got into the water before the beetles emerge to start their tunnels in other trees. Either the barking, if done at the right time, or the immersion in water, destroys the greater part of the larvæ or adults. These beetles seem, perhaps invariably, to prefer dying bark. Therefore by girdling, early in the season, trees selected for later cutting, the greater part of the beetles in the immediate neighborhood can be attracted to the bark of these "trap-trees," and later these trap-trees are barked or got into the water early, so that the contained brood will be killed. The refuse, tops and branches, are destroyed, removing what would otherwise be a suitable breeding-ground for many species.

Such modifications in methods of cutting can be relied upon when control is needed.

Before such methods can be outlined, however, it is necessary to obtain much information from forest entomologists. The insect pests of our Canadian forests have been studied but little. There are many injurious forest insects in Northern Quebec and Ontario about which we know absolutely nothing. There is much work to be done, therefore, by the systematist; work which is absolutely essential. The practical entomologist must be able to distinguish with certainty the injurious

species when he finds them. For instance, if recently killed pines are found with the bark filled with *Ips pini*, there is little cause for alarm. The pest level of that species is high. The same is true of a new species of Phlœotribus, which I have from spruce, and many other, indeed most, scolytids of this region. These species prefer, and usually are able to find dying bark for breeding purposes. But if spruces are found with *Dendroctonus piceaperda* in the bark, the matter may be serious enough; for this species is quite capable of destroying the finest of the spruce over miles of territory if once it surpasses the pest level. Much work should be done in the near future in collecting and studying the forest insects.

It is further necessary to know the exact life histories of the injurious species in the regions where they are numerous. The lumberman must know when to girdle the trap-trees, when to cut them and others with the bark filled with the brood, and bark or immerse them. He must know how many broods occur, and just when they appear to attack fresh trees. Many things must be known before we can outline profitable methods for the control of many of these pests.

This information must be obtained by entomologists; and those of us who are interested in forest insects have a great field before us, a splendid opportunity, and also a serious duty.

Insect control is only one factor in the great problem of forest culture; but it is an extremely important factor, and the sooner we know the injurious insects of our great forests, and their life histories, the sooner will the control of forest insects be undertaken in the Canadian woods.

The great forests of the United States have been almost swept away by forest fires, insects enemies and careless cutting. Now, perhaps too late, the people there are awake to the importance of forest control. We in Canada are following exactly in their footsteps. Great fires—there are hundreds of fires in our Northern forests every season—insect devastations, careless cutting, little effort towards reforestation; it needs no prophet to foretell the result.

Quebec, New Brunswick, Nova Scotia and British Columbia will surely soon follow the lead of this Province in taking decided steps towards forest control. And that good time will come the sooner if we entomologists preach at every opportunity that most important practice in the control of insect pests and fungous diseases, whether in the field, the orchard, or the forest—*Clean Culture.*

INSECT NOTES FROM STE. ANNE'S —NOV. 15, SEASON OF 1910.

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Orchard Insects.

The Apple Woolly Aphis, *S. lanigera,* has been gradually increasing in numbers with us for the last few years. It is found on many of our older trees in small masses, and is quite thickly scattered over the young orchard. On the young trees there is much more of it on the twigs than on the trunk just at this season, and the scars it causes are becoming numerous enough to need attention. Kerosene emulsion diluted 1-9 and driven in a strong stream controls it readily. I have never found the root form in Quebec, although it probably occurs in small numbers.

The Round-headed Borer, *Saperda candida,* occurs in very small numbers in our orchards; although it is common enough in an orchard about a mile away. At Cote St. Paul and at Rougemont it is doing serious injury.

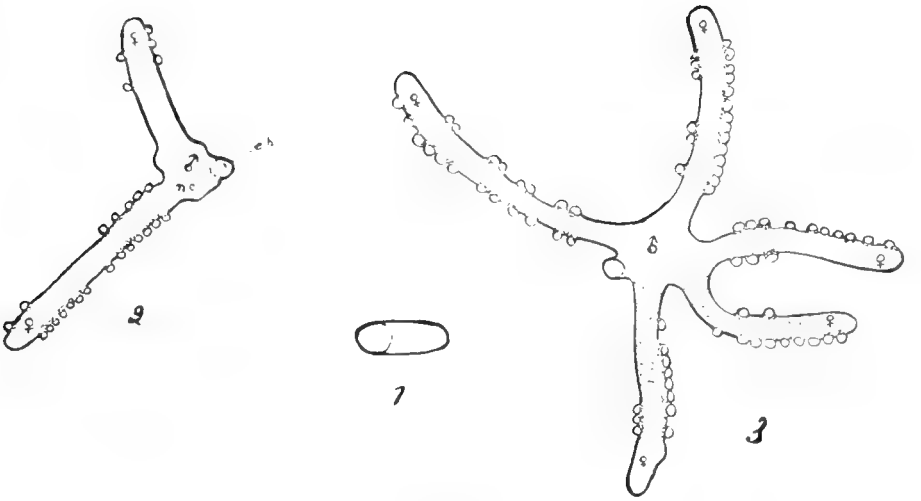

FIG. 8.
Work of *P. rufipennis*. Three stages in the development of the egg-tunnels.

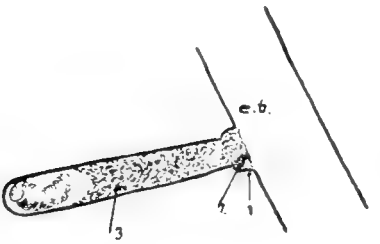

FIG. 9.
I. balsameus. Development of larval gallery. 1, egg-niche; 2, egg-packing; 3, chips and excrement of larva, darker in color; e.t., egg-tunnel.

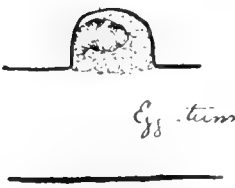

FIG. 11.
I. balsameus. Newly hatched larva.

FIG. 13.
I. caelatus. From white pine.

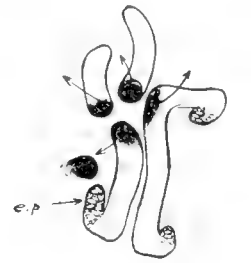

FIG. 10.
Larch Ips. Under side of bark.

FIG. 12.
The Larch Ips (24-V-10). Under side of the bark shown, with eggs in the pockets.

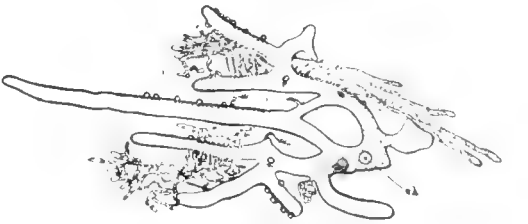

FIG. 14.
Dryocoetes autographus. Work in larch bark; larvæ one-third grown.

7 E.S.

FIG. 15.
Work of *Ips balsameus* in Abies, showing the wood surface scored by the chambers, egg-tunnels, larval galleries, and pupal cells. The latter are often sunken as indicated at "p.c." The work of *Monohammus marmorator*, which was bred from that trunk, is shown at "M.m."

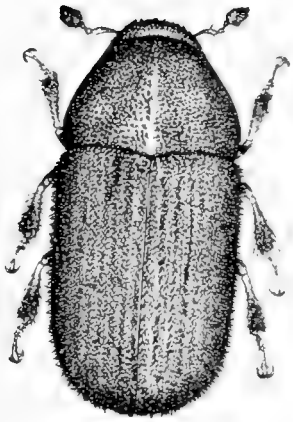

FIG. 16.
Polygraphus rufipennis
(Kirby).

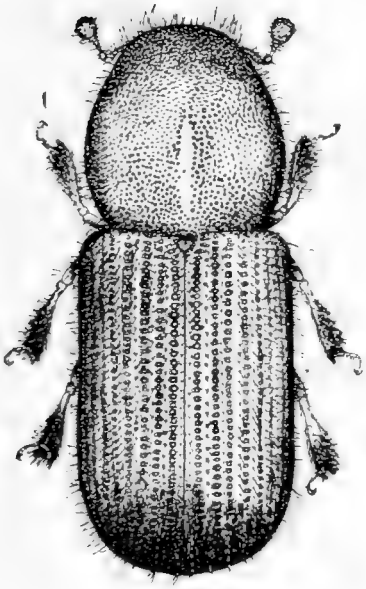

FIG. 17.
Dryocoetes autographus (Ratz).

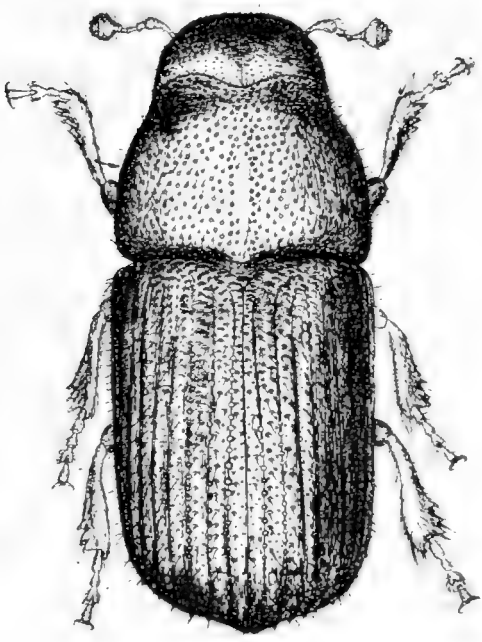

FIG. 18.
Dendroctonus simplex (Lec.)

The Flat-headed Borer, *Chrysobothris femorata*, is hardly found in our apple trees at all. And this is interesting, for the species is very common in the neighborhood, breeding in great numbers in fallen hickory and oak, particularly the former. This spring I took scores of specimens from one fallen hickory at Hudson, a few miles from Ste. Anne's. The beetles run about over the bark on fine days, mating and egg-laying, and fly very readily with a distinct "hum." Egg-laying begins with us on hickory in June, and lasts until late in July, although the greater part of the eggs are laid by the second week of July.

In our region at least the beetles much prefer dying hickory to apple trees in any condition, and I feel confident that Mr. Chittenden's suggestion that broken branches of hickory scattered about the orchard would trap most of the beetles, is one well worth trying when these beetles are injurious in orchards.

The Fruit Bark-beetle, *Eccoptogaster rugulosus*, is not yet to be found in our orchards. I have never taken any indeed in this Province.

The Peach-tree Bark beetle, *Phlocotribus liminarus*, was found in great numbers this season in wild cherry near the college. Over a score of large trees were studded with the gum from its entrance holes, although the beetles succeeded in breeding in very few of them. The entrance holes, and in a few places on some trees the egg tunnels, were cut this spring but very few eggs were laid. Again on the tenth of August, light coloured adults were starting tunnels in the bark.

Next year these cherry trees will probably have a hard time of it. They had enemies enough before, indeed, for the common cherry borer was altogether too plentiful.

Xyleborus dispar I have never taken in Quebec. A close ally, *X. serratus*, is very common in several forest trees, notably in yellow birch.

Last spring I bred from apple-twigs sent from Cambridge, N. B., a species of *Oberea*, which is possibly *O. tripunctata*. The female cuts three rows of bites and lays the egg between the bark and the wood above the second row. The grub feeds at first in the dying tip, and later bores downwards through the twig. The twigs are found dead during the summer and are frequently broken by storms. The injury is not serious, as yet, but the species may easily become an injurious pest.

The Buffalo Tree-hopper, *Ceresa bubalus*, has badly scarred several of our young trees. The cuts were made on both the stems, which are very small, and the branches. Soft maple seems to be preferred by this insect for egg-laying, and until the young maples were cut away from near our orchard the fruit trees were left entirely alone.

The Bud Moth, *Tmetocera ocellana*, was present in considerable numbers in our young orchard this season. Owing to lack of labor, early sprayings had to be omitted, and the result is intimated in the accompanying photograph. A poison spray, late in July, should control this insect effectively for the next season. The caterpillars begin to pupate about June 10 with us. The first adults appeared in the cases June 28, but empty cases were found in the field as early as the 18th.

When our orchard is sprayed with lime sulphur, winter strength, early in spring, we see little of the bud-moth, the case-bearers, or the leaf-aphides. I do not say that lime sulphur controls these insects, but our experience, so far, seems to indicate it.

The Cigar Case-bearer of the Apple, *Coleophora fletcherella*, was unusually abundant on our fruit trees this summer, and apparently the same species was breeding on thorn. The larvæ ceased feeding about June 15th, this season, and the first pupæ were found on the 20th. The first adults appeared in the cages on

Fig. 19.

Tmetocera ocellana, Bud-moth. Work on apple-leaves.

June 29th, and on the same day a larger, distinct, undetermined species of *Coleophora* was bred from cases on the thorn.

The Pistol Case-bearer of the Apple, *C. malivorella,* was present also in considerable numbers.

The Permanent Apple Aphis, *Aphis pomi,* was exceptionally numerous this season, and with it many *A. sorbi.* The leaves were badly curled, but its parasites controlled it before serious injury was done. Very few Aphides of either species could be found on the trees during the summer, but early in October both species were again common, and the leaves were curling badly. *A. pomi* was vastly more numerous, however, and seemed responsible for the curling. It has been reported that the leaf curling was due mainly to *sorbi.* It does not seem so with us. K. emulsion, or better, fish oil soap, about the middle of October would effectually control them for the following season; and lime sulphur, 1.04 S. G., sprayed in the early spring seems to be effective. Even in Quebec, where the San José is as yet practically unknown, a regular annual spray of lime sulphur, 1.04 S. G., seems a most excellent orchard practice.

The Apple-tent, *Malacosoma americana,* has its cycles with us, as elsewhere, and just now is on the increase. Many egg-masses are found this fall, whereas for the last two years but few were to be had. The Leaf-roller, the Leaf-crumpler, and two Leaf-miners have been common but not injurious.

The Codling-worm, *Carpocapsa pomonella,* has furnished us nothing new; except perhaps that it has discovered that we want it for class use and refuses to spin its cocoons on the trees. For some reason or other we found only about six cocoons on the trees this spring, although the species is not by any means rare.

The Plum Curculio, *C. nenuphar,* is not troublesome in our apples, although it will soon be a plum pest with us—our plums are just beginning to bear. The species causes more injury to apples than any other insect in some Quebec localities. As an apple pest I am quite of the opinion that it can be partially controlled by having a few plum trees in the orchard as traps. Thorough spraying with poison for the codling-moth, and rigid destruction of all fallen "wormy" fruit usually controls this pest.

The Apple Curculio, *A. quadrigibbus,* is injurious in a few Quebec localities, notably in Covey Hill region. A large orchard there has a considerable portion of the fruit distorted this season, and I think much of the injury is due to the punctures of this pest. Careful destruction of the fallen fruit is of importance in the control of this insect, and jarring is of use on small trees. Probably it is effectively controlled by spraying regularly for the codling-worm. This curculio lays its eggs in a simple puncture, and does not cut the crescent-shaped slit as does *nenuphar.* It pupates within the apple fruit.

The Apple Maggot, *T. pomonella,* is found in but few localities in Quebec, notably at Como, and in the region about Hemingford and Covey Hill. It has been effectively controlled at Como by careful destruction of the fallen fruit. That is, so far as known, the only effective method of control.

The San José we do not know in Quebec, although it has been reported from one place this summer near the Ontario line. *A. ostreaformis* was found here this season on plum trees. Our only apple scale is the Oyster-shell, *L. ulmi.* It is, however, often injurious, and is too frequently overlooked. There is no excuse for its presence in injurious numbers. Lime-wash in the late fall, or lime-sulphur in the early spring, with a contact-spray as the young appear in the late spring effectively control it. It is in neglected orchards that we find the Oyster-shell in abundance.

The Canker worms, *A. pometaria,* and *vernata,* trouble us but little at Ste. Anne's. In parts of Quebec, however, they are of local importance, and in the Annapolis Valley of Nova Scotia are among the worst of the apple pests. Under ordinary circumstances we recommend lead arsenate, applied as needed, and *when the caterpillars are small.* Carefully applied, and carefully watched bands of tree-tanglefoot are perhaps profitable in the districts worst affected. The males and females of *A. pometaria* have been common here this fall and were abundant until late in November; but we find most about the maple trees.

Small Fruits.

The Currant Span-worm, *C. ribearia,* has become a pest with us. Its spotted looping caterpillars feed voraciously, and seem harder to kill than the common saw-fly larvæ. Paris green is always effective, and plenty of hellebore will do the work. The caterpillars are very common early in June, and pupate the last of the month. The first moths appeared in our cages on July 4th, but were found outdoors on June 29th. The egg-laying period extends over several weeks.

The Currant Borer, *Sesia tipuliformis,* has nearly ruined a currant patch in this neighbourhood. Last year, on July 9th, we noticed a number of dying canes, which proved to have been killed by larvæ of this species. The larvæ had escaped and only two parasitized pupæ were found. There was nothing to be done then, of course, as the moths were all out and egg-laying partly over. This season by April 14th the larvæ were working in the canes in which they had wintered. While small they keep to the pith and may be found in all parts of the cane. Their work leaves a black tunnel through the centre of the cane, and the species may be recognized by this character of their tunnels. When full grown the larva spins a cocoon within the cane near an exit hole through the side previously cut by it. Shortly after the cocoon is spun the larva pupates. Often these pupæ wriggle from the cocoon and project, head foremost, from the opening, after the fashion of other Lepidopterous wood-boring species, thus enabling the moth to emerge without touching the wood. In many instances, however, the pupa-cases remain within the cocoons. In the laboratory cages the later stages are passed rapidly, and give little indication of the condition in the field. Larvæ pupated in the cages on the 1st of May, and emerged seven days later; but on this date, May 8th, the caterpillars outdoors were still feeding, and only a few even spinning cocoons. The first pupa was found outdoors on May 11th, and the greater number of the adults were flying during the third week in June. Mating and egg-laying take place at this time. The moths are extremely active, darting back and forth over the patch during the sunshine, but disappearing in cloudy weather. The eggs are laid on the canes, and the larvæ enter the canes and feed for the rest of the season, becoming perhaps two-thirds grown by winter time.

The injury to the canes appears in June, or late in May, usually about the time of pupation. The leaves wilt, turn yellow and fall, and the cane rapidly dies. Occasionally the canes survive the attack and bear fruit the following season. In these cases the old exit hole can be found in the side of the cane.

This insect is a very injurious pest, and quite capable of completely destroying a large plantation in a few years. The only method of control consists in rigidly destroying, *burning,* the diseased canes, as soon as they can be distinguished. Usually they are noticeable after, or even before, pupation, and can always be detected after pupation by the exit holes.

Our experience with this insect illustrates very well the value of clean culture in insect control. The moths appeared in the currants suddenly and in great numbers. They came from a row of old, neglected currants in a nearby orchard. They had bred in those canes, increasing in numbers, until finally there were no sound canes left. Then they took the shortest route to the currants first mentioned, about eight hundred yards away.

It is true of many of our injurious insects that a rigid system of clean culture is the cheapest and most effective method of control. Clean culture is a gospel well worth preaching. It would save our farmers and orchardists many thousands of dollars every year if rigidly practised; and the expense would be small. I know an apple orchard carefully sprayed and cared for, yet badly infested with apple pests every year. Why? Because just over the fence is a neglected orchard of perhaps fifty trees. These trees are worthless and absolutely uncared for. They serve, however, to breed apple insects for the whole neighbourhood. Clean culture even with us in Quebec is one of the most important factors in successful fruit-growing. In Ontario it is even more important, for here you have serious pests, the San José, and the bark-beetles, which we do not need, as yet, to consider.

Another currant borer, *Psenocerus supernotatus,* bred in considerable numbers in our canes this season. The beetles breed in the tips of the canes, and seem to do but little damage.

The Raspberry Cane-borer, *Oberea bimaculata,* was particularly numerous this season in raspberries. The adults appeared about June 20th, and were present in great numbers until the last of the month. Scores of specimens were picked from the canes during mid-day. Probably the same species breeds commonly here in wild raspberry and blackberry. Egg-cuts found here this season on roses may have been from *O. b. basalis,* a species which Mr. Morris, of Port Hope, has taken this season from rosebushes.

The Currant Saw-fly and the Currant Aphis were of course more or less common but easily controlled. I notice that currant growers seldom bother much about the late appearing larvæ of the former. Where these are killed the first brood of the succeeding season is usually few in numbers. The Currant Aphis appears to spread but slowly, at least with us. I have been watching it for three years now on a small group of canes where it is allowed to breed. Although it curls up practically every leaf on those bushes every season, it has so far caused no trouble in our plantation some thousand yards away.

The Grape-Vine Root-borer, *Fidia viticida,* appeared in our vineyard three years ago in small numbers. The characteristic holes in the leaves were quite evident. Possibly our cold winters are too much for them for we have never seen the species since.

MISCELLANEOUS.

The Rust Fly, *Psila rosæ,* has appeared in Montreal Island, and threatens to render carrot raising a precarious business. It has long been a serious pest in the Maritime Provinces and in Eastern Quebec, but until recently has been rare with us. It is difficult to control, and I know of nothing better than the practice recommended by Dr. Fletcher, of spraying with kerosene emulsion every ten days from the time the carrots are thinned until four or five sprays have been given. The spray should soak the ground about the roots.

The Clover-root borer, *Hylastinus obscurus*, is widely spread throughout the Montreal region. Apparently it will soon allow but one good crop of clover in our neighborhood.

Red and Mammoth Clovers are seriously injured; and I find the beetles breeding also in Alsike and in Crimson Clover, but not to an injurious extent. They sometimes start their tunnels in White Dutch and Sainfoin, but I have not so far found them breeding there. Alfalfa and sweet clover are not affected here.

The beetles started their tunnels here this season in the last of May and first part of June. They cut an entrance hole either in the base of the crown or through

FIG. 20.
Hylastinus obscurus. Work in clover roots. *e.h.*, entrance hole; *x.*, borings of adult beetle. The crown would separate easily from the root.

the side of the root, and continue a cylindric tunnel down the root, sometimes near the surface, sometimes deeper into the tissue. Along the sides of the tunnel shallow niches, egg-niches, are cut, and in these the eggs are deposited, one in each niche. The larvæ bore irregularly through the substance of the root, and as the majority are working just below the crown the tissue is there often largely destroyed. The crown for this reason frequently breaks away from the root when an attempt is made to pull the plant. The first pupæ are formed the third week in July, and from this time until the first week in October pupæ are always to be found. On October 10th, this season, a very few pupæ were obtained, but nearly all had trans-

formed. When these beetles are established in a section there is apparently no practical method of control. But this is perhaps not unfortunate for it is usually considered the best farm practice to take out one crop of clover from a rotation, and the first crop is not commonly affected seriously, although clover planted in May is sometimes attacked in numbers the following spring and the first crop injured. Plowing under the sod as soon as the first crop is cut should always be practised when this insect is common. Many of the larvæ can thus be destroyed.

The Cabbage maggot was more injurious this season than in other years, and the onion maggot was present though not in great numbers.

Anisota senatoria has been extremely numerous in the district between Howick and Hemmingford. Many oaks through that country were completely stripped last season by hordes of these caterpillars.

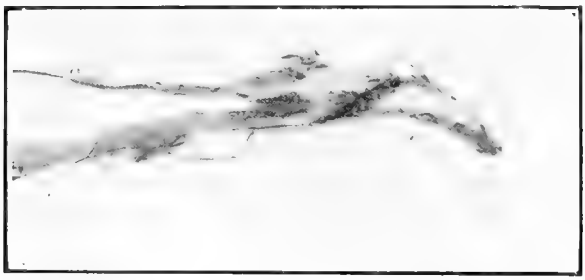

FIG. 21.
Hylastinus obscurus. Tunnel and eggs.

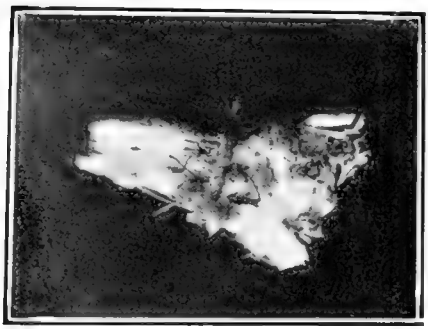

FIG. 22
Hylastinus obscurus. Tunnel and eggs.

FIG. 23.
Hylastinus obscurus. Eggs in the egg-niches, with adult beetle in the end of the egg-tunnel. (Twice enlarged.)

Grasshoppers were not so serious a pest in this province as in the last three years, but still were very numerous in some localities. In sections where the grasshoppers were very destructive two or three years ago but were not numerous this season, the blister-beetles, whose young feed upon grasshopper eggs, were reported very plentiful. "Criddle mixture" and "Hopper-catchers" would save many dollars in the grass and grain fields of this province in grasshopper years. The Blister beetles mentioned above, mostly *M. unicolor,* were injurious in a few places. Their young, apparently, do much to control the grasshoppers, and the adults should not be destroyed unless they are really doing injury.

The Fall Web-worm which has been so abundant on shade and forest trees for several years seems to be decreasing in numbers. The White-marked Tussock, which was so injurious in Montreal recently, has not yet revived from the attack of its parasites.

Otiorynchus sulcatus has been doing considerable injury to cyclamen and primroses in two of the Montreal greenhouses. Injury was reported from the feeding of the adults on the flowers; and the larvae which live in the soil, destroyed the roots, and even fed upon the corms of the cyclamen. Carbon bisulphide has had no effect upon the larvæ. Probably carbolic acid emulsion or strong kerosene emulsion will be effective. We are not yet able to report any success in its control. Only two sets of greenhouses were affected so far as we know; others near by were not at all troubled.

The Apple-leaf hopper, so injurious here on potato and other crops in 1908 and 1909, was not numerous this season.

The Cucumber beetle, *D. vittata*, was again injurious throughout this district. It certainly seems to prefer squashes to melons and cucumbers; and can be effectively kept from the two last by having a few "trap plants" of squash growing close by. These "trap" squashes should be covered with Arsenite, dusted on in large quantity, as soon as the beetles appear, and at the same time the valuable crop should be sprayed with Bordeaux, which the beetles dislike. Many beetles can in this way be poisoned during the first few days of their feeding. By repeating the spray of Bordeaux on the main crop as often as needed, and leaving the "trap" squashes unsprayed the beetles can be kept away from the cucumbers and melons. The same method is effective in squash fields; a few plants being used as "traps" and the rest being covered with Bordeaux. For several years I have had squash, melons, cucumbers, and pumpkins growing close together. The squashes have always been attacked by the beetles, but the melons and cucumbers have escaped completely, and without treatment.

The Spruce Budworm, *Tortrix fumiferana*, was noticed in small numbers at Hudson. The Larch Sawfly, *N. erichsonii*, was present, but did little damage.

BASSWOOD OR LINDEN INSECTS. IV.

Arthur Gibson, Ottawa.

In 1904, the writer published, in the annual report of this Society, notes on 94 different species of insects which had been found attacking *Tilia americana* L. In 1906, notes on other species were contributed which brought the list up to 102, and, in 1907, a further paper increased this latter number to 122. The following additional notes have since been made.

ATTACKING THE FOLIAGE.

Order Homoptera.

123. *Ceresa constans* Wlk. This insect has been found commonly on basswood at the Beaver Meadow, Hull, Que. in August and September, by Mr. W. Metcalfe. Mr. Van Duzee has also found the species on basswood near Buffalo, N. Y.

104 of 1906 list. *Telamona reclivata* Fitch. This species was collected on September 26, 1907, and again on Sept. 2, 1908. The 1906 specimens were taken on July 1.

124. *Cixius basalis* Van D. Beaver Meadow, Hull, Que. August 11, 1907, (Metcalfe.)

125. *Amalopota uhleri* Van D. Ottawa, Aug. 25, 1907, (Metcalfe.) This insect has been recorded as feeding on maple.

126. *Gypona albosignata* Uhl. Beaver Meadow, Hull, Que. Sept. 1, 1907, (Metcalfe.)

109 of 1906 list. *Diedrocephala coccinea* Forst. This species was abundant in 1905 but the specimens were not identified until 1907. (Det. by Heidemann.) Pupæ which were found on July 7, produced the perfect insects on July 10.

Order Hemiptera.

127. *Lygus tenellus* Uhl. MS. This species was collected by me from basswood on June 27, 1905, the determination being made by Mr. Van Duzee. In 1907, Mr. Metcalfe also found the same insect on linden at the Beaver Meadow, Hull, Que. on Aug. 11.

128. *Lygus monachus* Uhl. Mr. Metcalfe found this species commonly, at Ottawa, on basswood on July 1, 1904. In Miss Murtfeldt's account of this bug in Bulletin No. 13 of the U. S. Division of Entomology, the insect is stated to have been found infesting the growing points of young maples (*Acer dasycarpum.*). Besides maple, alder is also given as a food plant and "many other kinds of small trees and shrubs." The insect evidently has a wide range of food plants.

129. *Camptobrochis nebulosus* Uhl. Beaver Meadow, Hull, Que., Aug. 11, 1907, (Metcalfe). Box-elder and willow are also recorded as food plants for this insect, the former by Baker and the latter by Gillette.

Order Lepidoptera.

19 of 1903 list. *Ennomos alniaria* L. In 1906, Mr. Young found the larva at Meach Lake, Que. This was the first record of its feeding on basswood in the Ottawa district. On Sept. 2, 1908, the writer found a mature larva which measured two and one-eighth inches long, also feeding on basswood, on the Experimental Farm.

130 *Pyrausta pertextalis* Led. Larvæ of this pyralid were found on basswood at Ottawa in June, 1908, the moths emerging June 27.

131. *Archips fractivittana* Clem. A single larva which produced this moth was found on basswood in 1908. It pupated on June 1, and the moth emerged on June 10. A brief note reads "larva like *rosaciana.*"

Order Hymenoptera.

67 of 1903 list. The Willow Sawfly, or American Cimbex, C. *americana* Leach. A single specimen of this larva was found by the writer feeding on basswood, at Ottawa, on October 8, 1907. This specimen, instead of being the usual pale yellow colour, was of a light vermilion shade.

Order Acarina.

69 of 1903 list. The Linden Gall Mite, *Phytoptus abnormis* Garman. Very abundant at Ottawa in June 1908. Some leaves were much infested; quite a few of the galls were on the undersides of the leaves.

OCCURRING ON THE BARK.

ORDER HOMOPTERA.

132. *Lachnus dentatus* LeB. Specimens of apterous females, depositing eggs on basswood were shown at the annual meeting of this Society, at Guelph, on 31 Oct., and 1 Nov., 1907, by Dr. Bethune and Mr. Jarvis. This is probably the species which I found on the same tree at Ottawa a few years previously. In Packard's Forest Insects, the insect is mentioned as having been found on the branches of willow and also on small nursery apple trees.

133. *Pulvinaria vitis* Linn. This species is recorded from Western Ontario as occurring on *Tilia americana,* (Jarvis, Rep. Ent. Soc. 1907, p. 51). In Mrs. Fernald's Catalogue of the Coccidæ of the World the only food plant mentioned is grape vine.

134 *Toumeyella liriodendri* (Gmel.) Ottawa, (Jarvis, Rep. Ent. Soc. Ont., 1907, p. 51).

135. *Aspidiotus asculi* Johns. Mr. Jarvis records this scale insect as infesting basswood at Toronto, Brantford and Guelph (Rep. Ent. Soc., 1907, p. 51). In Mrs. Fernald's Catalogue *Æsculus californica* is mentioned as the food plant and the habitat given as California.

136. *Aspidiotus diffinis* Newst. Mrs. Fernald records this species as occurring on basswood as well also as on lilac. Jarvis lists the species from basswood, from Guilds, Ont. (Rep. Ent. Soc. Ont., 1907, p. 51).

137. *Aspidiotus juglans-regiæ* Comst.

138. *Aspidiotus ulmi* John.

In April, 1907, Mr. J. Fred. Smith, late Provincial San José Scale Inspector, sent to the Division at Ottawa some basswood heavily infested with scale insects. The wood was taken from a tree near Beamsville, Ont. The material was sent to Dr. Howard, at Washington, and was reported upon by Mr. Marlatt as follows: "The scale insects on basswood from Mr. J. F. Smith are of two species, viz. *Aspidiotus juglans-regiæ* Comst. and *Aspidiotus ulmi* Johnson." *A. juglans-regiæ* has a wide range of food plants. Mrs. Fernald mentions walnut, apricot, apple, pear, peach, cherry, Japan plum, locust and maple. *A. ulmi* is recorded from elm, catalpa and *Cycas revoluta.*

THE ENTOMOLOGICAL RECORD FOR 1910.

ARTHUR GIBSON, OTTAWA.

The season of 1910 in Canada was, on the whole, a most favorable one for the collection of insects. Reports from many widely separated localities refer to the remarkably fine and dry weather. In the east, the season was much drier than that of 1909. From the many interesting records sent in, the year, too, has been an improvement with regard to the number of rarer forms which have been collected. As yet, of course, much material gathered in 1910, still remains to be worked up. As this is done a mention of the more interesting species, it is hoped, will be made in future issues of the Record. In the present Record are included notes on a number of rarer forms collected in other years, but only studied in 1910.

The compiler of the Record is exceedingly grateful to his many friends who have either helped him by sending in records for the "Notes of Captures", or in giving assistance in the identification of doubtful species.

Canadian collectors and students, as in previous years, have received invaluable help from the leading specialists in the United States and elsewhere. Particular acknowledgment is due to Dr. L. O. Howard, and his expert associates, Dr. H. G. Dyar and Mr. W. D. Coquillett, of Washington, D.C.; Dr. J. B. Smith, of New Brunswick, N.J.,; Sir George Hampson, of the British Museum; Mr. W. D. Kearfott, of Montclair, N.J.; Prof. H. F. Wickham, of Iowa City, Iowa; Mr. E. P. Van Duzee, of Buffalo, N.Y.; Mr. W. Beutenmuller, of New York, N.Y.; Dr. Henry Skinner, of Philadelphia, Pa.; Dr. E. M. Walker, of Toronto, Ont.; Col. Thos. L. Casey, of Washington, D.C.; Mr. Chas. Leibeck, of Philadelphia, Pa.; Rev. G. W. Taylor, of Departure Bay, B.C., Mr. C. H. Roberts, of New York, Mr. J. D. Evans, of Trenton, Ont., Mr. W. H. Harrington, of Ottawa, and Mr. F. H. Wolley-Dod, of Millarville, Alta. Mr. Dod is specializing in North American noctuidæ and will be pleased to name and return any specimens submitted to him.

Literature.

Among the many valuable publications which have been received during the past year, and which are of interest to Canadian students, mention may be made of the following:—

Banks, Nathan. Catalogue of Nearctic Spiders. Smithsonian Institution, United States National Museum, Bulletin No. 72. This publication takes the place of the Marx Catalogue prepared some twenty years ago. The author states that the catalogue includes a little over 1,300 species. "The largest family is the Theridiidæ, with 298 species; the Attidæ is next with 213; two other families, the Lycosidæ and Epeiridæ, have over 100 species in each. Sixteen families have less than 10 species apiece." This work will be a most useful one. Many of the species occur in Canada,, but comparatively few definite records are available. The publication of this catalogue will undoubtedly lead to more systematic work, and it is to be hoped that entomologists in Canada will do their share in working up local species.

Beutenmuller, William. The North American species of Neuroterus and their Galls, (issued May 20, 1910); The North American species of Aylax and their Galls, (issued May 20, 1910); The North American species of Aulacidea and their Galls, (issued July 16, 1910): American Museum of Natural History, New York. These papers are a continuation of the results of Mr. Beutenmuller's studies on American Cynipidæ and their Galls. They are very useful publications. The illustrations are particularly good; in fact they could not be otherwise, coming from the hand of Mrs. Beutenmuller. Several Canadian records appear in the above contributions.

Blatchley, W. S. The Coleoptera or Beetles of Indiana; Department of Geology and Natural Resources; Bulletin No. 1, State Printers, Indianapolis; 1386 pages, with nearly 600 excellent illustrations. No book has appeared during the year which will give such general pleasure to entomologists as Professor Blatchley's magnificent work on the beetles of Indiana. Such a work has been much wanted, and although the author has confined it to the above State, it will, nevertheless, be of the greatest use to students in Ontario and other parts of Canada. Many of the species which occur in Indiana are to be found in Canada, and from the descriptions of families and genera and the keys to the genera and species and the descriptions thereof, students are now able to run down many insects which otherwise could only be determined by the specialist. Unfortunately the edition of this work is small, and many, doubtless, will be unable to obtain a copy.

Casey, Thos. L. Memoirs on the Coleoptera, 1: New Era Printing Co., Lancaster, Pa.; issued September 24, 1910. This memoir, of 205 pages, by Col. Casey, the well-known student of coleoptera, is indeed an important publication. It is divided into 2 parts: 1—New species of the Staphylinid Tribe Myrmedoniini; 2—Synonymic and descriptive notes on the Pæderini and Pinophilini. Altogether 365 species are described as new, 25 of which are from Canada. Of these 25, all but two occur in British Columbia, and were mostly collected by the Rev. J. H. Keen, the enthusiastic naturalist, at Metlakatla. The two other species are from Ontario, one collected at Toronto and one at Ottawa. This further work on Staphylinid beetles will be of great interest to coleopterists. Such memoirs represent much close study, and the author deserves great credit for this additional contribution to the knowledge of these insects which are so difficult to study.

Coquillett, D. W. The Type-species of the North American Genera of Diptera. Proc. U. S. Nat. Museum, Vol. 37, pages 499-647; published August 4, 1910. "The great importance of knowing definitely what species is the type of any given genus is now recognized by practically every worker in the field of biology." This important contribution is the result of several years of work in ascertaining the types of the genera of diptera reported as occurring in North and Middle America. It contains all the genera known to the writer up to January 1, 1909, together with their type-species and synonymy. Students of diptera will find this publication of extreme value. In the *Canadian Entomologist* for November, 1910, Mr. Coquillett points out several corrections and omissions to the above paper, which should be noted by those who possess a copy of the article.

Dietz, W. G. Revision of the Blastobasidæ of North America. Trans. Amer. Ent. Soc., Vol. xxxvi, Jan.-March, 1910, pp. 1-72, plates I.-IV. This interesting paper deals with 66 different species, several of which are recorded from Canada. Thirty-six are described as new. The author states in the beginning of the paper that "the Blastobasidæ, as now understood and distinguished from the Œcophoridæ, form a well defined family of the Tineina. This revision will be of much use to students of the microlepidoptera. Doubtless many others of the species listed will be found in Canada.

Grossbeck, John A. Studies of the North American Geometrid Moths of the Genus Pero. U. S. Nat. Museum, Vol. 38, pages 359-377, with Plates 13-16; published August 19, 1910. In this interesting paper Mr. Grossbeck gives the results of his investigation in the above named genus (= *Azelina* Guenee in part). Long series were gathered together from different parts of the United States and Canada, and four new species recognized. Four plates are added, one of these figures the adult moths, another structural characters and the remaining two show the genitalea of the species.

Hampson, Sir George F. (Bart.). Catalogue of the Lepidoptera Phalænæ in the British Museum, Vol. IX, Noctuidæ, 1910, 552 pp., plates cxxxvii to cxlvii. Received May 2. This volume "is the third and final part of the very large Noctuid subfamily *Acronyctinæ*: it contains 725 species belonging to 185 genera, as compared with 843 species belonging to 96 genera in Vol. VII, and 720 species belonging to 104 genera in Vol. VIII." Many of the species figured in the beautiful plates occur in Canada, and owing to the great care of the artist, in most instances, it is an easy matter to determine our North American forms. These volumes are eagerly looked forward to by lepidopterists. Vol. IX. is extremely interesting as it deals with many species which have of recent years been studied by American entomologists. Collectors in Canada should assist Sir George Hampson in his great work by sending him material from their respective districts. In this

way, of course, future volumes will be made much more useful for those who are studying specially the lepidoptera of our country.

JOHANNSEN, O. A. The Mycetophilidæ of North America: Maine Agric. Exp. Station, Bull. 172, Part I, (March, 1910), pp. 209-276, plates 3; Bull. 180, Part II, (June, 1910), pp. 125-192, plates 4. This monographic treatment of the Fungus Gnats of North America is a most valuable contribution to our knowledge of diptera. In Part I the lower and economically less important subfamilies Bolitophilinæ, Myçetobiinæ, Diadocidiinæ, Ceroplatinæ and Macrocerinæ, are treated; in Part II the Sciophilinæ are dealt with.

KIRBY, W. F. A Synonymic Catalogue of Orthoptera, Vol. III, Locustidæ vel Acridiidæ; British Museum (Natural History), March, 1910. This volume completes Mr. Kirby's general Catalogue of the Order Orthoptera. It is a book of 674 pages, and therefore considerably larger than Vols. I and II. This is owing to the fact that the Locustidæ (the short-horned Grasshoppers or Migratory Locusts) is a much larger family than the others. This work will be of the greatest use to systematists, and now that the whole Catalogue has been completed, the order Orthoptera will doubtless attract more and more students from year to year. Pages 562 to 586 are given up to "Additions and Corrections" to the three volumes.

MUTTKOWSKI, RICHARD A. Catalogue of the Odonata of North America: Bulletin of the Public Museum of the City of Milwaukee, Vol. I, article I, pp. 207. This well prepared catalogue, which was issued on June 27th, is a publication which will be widely welcomed by students of the Odonata. Such a catalogue has been much wanted. It presents in convenient form what purports to be a complete list of these insects from the North American region. The author has had the co-operation of the leading students in this order in the preparation of the catalogue; the classification and nomenclature employed, therefore, represents the more approved and advanced ideas of odonatologists. The publication is an important one, and should be in the hands of all Canadian students of these neuropteroid insects.

PIERCE, W. DWIGHT. A Monographic Revision of the Twisted Winged Insects comprising the Order Strepsiptera Kirby. Smithsonian Institution: U. S. Nat. Museum, Bulletin 66. Received Jany. 7, 1910. In this extensive contribution of 232 pages, 37 genera are treated of, comprising 103 species. Sixty-two new species are described from North America. The introductory chapters on "History" and "Biology" give much information about these interesting insects, which have been so little studied by North American students. Fifteen plates appear at the end of the Bulletin.

ROHWER, S. A. On a Collection of Tenthredinoidea from Eastern Canada. Proc. U. S. Nat. Museum, Vol. 38, pages 197-209; published June 6, 1910. This paper is a report of an interesting collection of sawflies made by Mr. A. Gordon Leavitt, in the County of St. John, New Brunswick. Fifty-three different species are listed, 12 of which are described as new.

SMITH, JOHN B. A List of New Jersey Insects: Annual Report of the New Jersey State Museum, 1909; pp. 888. This report, with the exception of 13 pages, is devoted to Dr. Smith's New List of the Insects of New Jersey. No less than 10,385 different species are listed, comprising 3,486 genera and 331 families. In the 1899 list 8,537 species were included. Considerable progress has therefore been made in a knowledge of the insects of the State. This List is an extremely useful publication. Unfortunately its edition is limited, and it will be impossible to supply everyone who will want this work with a copy.

SNODGRASS, ROBERT EVANS. The Thorax of the Hymenoptera. Proc. U. S. Nat. Museum, Vol. 39, pages 37-91, with plates 1-16; published October 25, 1910. In this paper the author gives much extremely useful information on the thorax of hymenopterous insects. In such a study it was necessary, of course, to make many dissections and drawings. The reproductions of these latter are particularly good. In addition to the 77 figures on the plates, 16 other figures appear in the text.

WHEELER, WILLIAM MORTON. Ants: Their Structure, Development and Behavior. New York: The Columbia University Press, 1910. This remarkable book of 663 pages is one of the most important contributions to the literature of entomology which has appeared during the year. It is a work that has been much wanted and will be of extreme value the world over. The book is divided into thirty chapters, each of which contains a number of parts. Chapter I treats of "Ants as Dominant Insects." This is followed by chapters on external and internal structure, development, polymorphism, history of myrmecology and classification of ants, distribution, fossil ants, etc. At the end are several appendices: A—Methods of Collecting, Mounting and Studying Ants; B—Key to the subfamilies, genera and subgenera of the North American Formicidæ, for the identification of the workers; C—A list of described North American ants; D—Methods of exterminating noxious ants; E—Literature. Beautiful illustrations appear throughout the text. This magnificent work will undoubtedly lead many to make serious studies of these most interesting insects, about which so much reliable information has now been made readily available.

WILLIAMSON, EDWARD BRUCE. The North American Dragonflies (Odonata) of the Genus Macromia. Proc. U. S. Nat. Museum, Vol. 37, pages 369-398, with plates 35-36; received 7 Jany., 1910. This paper on the genus Macromia will be of much value to students of dragonflies. The American species are distributed generally over the United States and Southern and Eastern Canada. Nine species are treated of at length, three of which are described as new. Seven figures, showing wing venation, are included in the text.

The following is a list of names and addresses of collectors heard from during 1910:—

Anderson, E. M., Provincial Museum, Victoria, B. C.
Baird, Thomas, High River, Alta.
Baldwin, J. W., 74 Besserer Street, Ottawa.
Bethune, Rev. Prof., O. A. C., Guelph.
Boulton, A. R. M., care King Brothers, Quebec, Que.
Bush, A. H., 1105 Ninth Ave., Vancouver. B.C.
Carr, F. S., Edmonton, Alta.
Chagnon, Gus., Box 186, Montreal.
Cockle, J. W., Kaslo, B.C.
Crew, R. J., 561 Carlaw Ave., Toronto.
Criddle, Norman, Treesbank, Man.
Dawson, Horace, Hymers, Ont.
Day, G. O., Duncans, B.C.
Dod, F. H. Woolley-, Millarville, Alta.
Evans, J. D., Trenton, Ont.
Fyles, Rev. T. W., Hull, Que.
Gibson, Arthur, Experimental Farm, Ottawa.

Groh, H., Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Haight, D. H., Sudbury, Ont.
Halkett, A., Fisheries Museum, Ottawa.
Hanham, A. W., Duncans, B.C.
Harms, J. F., Treesbank, Man.
Harrington, W. H., P.O. Department, Ottawa.
Heath, E. F., Cartwright, Man.
Hewitt, Dr. C. Gordon, Experimental Farm, Ottawa.
Hudson, A. F., Millarville, Alta.
Jarvis, T. D., O. A. C., Guelph.
Keen, Rev. J. H., Metlakatla, B.C.
Leavitt, A. G., St. John, N.B.
Lyman, H. H., 74 McTavish Street, Montreal.
Marmont, L. E., 2553 Second Ave. West, Vancover, B.C.
McIntosh, W., St. John, N.B.
Metcalfe, W., 288 Bank Street, Ottawa.
Moore, G. A., 850 St. Hubert St., Montreal.
Moore, W. H., Scotch Lake, N.B.
Morris, Frank, Port Hope, Ont.
Nelles, Douglas H., Dept. Interior, Ottawa.
Nicholls, A., 18 Electric Street, Ottawa.
Perrin, Jos., McNab's Island, Halifax, N.S.
Rowland, Alton, Windsor Mills, Que.
Russell, John, Hope Station, B.C.
Sanders, G. E., Experimental Farm, Ottawa.
Sanson, N. B., Banff, Alta.
Saunders, Henry, 21 Harbord Street, Toronto.
Sherman, R. S., 2285 Sixth Avenue, Vancouver, B.C.
Simpson, W., Dominion Observatory, Ottawa.
Southee, G. R., Sherbrooke, Que.
Swaine, J. M., Macdonald College, Que.
Taylor, Rev. G. W., Departure Bay, B.C.
Tipping, E. Dalton, Minnehik P.O., via Bluff Centre, Alta.
Treherne, R. C., Grimsby, Ont.
Venables, E. P. Vernon, B.C.
Walker, Dr. E. M., Biological Dept., Univ. of Toronto.
Wallis, J. B., Machray School, Winnipeg, Man.
Willing, T. N., Saskatoon, Sask.
Winn, A. F., 32 Springfield Ave., Westmount, Que.
Young, C. H., Geological Survey, Ottawa.
Zavitz, E. J., O. A. C., Quelph, Ont.

NOTES OF CAPTURES.

LEPIDOPTERA.

(Arranged according to Dyar's List of North American **Lepidoptera, U.S. N.M. Bull. No. 52).**

(Dyar's number).

14. *Papilio thoas* L. Toronto, a fine specimen seen at the corner of Queen and Yonge Streets, July 2, (Crew).

64. *Eurymus boothii* Curtis. Dawson, Y.T., 1908, (A. Day).
95. *Speyeria idalia* Dru. Toronto, end August, (J. R. McMurrich). First record for this district.
131. *Brenthis myrina* Cram. A remarkable melanic specimen of this common butterfly was taken at Hull, Que., Aug. 8, by Dr. Fyles. The forewings are almost entirely suffused with black, very little red.
185. *Charidryas nycteis* D. & H. East Toronto, near Golf Links, August, (J. R. McMurrich.) This is another remarkable aberration in which the central large band across the wings is entirely white, not yellow as is usual.
282. *Coenonympha kodiak* Edw. a. *yukonensis* Holland. Dawson, Y.T., 1908, (A. Day).
284. *Coenonympha typhon* Rott. a. *laidon* Bork. Belleville, Ont. (Miss M. C. Melburn).
289 *Œneis macounii* Edw. Hymers, Ont., June 9, (Dawson).
295. *Œneis norna* Thunb. f. *taygete* Hbn. Dawson, Y.T., 1908, (A. Day).
378. *Incisalia niphon* Hbn. Hudson, Que., May 5, (Winn).
419 *Nomiades couperii* Grt. Sherbrooke, Que., June 4, (Southee).
430. *Rusticus shasta* Edw. Lethbridge, Alta., July 5, (Wallis).
440g *Cyaniris ladon* Cram. g. *piasus* Bdv. Bird's Hill, Winnipeg, Man., June 5, (Wallis).
656a. *Hemaris ruficaudis* Kirby. Edmonton, at sallow blossoms, May 13, (Carr), new to Alberta. I have the same form from Field, B.C., and from Chicago, and it is the *thysbe* of Holland's figure, with the marginal band even instead of dentate, and seems to be the *ruficaudis* of Smith's Monograph, (Dod).
657. *Lepisesia flavofasciata* Wlk. Sudbury, Ont., June 7, (Haight).
699. *Phlegethontius convolvuli* L. a. *cingulata* Fab. Ottawa, no date, (Bro. Germain). First record for the district.
713. *Sphinx canadensis* Bdv. Britannia, near Ottawa, July 19, (Groh).
741. *Samia columbia* Smith. Dryden, Ont., June 6, (McNicol & Pitt).
778. *Eacles imperialis* Dru. In addition to the captures recorded in the Ottawa Naturalist, Aug. 1910, 2 other specimens were collected at Ottawa, one on July 7, and the other at end of July, (W. Gibson). Mr. Grant also took 3 specimens at Orillia, Ont.
853. *Estigmene prima* Slosson. Several specimens of this rare moth were taken the past season in widely different localities: Shawbridge, Que., June 4, (Winn); Ottawa, (Nicholls); Sudbury, Ont., June 16, (Haight); Winnipeg, Man., June 2, (Wallis).
867. *Neoarctia brucei* Hy Edw. Mt. Cheam, B.C., Aug. 12, 1907, (Bush). First Canadian record that I know of.
876. *Apantesis michabo* Grt. Aweme, Man., May 27, (Criddle); var. *minea*, Hymers, Ont., June 7, (Dawson).
911. *Euchaetias oregonensis* Stretch. Ottawa, no date, (Nicholls), first record for district; Maynooth, Ont., June 18, rare in my experience, (Evans).
958. *Panthea portlandia* Grt. Banff, Alta., June 1, (Sanson). A Banff male, dated July 16, is in Prof. Smith's collection. Both are rather dark. New to Alberta, (Dod).
960. *Panthea acronyctoides* Wlk. Montreal, May 21, (Winn).
964. *Charadra deridens* Gn. Aweme, Man. June 28, (Criddle; Winnipeg, June 17, (Wallis). Rare in Manitoba.

Apatela cyanescens Hamp. Cowichan Lake District, B.C., 1 specimen, June 22, 1908, (Day).

974. *Apatela hesperida* Sm. Aweme, Man., June 28, Criddle).
992. *Apatela latifica* Sm. Winnipeg, Man., June 17, (Wallis).
1001. *Apatela spinigera* Gn. Winnipeg, Man., June 17, (Wallis).
1005. *Apatela lithospila* Grt. Worthington, Ont., near Sudbury, July 6, (Haight).
1008. *Apatela funeralis* Grt. Ottawa, June 14, (Nicholls).
1010. *Apatela minella* Dyar. Winnipeg, June 15, (Wallis).
1097. *Platyperigea præacuta* Sm. Duncans, B.C., July 15, not previously recorded from Vancouver Island, (Hanham).
1101. *Caradrina meralis* Morr. Duncans, B.C., Aug. 25, not previously recorded from Vancouver Island, (Hanham); Trenton, Ont., Sept. 2, (Evans).
1109. *Caradrina miranda* Grt. Victoria, B.C., July 5, not previously recorded from Vancouver Island, (Hanham).
1149. *Hadena bridghami* G. & R. Rimouski Wharf, Que., Aug., (Gibb).
1189. *Hadena barnesii* Sm. Banff, Alta., July 30 to Aug. 4, not rare, (Sanson). This is the species so standing in my Alberta list. It seems almost, but not quite, to connect with *sora*.. Typical *barnesii* from Colorado is smaller and brighter coloured than either, (Dod).
1199. *Hadena versuta* Sm. Hymers, Ont., June 20-28, (Dawson).
1202. *Hadena miseloides* Gn. Winnipeg, June 17, (Wallis).
1210. *Hadena niveivenosa* Grt. Hymers, Ont., Aug. 7, 1909, (Dawson).
1221. *Hadena apamiformis* Gn. Winnipeg Beach, Man., July 5, (Wallis); Hymers, Ont., July 7, (Dawson).
1217. *Hadena remissa* Hbn. Duncans, B.C., May 23, not previously recorded from Vancouver Island, (Hanham).
1223. *Hadena morna* Strk. Duncans, B.C., Aug. 2, a rare species, (Hanham). The record of this species from High River in the Record for 1909 is wrong. The name was probably given by me, as the species stands as *morna* in Hampson's Catalogue, though erroneously. It is the *Orthosia conradi* Grt. of the Alberta List, and is either a local race or close ally of that species. Prof. Smith has described it as new under the name of *Agroperina lincosa* in Jour. N. Y. Ent. Soc., xviii, 145, Sept., 1910, (Dod).
1226. *Hadena cogitata* Sm. McNab's Island, near Halifax, N.S., June 30, (Perrin).
Hadena enigra Sm. Winnipeg, June 24, (Wallis).
Hadena multicolor Dyar. Duncans, B.C., June 2-29, (Hanham).
Hadena bonilla Barnes. Metlakatla, B.C., Aug. 6, 1904, (Keen).
Hadena sora Sm. Banff, Alta., July 16 to 22, three specimens, (Sanson).
1259. *Polia epichysis* Grt. Victoria, B.C., Aug. 24, not previously recorded from Vancouver Island, (Hanham).
Trachea jocasta Sm. Cartwright, Man., Sept 5, (Heath).
1356. *Oncocnemis barnesii* Sm. Banff, Alta., one worn female, Oct., 17, (Sanson). It agrees pretty closely with the description and with Hampson's figure, copied from a figure of the type from Yellowstone Park. The specimen is unlike any other species known to me, and a most interesting new Alberta record, (Dod).
1393. *Rhynchagrotis anchocelioides* Gn. Duncans, B.C., 1 sp. bred, July 5, not previously recorded from Vancouver Island, (Hanham).
1405a. *Rhynchagrotis formalis* Grt. a. *falcula* Grt. Winnipeg, Aug. 31, a surprising capture, (Wallis).

1421. *Platagrotis imperita* Hbn. Banff, Alta., 4 specimens, July 30 to Aug. 4, (Sanson); Calgary, Alta., July 23, 1908; Didsbury, Alta., Aug. 5, 8, 1905, (C. G. Garrett). I have a Labrador specimen from Prof. Smith's collection, and a B.C. specimen, probably from the Okanagan, is in the British Museum. It appears to be the *imperita* of Hampson's Catalogue. First Alberta records, (Dod).

1426. *Semiophora climata* Gn. Banff, Alta., July 25, (Sanson). New to Alberta.

1449. *Setagrotis vernilis* Grt. Banff, Alta., July 30, (Sanson). A very dark specimen, but I think this species. New to Alberta, (Dod).

Setagrotis filiis Sm. (Trans. Amer. Ent. Soc. xxxiii, 125, April, 1907). Banff, Alta., Sept 1. The type is from Pullman, Wash.; a female from Laggan, Alta., Aug. 9, is in Prof. Smith's collection. I do not feel sure that it is not merely a very dark blue-grey form of *infimatis*. A new Alberta record, at any rate, (Dod).

1486. *Noctua oblata* Morr. Barrington Passage, N.S., July 5, (Young).

1544. *Feltia gladiaria* Morr. Trenton, Ont., Sept. 13, second specimen taken, (Evans).

1581. *Paragrotis olivalis* Grt. Duncans, B.C., rare, 1 at sugar, Aug. 15, and another at rest, Sept. 5, (Hanham).

1588. *Paragrotis brocha* Morr. Duncans, B.C., at sugar Sept. 15, 1908, not taken since, (Hanham).

1623. *Paragrotis personata* Morr. Rounthwaite, Man., (Marmont); Aweme, Man., July 13, 1904; Aug. 25, 1905 (Fletcher). See Ottawa Naturalist, Sept. 1910.

1639. *Paragrotis vallus* Sm. Banff, Alta., Sept. 8, (Sanson). The type is a female from Laggan. I have a female taken at Millarville on Oct. 5, 1907, which I had believed to be the female of *vulpina*, of which I have seen males only. Mr. Sanson's specimen is a male, and indicates a distinct species from *vulpina*, (Dod).

1682. *Paragrotis fuscigera* Grt. The species referred to by me under this name in the Record for 1909, turns out to be *pestula* Smith, which is an ally of *pleuritica* Grt. and distinct from *focinus* Smith, to which I have referred it, (Dod).

1692. *Paragrotis intrita* Morr. Winnipeg Beach, Man., Aug. 19-24, four specimens, (Wallis). Smaller only than Vancouver Island specimens of which I have a long series. I believe *strigilis* Grote, *titubatis* Smith and *reuda* Strecker, to be variations of *intrita*, and have specimens compared with all the types except *reuda*, which I overlooked. The "*intrita*" of my Alberta list is another species, and so have been all previous Manitoba records of any of the above names that I have been able to investigate, (Dod).

Paragrotis esta Sm. Duncans, B.C., Aug. 16, 1907, (Day).

1693. *Paragrotis mollis* Walk. Millarville, July 5, (Dod).

1703. *Paragrotis basiflava* Sm. Banff, Alta., Aug. 19, (Sanson). This was described from "N. W. B. C." *Compressipennis* was described from Yosemite, B.C., The types are identical, (Dod).

1734. *Paragrotis colata* Grt. Banff, Alta., July 22, (Sanson). Mrs. Nicholl took a specimen at 8,000 feet, on Wilcox Peak, near the head waters of the Saskatchewan, which is in the British Museum, and which I have compared with the type there from Mt. Hood, Oregon. The species resembles a dark *mollis*, (Dod).

1745. *Paragrotis silens* Grt. Rimouski Wharf, Que., Aug., a new locality, (Gibb).

1773. *Mamestra nimbosa* Gn. Duncans, B.C., at sugar, middle July, rare here, (Hanham).

1792. *Mamestra atlantica* Grt. This species does not appear to be included in our British Columbia list; I have one specimen labelled Victoria, (Hanham).

1805. *Mamestra congermana* Morr. McNab's Island, near Halifax, N.S., July 28, (Perrin); Winnipeg, June 15, 17; 2 females, (Wallis). Holland's figure under this name is *artesta* Smith. Sir George Hampson places them in different genera upon characters which are well marked, (Dod).

1806. *Mamestra rubefacta* Morr. McNab's Island, N.S., June 3, (Perrin); Winnipeg Beach, June 17, (Wallis).

1809. *Mamestra pulverulenta* Sm. Banff, Alta., (Sanson). *Pulverulenta* was described without locality, as a variety of *assimilis* Morr., and the Banff specimen agrees with the description, though I have seen the type of neither form. The "*assimilis*" of the Kaslo list is the same species. *Assimilis* is a black species common at Calgary, and I have seen it from Banff also. *Pulverulenta* is dark fuscous, powdery. I am under the impression that they are two species, (Dod).

1813. *Mamestra variolata* Sm. Victoria, B.C., July 15, only record, (Hanham).

1840. *Mamestra sutrina* Grt. Duncans, B.C., 2 at sugar, June 8, 12, a rare species in B.C., (Hanham).

1876. *Mamestra negussa* Sm. Winnipeg, Man., May 30, (Wallis).
Mamestra acutermina. Winnipeg, July 13, (Wallis).

1882. *Barathra curialis* Sm. Edmonton, June 17. New to Alberta, (Carr teste Dod).

2048. *Stretchia plusiiformis* Hy Edw. Hymers, Ont., May 15, (Dawson). First Ontario record.

2070. *Cleoceris rectifascia* Sm. Duncans, B.C., July 18, (Hanham).
Pleroma conserta Grt. Banff, Alta., April 25, and May 7, (Sanson). The type is from the State of Washington and is largely suffused with black. That of *apposita* Smith is from Victoria, B.C., and is similarly suffused. Sir George Hampson treats them as the same species, I think correctly. Mr. Sanson also took a form without the black suffusion, which I believe to be the same species, (Dod).
Pleroma cinerea Sm. Duncans, B.C., late Oct., (Hanham).

2086. *Xylina hemina* Grt. Hymers, Ont., Sept. 4, (Dawson).
Cucullia indicta Sm. Millarville, Alta., June 5 and 11, (Dod).

2148. *Bellura diffusa* Grt. Barrington Passage, N.S., July 12, (Young).

2171. *Papaipema cerina* Grt. Winnipeg, Sept. 15, (Wallis).

2190.1. *Papaipema insulidens* Bird. Duncans, B.C., at light, Aug. 21, 1908, (Day).

2199. *Xanthia flavago* Fab. Waswanipi River, Hudson Bay Slope, Aug. 1896, (Dr. R. Bell).

2210. *Pseudoglaa blanda* Grt. Duncans, B.C., Sept. 18, 1907, (Day).

2244. *Scopelosoma devia* Grt. Duncans, B.C., 1 specimen at sallow, March 26; *tristigmata* is, I believe, the only species previously recorded from British Columbia, (Hanham).

2280. *Pippona bimatris* Harv. Treesbank, Man., July 20, (Wallis).

2341. *Schinia acutilinea* Grt. Calgary, Alta., town lights, Aug. 8, (Hudson). Agrees with Hampson's figure of type from Colorado, and is like my specimens from Glenwood Springs. Apparently a new record for Canada, (Dod).

Autographa V-alba Ottol. Banff, Alta., Aug. 19, (Sanson). The specimen is a female and agrees with Ottolengui's figure of the type in all except the sign, which is more like the sign in his figure of *surena,* though not nearly as wide. It can be no other known species than *V-alba,* and the sign probably varies to that extent, (Dod).

2509. *Autographa selecta* Wlk. Banff, Alta., Aug. 4 to 19, (Sanson). Walker's type has the subterminal line waved, rather than dentate, as in Grote's type of *viridisignata.* Autographas do not usually vary that way, and the character may prove to be of specific value. *Viridisignata* is the common form, though the sign is not always green. Mr. Sanson has both forms. The first Alberta records, (Dod).

2514. *Autographa celsa* Hy. Edw. Ucluelet, B.C., Aug. 20, 1909, (Young).

2526. *Autographa speciosa* Ottol. Duncans, B.C., July 12, 1907, (Day).

Autographa sansoni Dod. Banff, Alta., June 10, (Sanson).

2548. *Pœctes oculatrix* Gn. Winnipeg, June 15, (Wallis).

2784. *Syneda alleni* Grt. Orillia, Ont., (Grant).

2819. *Catocala obscura* Strk. Ottawa, (Nicholls). First record for district.

2858. *Catocala coccinata* Grt. "E. Ont., Can.," (Evans).

2871. *Catocala subnata* Grt. Belleville, Ont., (Evans).

2886. *Catocala cœlebs* Grt. Belleville, Ont., (Evans).

2890. *Catocala whitneyi* Dodge. Stony Mt., Man., Aug. 11, (Chaplin & Wallis).

Catocala caerulea Beut. Penticton, B.C., Aug. 11, 1909, (Wallis). First record for Canada, hitherto known from Oregon.

3125. *Symmerista albifrons* S. & A. Montreal West; moths in great abundance on tree trunks, June 19, not a trace of larvæ in August, (Winn).

3165. *Fentonia marthesia* Cram. Orillia, Ont., (Grant).

3176. *Pseudothyatira cymatophoroides* Gn. Edmonton, July 1, (Carr). New to Alberta, (Dod).

3180. *Euthyatira pudens* Gn. Winnipeg, May 20, (Wallis).

3226. *Oreta rosea* Wlk. Montreal, Aug. 19, taken at rest in city. First time I have taken it here, (Winn).

3227. *Oreta irrorata* Pack. Rimouski Wharf, Que., (Gibb).

Tephroclystis russeliata Swett. St. Fabien, Rimouski Co., Que., July, (Chagnon).

3455. *Petrophora algidata* Mosh. Westbourne, Man., July 30, 1908, (Wallis).

3476. *Mycterophora slossoniæ* Hulst. Winnipeg, Man., July 23, 1908, (Wallis). In identifying this specimen Mr. Grossbeck reports: "Dr. Dyar says this is a noctuid, and apparently he is correct."

3545. *Eois persimilis* Hulst. Winnipeg, Man., June 27, 1908, (Wallis). A rare species.

3657. *Sciagraphia hebitata* Hulst. Banff Alta. June 23, 1909, (Wallis).

3693. *Cymatophora flavicaria* Pack. Yukon, collected on wagon road, between White Horse and Dawson, (R. Stewart).

3876. *Apocheima rachelæ* Hulst. High River, Alta., March 12, (Baird).

Cingilia rubiferaria Swett. Montreal, Sept. 28, 1905, (Chagnon).

3902. *Sicya macularia* Harr. "Nordenskiold", Yukon Territory, Aug. 21, 1908, (R. Stewart).

3963. *Euchlana astylusaria* Walk. Millarville, Alta., May 31, (Dod).
3991. *Privecyla decoloraria* Hulst. St. John's, Que., July 1, 1906, (Chagnon).
4095. *Cochlidion rectilinea* G. & R. Trenton, Ont., July 12, (Evans).
4142. *Cossus centerensis* Lint. Hymers, Ont., June 27, (Dawson)
4148. *Prionoxystus macmurtrei* G. M. Port Hope, Ont., June 21, 1896, (Metcalfe).
4210. *Sesia marula* Hy. Edw. Aweme, Man., 2 specimens, July 20, 21, (Criddle). Apparently the first Canadian record.
4622. *Argyria auratella* Clem. St. John's, Que., July 12, (Chagnon).
4658. *Tetralopha militella* Zell. Rigaud, Que., July 28, (Chagnon).
4693. *Acrobasis betulella* Hulst. Mt. St. Hilaire, Que., July 1, (Chagnon).
4694. *Acrobasis comptoniella* Hulst. Mt. St. Hilaire, Que., July 1, (Chagnon).
4711. *Dioryctria abietella* D. & S. Montreal, July 25, (Chagnon).
4723. *Glyptocera consobrinella* Zell. Mt. St. Hilaire, Que., June 27, (Chagnon).
4734. *Nephopteryx ovalis* Pack. Mt. St. Hilaire, Que., July 2, (Chagnon).
4746. *Meroptera pravella* Grt. Mt. St. Hilaire, Que., July 5, (Chagnon).
4748. *Meroptera unicolorella* Hulst. Mt. St. Hilaire, Que., June 27, (Chagnon).
4759. *Salebria contatella* Grt. St. John's Que., July 1, (Chagnon).
4776. *Laodamia fusca* Haw. Mt. St. Hilaire, Que., Sept. 1, (Chagnon).
4843. *Canarsia ulmiarrosorella* Clem. Mt. St. Hilaire, Que., July 6, (Chagnon).
4870. *Honiwosoma stypicellum* Grt. Mt. St. Hilaire, Que., July 6, (Chagnon).
4939. *Platyptilia acanthodactyla* Hbn. Trenton, Ont., Sept 13, 1908, (Evans).
5049. *Olethreutes duplex* Walsm. Ottawa, leaf roller on poplar, May, 1908, (Gibson).
5131. *Eucosma nisella* Clerck. Trenton, Ont., Aug. 26, 1908, (Evans).
5207. *Episimus argutanus* Clem. Trenton, June 13, (Evans).
Proteoteras crescentana Kearf. Winnipeg, Man., (Wallis); Regina, Sask., July, (Willing). Larvæ probably in stem galls on box elder, (W. D. K.).
5261. *Aneylis goodelliana* Fern. Trenton, July 25, 1908, (Evans).
5287. *Ecdytolopha insiticiana* Zell. Trenton, June 18, Aug. 14, (Evans).
Sparganothis tristriata Kearf. Ottawa, June 27, 1908, (Gibson). A rare species.
5371. *Archips fractivittana* Clem. Chelsea, Que., emerged June 10, 1908, (Gibson); Montreal, June, (Chagnon).
Tortrix alleni Fern. Trenton, 3 dates, July 1-July 6, (Evans).
5419. *Eulia quadrifasciana* Fern. Trenton, 4 dates, June 25-July 17, (Evans).
5452. *Phalonia bunteana* Rob. Trenton, July 4, (Evans).
Hysterosia baracana Busck. Trenton, July 11, (Evans).
5504. *Plutella porrectella* L. Trenton, June 14, 1904, (Evans).
5579. *Aristotelia fungivorella* Clem. Trenton, June 28, (Evans).
5595. *Eucordylea atrupictella* Dietz. Trenton, July 18, (Evans).
5655. *Trichotaphe flavocostella* Clem. Trenton, July 4, (Evans).
5769. *Gelechia rileyella* Chamb. Trenton, (Evans).
5870 *Depressaria nebulosa* Zell. Sudbury, Ont., (Evans).
6010. *Coleophora spissicornis* Haw. Trenton, 13 dates, June 20-Sept. 24, (Evans).
6048. *Coleophora tiliafoliella* Clem. Ottawa, case on basswood, Sept. 24, (Gibson).
6096. *Lymnæcia phragmitiella* Stainton. Trenton, 2 specimens, July 14, 1906, July 16, 1907, (Evans).
Mompha stillella Busck. Trenton, Sept. 19, 1906, (Evans).

6282. *Lithocolletes sexnotella* Chamb. Trenton, 5 specimens, June 13-July 9, 1908, (Evans).
6306. *Lithocolletes guttifinitella* Clem. Halifax, N.S., Sept., larvæ mining the upper surface of *Rhus toxicodendron*, (A. H. Mackay).
Lithocolletes hamameliella Busck. Halifax, N.S., Sept., larvæ mining leaves of *Hamamelis virginica*, (A. H. Mackay).
6496. *Tinea bimaculella* Chamb. Trenton, June 20, (Evans).
6497. *Tinea canariella* Clem. Trenton, July 2, (Evans).
6534. *Amadrya effrenatella* Clem. Trenton, July 29, (Evans).
6537. *Diachorisia velatella* Clem. Trenton, July 22, (Evans).
6606. *Sthenopis thule* Strk. Ottawa, at light, (Nicholls). Second specimen taken in this district.
6609. *Hepialus mustelinus* Pack. Hymers, Ont., July 7, (Dawson).

Coleoptera.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico).

178. *Notiophilus sibiricus* Mots. Vicinity of Stewart River, Y. T., (Nelles).
411. *Bembidium acutifrons* Lec. Winnipeg, Man., May 14, 1909, (Wallis).
413. *Bembidium cautum* Lec. Winnipeg, Man., May 14, 1909, (Wallis).
558. *Pterostichus scitulus* Lec. Lethbridge, Alta., July 5, 1909, (Wallis).
564. *Pterostichus sayi* Brulle. Deseronto, Ont., Sept. 25, 1 specimen, the only one I have ever taken, (Evans).
587. *Pterostichus patruelis* Dej. Vicinity of Stewart River, Y.T., (Nelles).
636. *Amara brunnipennis* Dej. Fullerton, Hudson Bay, July 5, 1904, (Halkett).
813. *Platynus perforatus* Lec. Vicinity of Stewart River, Y.T., (Nelles).
1157. *Bradycellus cordicollis* Lec. Winnipeg, Man., May 14, (Wallis).
1225. *Haliplus cribrarius* Lec. Winnipeg Beach, Man., Sept. 6, (Wallis).
1226. *Haliplus ruficollis* DeG. Winnipeg Beach, Man., June 12; Peachland, B. C., July 28, 1909, (Wallis).
1227. *Haliplus longulus* DeG. Winnipeg, June 5, (Wallis).
1228. *Cnemidotus callosus* Lec. Peachland, B.C., Aug. 18, (Wallis).
1233. *Cnemidotus edentulus* Lec. Winnipeg Beach, Man., June 12, (Wallis).
1275. *Bidessus affinis* Say. Winnipeg, May 27, (Wallis).
1285. *Cœlambus punctatus* Say. Winnipeg Beach, Man., June 12; Peachland, July 31, (Wallis).
1289. *Cœlambus turbidus* Lec. Winnipeg, May 1, (Wallis).
1290. *Cœlambus lutescens* Lec. Winnipeg, April 13, (Wallis).
1293. *Cœlambus sellatus* Lec. Peachland, B.C., Aug. 18, (Wallis).
1297. *Cœlambus nubilus* Lec. Winnipeg, June 19, (Wallis).
1302. *Cœlambus impressopunctatus* Sch. Winnipeg, April 13, (Wallis.
1303. *Deronectes depressus* Fab. Winnipeg Beach, Man., June 12, (Wallis).
1306. *Deronectes striatellus* Lec. Peachland, B.C., July 27, (Wallis).
1320. *Hydroporus consimilis* Lec. Winnipeg Beach, June 12, (Wallis).
1338. *Hydroporus septentrionalis* Gyll. Peachland, B.C., July 27, (Wallis).
1340. *Hydroporus rivalis* Gyll. Peachland, B.C., July 27, (Wallis).
Hydroporus rusticus Sharp. Winnipeg, April 13, (Wallis). Mr. Roberts considers this to be a good species.
1352. *Hydroporus tristis* Payk. Winnipeg, May 1, (Wallis).

1354. *Hydroporus rufinasus* Mann. Winnipeg, May 8, (Wallis). A rare species.
1376. *Hydroporus oblongus* Steph. Winnipeg, April 13, (Wallis). I have never seen this species in any collection but my own, (C.H.R.).
1396. *Coptotomus interrogatus* Fab. Winnipeg Beach, Sept. 6, (Wallis).
1399. *Ilybiosoma bifarius* Kirby. Winnipeg, April 13, (Wallis).
1423. *Agabus semipunctatus* Kirby. Winnipeg, April 12, (Wallis).
Agabus æneolus Cr. Winnipeg, April 13, (Wallis).
1434. *Agabus subfuscatus* Sharp. Winnipeg, May 13, (Wallis).
1450. *Agabus clavatus* Lec. Winnipeg, May 1, (Wallis); Aweme, Man., (Criddle). A rare species.
1466. *Rhantus bistriatus* Bergst. Winnipeg, Sept. 11, (Wallis).
Graphoderes perplexus Sharp. Winnipeg Beach, Sept. 6, (Wallis); Aweme, Man., (Criddle). A rare species.
1508. *Gyrinus fraternus* Coup. Winnipeg Beach, June 12, (Wallis).
1519. *Gyrinus affinis* Aube. Winnipeg Beach, June 12, (Wallis).
1529. *Gyrinus picipes* Aube. Winnipeg Beach, June 12, (Wallis).
Athetá nimia Casey. Metlakatla, B.C., (Keen).
Athetá keeni Casey. Metlakatla, (Keen).
Athetá insolens Casey. Massett, Q.C.I., (Keen).
Athetá fanatica Casey. Massett, Q.C.I., (Keen).
Athetá massettensis Casey. Massett, Q.C.I., (Keen).
Dimetrota retrusa Casey. Metlakatla, B. C., (Keen).
Sabletá canadensis Casey. Toronto, Ont.
Sabletá phrenctica Casey. Metlakatla, B.C., (Keen).
Acrotona adjuvans Casey. Ottawa, Ont., (Harrington).
2114. *Quedius ferox* Lec. Trenton, Ont. Sept. 4, 1 specimen, never took it before, (Evans).
2301. *Dianous zephyrus Casey.* Vernon, B.C., (Venables).
2618. *Tachinus nigricornis* Mann. Victoria, B.C., July 17, (Wallis).
3052. *Hippodamia folcigera* Cr. Stewart River, Y.T., (Nelles).
3709. *Epuræa truncatella* Mann. Stewart River, Y.T., (Nelles).
3848. *Peltis pippingskoeldi* Mann. Penticton, B.C., Aug. 16, (Wallis).
4150. *Cryptohypnus bicolor* Esch. Roland, Man., May 24, (Wallis).
4382. *Pityobius anguinus* Lec. St. Andrew's, N.B., July 11, (Treherne and Sanders).
4503. *Asaphes morio* Lec. Victoria, B.C., July 17, (Wallis).
4594. *Pœcilonota cyanipes* Say. Stewart River, Y.T., (Nelles).
4602. *Buprestis consularis* Gory. Stewart River, Y.T., (Nelles).
4611. *Buprestis adjecta* Lec. Peachland, B.C., Aug. 23, (Wallis).
4629. *Anthaxia deleta* Lec. Peachland, B.C., July 23, (Wallis).
4948. *Telephorus curtisii* Kirby. Vicinity of Stewart River, Y.T., (Nelles).
5271. *Hadrobregmus carinatus* Say. Stewart River, Y.T., (Nelles).
5329. *Cœnocara scymnoides* Lec. Strassburg, Sask., June, 1907, from puff ball, (Willing).
5603. *Geotropes balyi* Jek. St. Paul's Island, Hudson Bay, Aug., 25, 1904, (Halkett).

Lachnosterna. Among 404 specimens of May beetles collected at Round Hill, N.S., by Miss E. Grace Sanders, from May 21 till June 15, only two species were represented, viz., *dubia* and *grandis.* The latter species was rare, only six being taken, three of these on *Cratægus.* The determinations were made by Mr. R. D. Glasgow, of the University of Illinois,

Urbana, Ill. Mr. Glasgow is making a special study of the Lachnosternidæ, and would be glad to examine and return Canadian material. No specimens should be pinned without having the genitalea extruded. It is important, too, that the specimens be collected in the evening, when they are feeding, and a note of the food plant taken.

5880. *Xyloryctes satyrus* Fab. Mt. St. Hilaire, Que., May 20, (Chagnon).
5924. *Cremastochilus crinitus* Lec. Peachland, B.C., July 25, (Wallis).
6240. *Toxotus vittiger* Rand. Pincher, Alta., July 10, 1904, (Willing).
6250. *Pachyta rugipennis* Newm. Hymers, Ont., June 6, (Dawson).
6253. *Anthophylax malachiticus* Hald. Twp. Sabine, Ont., 1 specimen, June 17; I took one other about 1875 at Madoc Village; a rare species, (Evans).
6260. *Acmæops atra* Lec. Pine Creek, Alta., July 12, 1903, (Willing).
6320. *Leptura tribalteata* Lec. Peachland, B.C., Aug. 2, (Wallis).
6349. *Leptura tibialis* Lec. Peachland, B.C., Aug. 7, (Wallis).
6445. *Acanthocinus obsoletus* Oliv. Vicinity of Stewart River, Y.T., (Nelles).
6487. *Saperda puncticollis* Say. Guelph, Ont., May 18, (Zavitz); Macdonald College, Que., (Swaine).
6532. *Donacia hirticollis* Kirby. Penticton, B.C., Aug. 11 (Wallis).
6782. *Prasacuris phellandrii* L. Victoria, B.C., July 17, (Wallis).
6904. *Galeruca tuberculatá* Say, var. *punctipennis* Mann. Goldstream, B.C., on alder, Aug. 12, (J. R. Anderson). Not heretofore recorded from Canada, so far as I am aware, except that Horn in his synopsis of the genus gives it as occurring on Vancouver Island, (Evans).
6968. *Haltica evictá* Lec. Halfway Lake, Alta., on turnips and cabbages, (F. Strutton); Vernon, B.C., (Venables).
Phyllotreta armoricæ Kock. Montreal, June 20, (Winn).
7257. *Asida politá* Say. Swift Current, Sask., Aug. 1901, (Willing).
7666. *Serropalpus barbatus* Schall. Cupar, Sask., June 4, 1907, (Willing).
7704. *Mycterus concolor* Lec. Peachland, B.C., Aug. 7, (Wallis).
7704a. *Mycterus flavipennis* Horn. Peachland, B.C., Aug. 7, (Wallis).
7724. *Calopus angustus* Lec. Hymers, Ont., July 22, (Dawson).
8121. *Pomphopœa sayi* Lec. Shawbridge, Que., June 4, (Winn).
8221. *Rhynchites eyanellus* Lec. Quill Lake, Sask., on willow, June 30, 1907, (Willing).
8203. *Auletes subcræuleus* Lec. Vernon, B.C., (Venables).
Apion commodus Fall. Aweme, Man., (Criddle).
8543. *Erycus puncticollis* Lec. Cupar, Sask., under chips and bark, June 4, 1907, (Willing).
8760. *Acalles porosus* Lec. Lethbridge, Alta., July 5, (Willing).
8825. *Mononychus vulpeculus* Fab. Quyon, Que., (Fyles).
9320. *Creniphilus moratus* Horn. Vernon, B.C., (Venables).
11079. *Phytobius griseomicans* Sz. Last Mountain Lake, Sask., June 5, (G. C. McBean).

Diptera.

(Arranged according to a catalogue of North American Diptera, by J. M. Aldrich, Smithsonian Misc. Coll. XLVI, No. 1,144. The numbers refer to the pages in the catalogue).

During the past year Mr. D. W. Coquillett has determined collections of diptera made in 1908 and 1909 in Manitoba, Alberta and British Columbia, by Mr. J. B. Wallis, of Winnipeg. In these collections are many species of interest, some of which are new to the Canadian list.

97. *Pachyrhina altissima* O. S. Winnipeg, Man., Aug. 23, 1908, (Wallis).
97. *Pachyrhina erythrophrys* Will. Winnipeg, July 6, 1908, (Wallis).
98. *Pachyrhina ferruginea* Fab. Winnipeg, June 19, (Wallis).
112. *Chironomus cristatus* Fab. Winnipeg, May 5, 1908, (Wallis).
126. *Theobaldia incidens* Thom. Metlakatla, B.C., emerged 1-6 Aug., (Keen).
140. *Sciophila flavohirta* Coq. Winnipeg, June 22, 1908, (Wallis).
144. *Neoglaphyroptera cincta* Coq. Winnipeg, June 22, 1908, (Wallis).
164. *Plecia heteroptera* Say. Winnipeg, Sept. 16, 1908, (Wallis).
172. *Rhyphus alternatus* Say. Treesbank, Man., June, 1908, (Wallis).
174. *Actina viridis* Say. Winnipeg, June 24, 1908, (Wallis).
200. *Tabanus affinis* Kirby. Peachland, B.C., Aug. 7, 1909, (Wallis).
200. *Tabanus aegrotus* O. S. Penticton, B.C., Aug., 1908, (Miss B. Farmer); Peachland, B.C., Aug 18, 1909, (Wallis).
217. *Atherix variegata* Walk. Winnipeg, June 19, 1908, (Wallis).
219. *Pterodontia flavipes* Gray. Callander, Ont., July 19, 1909, (H. A. Wenzel).
225. *Exoprosopa decora* Loew. Lethbridge, Alta., July 9, 1909; Westbourne, Man., Aug. 24, (Wallis).
225. *Exoprosopa caliptera* Say. Lethbridge, Alta., July 7, 1909; Westbourne, Man., Aug. 14, (Wallis).
227. *Dipalta serpentina* O. S. Peachland, B.C., July 31, 1909, (Wallis).
228. *Anthrax alternata* Say. Peachland, B.C., Aug. 6, 1909, (Wallis).
229. *Anthrax catulina* Coq. Peachland, B.C., July 21, 1909, (Wallis).
230. *Anthrax cumenes* O. S. Lethbridge, Alta., July 3, 1909; Victoria, B.C., July 15, 1909, (Wallis).
230. *Anthrax fulviana* Say. Westbourne, Man., Aug. 16, 1908, (Wallis).
232. *Anthrax lucifer* Fab. Winnipeg, Aug. 8, 1908; Westbourne, July 27, 1908, (Wallis).
233. *Anthrax mucorea* Loew. Lethbridge, Alta., July 7, 1909.
234. *Anthrax sinuosa* Wied. Westbourne, Man., Aug., 19, 26, 1908; Lethbridge, Alta, July 9, 1909; Peachland, B.C., July 21, Aug 18, 1909, (Wallis).
234. *Anthrax tegminipennis* Say. Winnipeg, July 21, 1908, (Wallis).
237. *Systechus candidulus* Loew. Winnipeg, July 21, 1908, (Wallis).
247. *Psilocephala haemorrhoidalis* Macq. Peachland, B.C., July 29, 1909, (Wallis).
256. *Stenopogon inquinatus* Loew. Peachland, B.C., Aug. 3, 1909, (Wallis).
259. *Cyrtopogon dasyllis* Will. Kaslo, B.C., Sept. 1, 1907, (Cockle).
259. *Cyrtopogon dasylloides* Will. Kaslo, B.C., Sept. 1, (Cockle).
260. *Cyrtopogon prapes* Will. Banff, Alta., (Sanson).
260. *Cyrtopogon rejectus* O. S. Peachland, B.C., July 24, 1909, (Wallis).
269. *Pogonosoma dorsatum* Say. Victoria, B.C., July 1908, (Miss B. Farmer).
272. *Laphria canis* Will. Ottawa, Sept. 1, (Hewitt).
274. *Proctacanthus milbertii* Macq. Peachland, B.C., Aug. 21, 1909, (Wallis).
276. *Erax aridus* Will. Peachland, B.C., Aug. 7, 1909, (Wallis).
281. *Tolmerus callidus* Will. Lethbridge, Alta., July 3, 1909, (Wallis).
283. *Asilus paropus* Walk. Westbourne, Man., Aug. 20, 1908, (Wallis).
300. *Dolichopus brevimanus* Loew. Winnipeg, Man., June 19, 1908, (Wallis).
349. *Pipiza albipilosa* Will. Kaslo, B.C., July 14, 1908, (Cockle).
360. *Melanostoma cærulescens* Will. Kaslo, B.C., April 12, July 10, (Cockle).
Syrphus perplexus Osburn. Kaslo, B.C., July 14, 1908, (Cockle).
368. *Syrphus umbellatarum* Fab. Kaslo, B.C., Oct. 11, 1909, (Cockle).
368. *Allograpta fracta* O.S. Winnipeg, Man., June 29, 1908, (Wallis).

375. *Rhingia nasica* Say. Winnipeg, Man., June 19, 1908, (Wallis).
375. *Hammerschmidtia ferruginea* Fallen. Winnipeg, June 19, 1908, (Wallis).
387. *Eristalis occidentalis* Will. Victoria, B.C., July 17, 1909, (Wallis).
401. *Brachypalpus pulcher* Will. Kaslo, B.C., July 21, 1907, (Cockle).
402. *Criorhina kincaidi* Coq. Kaslo, B.C., May 2, 1904, (Cockle).
408. *Physocephala burgessi* Will. Victoria, B.C., July 17, 1909, (Wallis).
456. *Exorista chelonia* Rond. Reared at Ottawa from larva of *Phragmatobia assimilans*, var. *franconia*, from Mr. H. Dawson, of Hymers, Ont., (Gibson).
464. *Frontina setipes* Coq. Aweme, Man., April 21, 1908, (Wallis).
582. *Palloptera jucunda* Loew. Kaslo, B.C., Oct. 27, 1906, (Cockle).
590. *Tritoxa cuneata* Loew. Lethbridge, Alta., July 4, 1909, (Wallis).
615. *Micropeza producta* Walk. Winnipeg, Man., July 6, 1908, (Wallis).
638. *Oscinis decipiens* Loew. Kaslo, B.C., Sept. 1, 1907 (Cockle).

Hymenoptera.

In the Entomological Records for 1907 and 1908, records are given of some Bombi. Since, Dr. H. J. Franklin has determined further material for Canadian collectors, and among these the following species may well be recorded here:

Bombus flavifrons Cresson. Metlakatla, B.C., May, (Keen).
Bombus melanopygus Mylander. Metlakatla, B.C., May, (Keen).
Bombus huntii Greene. Regina, Sask., Sept 17, Oct 3, (Willing).
Bombus terricola Kirby. Hampton, P.E.I., Aug 20, 1909, (Gibson).
Bombus rufocinctus Cresson. Gull Lake, Alta., Aug. 30, 1908 (Halkett).
Psithyrus ashtoni Cresson. Hampton, P.E.I., Aug. 20, 1909, (Gibson).
Psithyrus laboriosus Fab. Hampton, P.E.I., Aug. 20, 1909, (Gibson).

Prof. T. D. A. Cockerell, one of the leading authorities on North American bees very kindly named a small collection from the Northwest. Some of these are extremely interesting and new to Canada. The following may be mentioned:

Melissodes confusa Cr. Meota, Sask., July 8, 1906; Prince Albert, Sask., July 28, 1907; Radisson, Sask., July 29, 1907; Macleod, Alta., July 8, 1904, (Willing).

Osmia novomexicana Ckll. Medicine Hat, Alta., May 30, 1904, (Willing).

Halictoides maurus Cr. Kinistino, Sask., July 26, 1907, (Willing).

Anthidium tenuiflorae Ckll. Radisson, Sask., July 29, 1907; Saskatoon, Sask., July 18, (Willing).

Megachile calogaster Ckll. Macleod, Alta., July 2, 1904, (Willing).

Megachile infragilis Cr. Regina, Sask., July 11, 1909, (Willing).

Megachile manifesta Cr. Davidson, Sask., Aug. 21, 1907, (Willing).

Megachile pugnata Say. Radisson, Sask., July 29, (Willing).

Cœlioxys ribis Ckll. Prince Albert, Sask., July 27, 1907, (Willing).

Andrena cockerelli Graen. Lipton, Sask., June 5, 1907, (Willing).

Halictus trizonatus Cr. Mortlach, Sask., May 31, 1909, (Willing).

Halictus lerouxii ruborum Ckll. Mortlach, Sask., May 31, 1909, (Willing).

Agapostemon texanus Cr. Mortlach, Sask., May 31, 1909, (Willing).

Colletes salicicola geranii Ckll. Pincher, Alta., July 10, 1904, (Willing).

Coleocentrus pettitii Cr. Hymers, Ont., June 22, (Dawson).

Arotes amoenus Cr. Hymers, Ont., June 21, (Dawson).

Xylonomus stigmapterus Say. Hymers, Ont., (Dawson).

Echthrus niger Cr. Hymers, Ont., June 9, (Dawson).

Echthrus rufopedibus Harrington. Hymers, Ont., June 26, (Dawson).

Telenomus dalmanii (Ratz) Mayr. Reared in Division of Entomology, Ottawa, from eggs of *Notolophus antiqua,* from Little Bras d'Or, Cape Breton, N. S. Mr. Crawford, who determined the species says: "It is a European species recorded there from the same host, but not previously recorded from America."

Pachycrepoideus dubius Ashm. Reared in Division of Entomology, Ottawa, from breeding jar containing puparia of Cabbage Root Maggot; emerged Aug 14.

Nasonia tortricis Brues. Baskatong, Que., emerged from pupæ of *Tortrix fumiferana,* Aug. 1909, (Gibson).

Mematus pinguidorsum Dyar. Ottawa, larva Sept. 16, (Gibson).

Pteronus ochreatus Rohwer. St. John, N.B., July 14, (Leavitt).

Pontania pumila Rohwer. St. John, N.B., July 14; Nerepis, N.B., July 22, (Leavitt).

Pontania leavitti Rohwer. Nerepis, N.B., July 11, (Leavitt).

Pristiphora idiotiformis Rohwer. Nerepis, N.B., Aug. 18; St. John, N.B., Sept. 1, (Leavitt).

Pristiphora pallicoxa Rohwer. Nerepis, N.B., July 22, (Leavitt).

Cryptocampus pallistigmus Rohwer. St. John, N.B., July 18, (Leavitt).

Polybates secundus Rohwer. St. John, N.B., Sept. 1, (Leavitt).

Parabates leucostomus Rohwer. St. John, N,B., July 11, (Leavitt).

Hemitaxonus rufopectus Rohwer. Nerepis, N.B., Aug. 22, (Leavitt).

Monsoma maura Rohwer. Nerepis, N.B., July 18; St. Johns Bay, N.B., July 14, (Leavitt).

Dimorphopteryx melanognathus Rohwer. Nerepis, N.B., July 22, (Leavitt).

Tenthredo diversiceps Rohwer. Nerepis, N.B., July 22, (Leavitt).

Hemiptera.

Little systematic work has been done in this order, as far as the writer knows, in Canada, during 1910. Small collections of material gathered in other years have been worked over by Mr. Van Duzee, and of these the following species are of interest. They are entered here in the order in which they were received.

Apiomerus ventralis Say. Lethbridge, Alta., July 3, 1909, (Wallis).

Aradus inornatus Uhler. Peachland, B.C., Aug. 17, 1909, (Wallis).

Aradus robustus Uhler. "North West Territories," (record sent by Mr. Evans).

Lygus viticollis Reut. Winnipeg, Man., June 29, 1908, (Wallis).

Corythuca arcuata Say. Chelsea, Que., June 20, (Groh).

Alydus conspersus Mont. Aylmer, Que., (Fyles).

Megalotomus quinquespinosus Say. Aylmer, Que., (Fyles).

Podisus placidus Uhler. Co. Hastings, Ont., (Evans).

Podisus sereiventris Uhler. Co. Hastings, Ont., Aug. 15, 1906, (Evans).

Peribalus piceus Dallas. Sudbury, Ont., June 13, 1889, (Evans).

Crophius bohemani Stal. "North West Territories," (record sent by Mr. Evans).

Peritrechus fraternus Uhler. Belleville, Ont., (Evans).

Pilophorus walshii Uhler. Belleville, Ont., (Evans).

Plinthisus americanus Van D. Belleville, Ont., (Evans).

Antillocoris pallidus Uhler. Belleville, Ont., (Evans).

Banasa calva Say. Trenton, Ont., Sept. 21, 1901, (Evans).

Phimodera torpida Walk. "North West Territories," (record sent by Mr. Evans).

Thyreocoris montanus Van D. "British Columbia, June 10-20, 1905," (record sent by Mr. Evans).

Aelia americana Dallas. "North West Territories," (record sent by Mr. Evans). A rare form.

Zicrona cærulea Linn. Sudbury, Ont., (Evans).

Sciocoris microphthalmus Flor. Sudbury, Ont., 1886; Belleville, Ont., (Evans). When determining these Mr. Van Duzee remarked: "The only specimens from America which I have seen of this species, excepting one taken by Mrs. Slosson in the White Mountains."

Okanagana novæboracensis Emmons. Sudbury, Ont., 1892, (Evans).

Orthoptera.

Dr. E. M. Walker has kindly sent me the notes on the species mentioned below, all of which he thinks are worthy of including here. His papers on "The Orthoptera of Western Canada," which have recently appeared in the *Canadian Entomologist* will undoubtedly lead to much greater attention being paid to these insects by collectors in the West.

Pycnoscelus surinamensis Scudd. One immature specimen.

Periplaneta australasiæ Brunn. Several immature specimens.

Nyctobora sericea Scudd. One mature specimen.

Panchlora virescens Sauss. Two mature specimens.

The above four species were found upon bunches of bananas, at Toronto, by Mr. C. W. Nash.

Chlöcaltes conspersa Harris. Aweme, Man., July 22, 1910, 3 males, (Criddle). This species has been only once before reported from Manitoba, by Scudder, in 1862, (E. M. W.).

Melanoplus angustipennis coccineipes Scudd. Fort William, Ont., Aug. 2, 1910, pair in copula, (Walker).

Nemobius fasciatus abortivus Caudell. Fort William, Ont., Aug. 9, 1910, (Walker).

Odonata.

Dr. E. M. Walker, of Toronto, has examined, during the year, much material collected in different parts of Canada. Some of the specimens sent to him are of considerable interest. He has, therefore, been good enough to send me for inclusion here, the following records:

Lestes congener Hagen. Peachland, B.C., Aug. 9, 1909, 1 male, 1 female, (Wallis).

Lestes disjunctus Selys. Peachland, B.C., Aug. 9, 1909, 1 male, 1 female, (Wallis).

Nehalennia irene Hagen. Aweme, Man., July 4, 1909, 1 female (Criddle); Winnipeg Beach, Lake Winnipeg, Man., June 19, 1909, 3 males, 4 females, (Wallis).

Enallagma cyathigerum (Charp.). Nepigon, Ont., Aug. 8, (Walker); Lethbridge, Alta., July 5-9, 1909, (Wallis); Peachland, B.C., July 24, 1909, (Wallis).

Enallagma calverti Morse. Nepigon, Ont., Aug. 8, 1910, (Walker); Aweme, Man., July 1-24, 1909, (Criddle); Winnipeg Beach, Man., June 19, 1909, (Wallis).

Ischnura verticalis (Say). Nepigon, Ont., Aug. 8, 1910, (Walker). This appears to be the most northern record for this species, and the most westerly in Canada, (E. M. W.).

Ophiogomphus severus Hagen. Lethbridge, Sask., July 8, 1909, 1 male, (Wallis). First Canadian record, (E. M. W.).

Ophiogomphus colubrinus Selys. Nepigon, Ont., Aug. 6, 1 male, 1 female, (Walker). First Ontario record, (E. M. W.).

Gomphus olivaceus Selys. Peachland, B.C., Aug. 12, 1909, 1 female. First Canadian record, (E. M. W.).

The last three species were determined by comparison with specimens in the Hagen collection, Museum of Comparative Zoology, Cambridge, Mass., (E. M. W.).

Aeshna sitchensis Hagen. Ellis Bay, Anticosti Island, Sept., 12, 1 female, (E. V. Cowdry).

Aeshna umbrosa Walk. Ellis Bay, Anticosti Island, Sept. 12, common, (E. V. Cowdry); Winnipeg Beach, Man., Sept. 6, 1909, (Wallis).

Tetragoneuria canis Maclachlan. DeGrassi Pt., Lake Simcoe, Ont., June 24, 2 males, (Walker); Sudbury, Ont., June 11, 1892; June 6, 1893, 2 males, (Evans); Hull, Que., 1 male, (Fyles).

Cordulia shurtleiffi Scudd. Sudbury, Ont., June 26, 1892, 2 males, (Evans).

Somatochlora walshii (Scudd). De Grassi Pt., Lake Simcoe, Ont., July 2, 1 male, (Walker).

Somatochlora albicincta (Burm.). Aweme, Man., June 11, 1909, 1 female, (Criddle).

Libellula pulchella Drury. Fort William, Ont., Aug. 3, 1 specimen seen, (Walker). This is the most northern record for this species, (E. M. W.).

Leucorrhinia frigida Hagen. Sudbury, Ont., June 26, 1892, 1 male, 2 females, (Evans).

Leucorrhinia hudsonica (Selys). Sudbury, Ont., June 11, 1893, 1 female, (Evans).

Leucorrhinia borealis Hagen. Bird's Hill, Man., June 5, 1909, (Wallis).

Siphonaptera.

Several hundreds of specimens of fleas were collected by the Rev. J. H. Keen, of Metlakatla, B.C. These were submitted to the Hon. N. Charles Rothschild, who has determined the following species:

Ceratophyllus agilis. Specimens taken from Neotoma.
Ceratophyllus ciliatus. Specimens taken from Sciurus.
Ceratophyllus gallinæ.
Ceratophyllus charlottensis?
Ceratophyllus fasciatus.
Hystrichopsylla dippiei.

FINANCIAL STATEMENT

For the Year ending October, 1910.

Receipts.		*Expenditures.*	
Balance from 1909	$373 06	Subscription (Fletcher Memorial)	$50 00
Members' Fees	350 48	Annual Report	123 50
Reports and Back Numbers	199 07	Cork and Pins	76 95
Advertising	68 22	Salaries	75 00
Government Grant	1,000 00	Expense, Postage, Etc.	37 77
Printing	71 68	Insurance	26 00
Cork and Pins	103 02	Annual Meeting	43 25
Expense	20 00	Printing	1,002 90
Interest	13 89	Library	29 86
		Bank Exchange	4 23
			$1,469 46
		Balance	729 96
	$2,199 42		$2,199 42

J. E. HOWITT, *Treasurer.*

Examined and found correct.

S. B. McCREADY,
J. W. CROW, } *Auditors.*

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