

TWENTY-NINTH ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY
OF
ONTARIO.

1898.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

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THE LEGISLATIVE ASSEMBLY OF ONTARIO.



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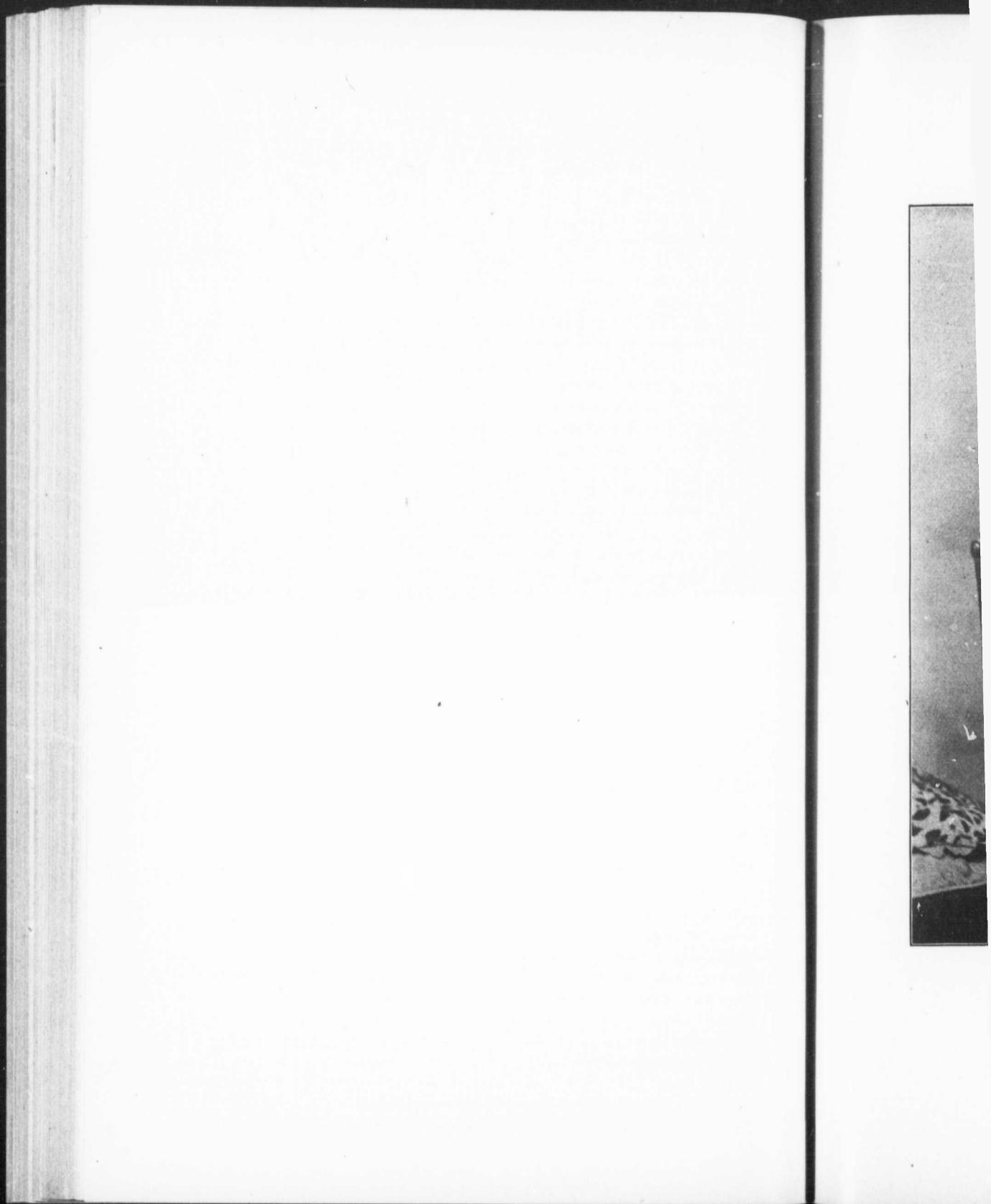
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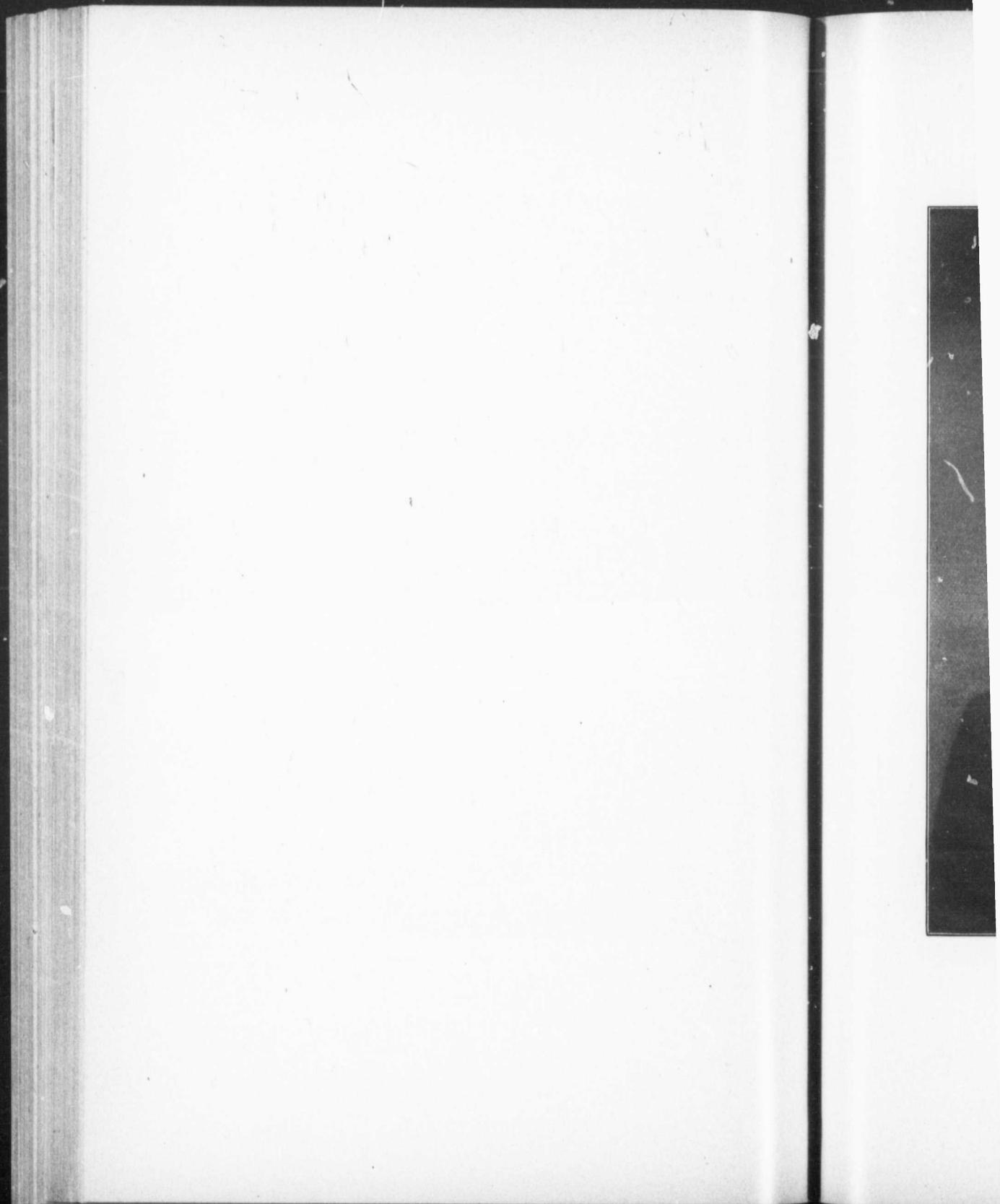
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WILLIAM HAGUE HARRINGTON, F.R.S.C.
President of the Entomological Society of Ontario, 1893-5





JOHN DEARNESS, I.P.S.

President of the Entomological Society of Ontario, 1895-7

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TWENTY-NINTH ANNUAL REPORT
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ENTOMOLOGICAL SOCIETY OF ONTARIO,
1898.

To the Honorable John Dryden, Minister of Agriculture.

SIR,—I have the honor to present herewith the twenty-ninth annual report of the Entomological Society of Ontario. It contains an account of the proceedings at our annual meeting, which was held in the City of Montreal, on the 8th and 9th of November last. The change from London, the usual place of meeting and the headquarters of the society, was made in order that the members generally might join in the celebration of the twenty-fifth anniversary of the formation of the Montreal Branch. The report includes the financial statement of the Treasurer and the reports of the various sections, branches and officers of the society, as well as the papers and addresses delivered during the course of the meeting.

The *Canadian Entomologist*, the monthly magazine published by the society, has now completed its thirtieth volume and begun the issue of the thirty-first. The volume contains a large number of valuable original papers contributed by the most eminent writers in this department of science in Canada and elsewhere. Great attention, it may be observed, has been paid to scale insects and a great many new species from different parts of North America have been described.

I have the honor to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,
Editor.

Trinity College School,
Port Hope.

OFFICERS FOR 1898-9.

President HENRY H. LYMAN, M.A. Montreal.
Vice-President REV. T. W. FYLES, D.C.L., F.L.S. South Quebec.
Secretary W. E. SAUNDERS London.
Treasurer J. A. BALKWILL London.

Directors :

Division No. 1 W. H. HARRINGTON, F.R.S.O. Ottawa.
 " 2 J. D. EVANS Trenton.
 " 3 ARTHUR GIBSON Toronto.
 " 4 A. H. KILMAN Ridgeway.
 " 5 R. W. RENNIE London.

Directors ex-Officio (ex-Presidents of the Society)

PROF. WM. SAUNDERS, LL.D., F.R.S.O., F.L.S.,
 Director of Experimental Farms Ottawa.
 REV. C. J. S. BETHUNE, M.A., D.C.L., F.R.S.C.,
 Head Master Trinity College School Port Hope.
 JAMES FLETCHER, LL.D., F.R.S.O., F.L.S.,
 Entomologist and Botanist, Experimental
 Farms Ottawa.
 JOHN DEARNESS, I.P.S. London.

Director Ex-officio (Ontario Agricultural College)....

PROF. WM. LOCHHEAD Guelph.

Librarian and Curator J. ALSTON MOFFAT London.

Auditors J. H. BOWMAN and W. H. HAMILTON London.

Editor of the "Canadian Entomologist"

REV. DR. BETHUNE Port Hope.

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DR. J. FLETCHER Ottawa.
 H. H. LYMAN Montreal.
 J. D. EVANS Trenton.
 W. H. HARRINGTON Ottawa.
 JAMES WHITE Snelgrove.

Delegate to the Royal Society ... REV. DR. FYLES South Quebec.

Delegates to the Western Fair .. J. DEARNESS and W. E. SAUNDERS London.

Committee on Field Days....

DR. WOOLVERTON, MESSRS. BALKWILL, BOWMAN,
 ELLIOTT, LAW, PERCIVAL, RENNIE, SAUNDERS,
 and SPENCER London.
 DR. HOTSON Parkhill.

Library and Rooms Committee

MESSRS. BALKWILL, BETHUNE, DEARNESS, MOFFAT, and SAUNDERS.

ANNUAL M

The thirty-five members were present at Montreal, in the November 8th and twenty-fifth anniversary of the President, Mr. of Port Hope.

The meeting and Botanist, Exp (Secretary) Londo Mr. J. D. Evans, Mr. Winn, J. T. H. A. E. Norris, H. others, Montreal.

The President from the following the Division of Entomology Dr. W. J. Holland Pa.; Professor F. University, Ithaca,

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The Reports of Montreal Branch by

* By an error it is stated in 1897. As the Society voted

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO, 1898.

The thirty-fifth* annual meeting of the Entomological Society of Ontario was held at Montreal, in the Museum of the Natural History Society, on Tuesday and Wednesday, November 8th and 9th, in order that the members might join in the celebration of the twenty-fifth anniversary of the formation of the Montreal Branch. At the request of the President, Mr. Henry H. Lyman, the chair was occupied by the Rev. Dr. Bethune, of Port Hope.

The meeting was called to order at 2-30 p.m. on Tuesday, when the following members were present: Dr. Wm. Saunders, Director, and Dr. James Fletcher, Entomologist and Botanist, Experimental Farms, Ottawa; Messrs. John Dearness and W. E. Saunders (Secretary) London; Mr. Arthur Gibson, Toronto; Rev. C. J. S. Bethune, Port Hope; Mr. J. D. Evans, Trenton; Rev. Dr. Fyles, South Quebec; Messrs. H. H. Lyman, A. F. Winn, J. T. Hausen, Lachlan Gibb, M. Waring Davis, G. C. Dunlop, D. Brainerd, A. E. Norris, H. Brainerd, J. B. Williams, Chas. Stephenson, Rev. Dr. Campbell, and others, Montreal.

The President read letters expressing regret at their inability to attend the meeting, from the following prominent American entomologists: Dr. L. O. Howard, Director of the Division of Entomology, U.S. Department of Agriculture, Washington, D.C.; Rev. Dr. W. J. Holland, Chancellor of the Western University of Pennsylvania, Allegheny, Pa.; Professor F. M. Webster, Wooster, Ohio; Professor M. V. Slingerland, Cornell University, Ithaca, N.Y.

The report of the Librarian and Curator, Mr. J. Alston Moffat, was read by the Chairman, showing 47 additions to the Library, which make the total number of volumes 1,553, and satisfactory work in the increase of the collections.

The Chairman next read the report of the Treasurer, and explained that the large balance in hand on the 1st of September last, when the books were closed, would be greatly reduced by the payments that became due between that date and the end of the year. A discussion upon cork and pins then ensued. Dr. Fyles exhibited a sample of a substitute for cork that had been placed upon the market. Dr. Fletcher enquired why the quality of the cork recently supplied by the Society was so poor. The Secretary replied that he thought a better quality could be procured by paying a higher price for it. Dr. Fletcher considered that we should have the best obtainable, as the present supply was unsatisfactory. Mr. Lyman exhibited some specimens of English-made steel pins, both gilt and black enamelled, and the Secretary was authorized to procure a moderate supply in order that the members might use them if they wished.

The Report of the Botanical Section was then read by the Chairman. Dr. Fletcher made enquiries as to *Cuscuta epithymum*, a dodder which has been found upon clover in the County of Middlesex. Mr. Dearness assured him that it had been correctly identified. He then said that it was a true annual, growing from seed each year.

The Report of the Microscopical and Geological Sections were next read by the Chairman, who remarked that London had become a headquarters of scientific research for the western peninsula of Ontario, in consequence of the good work done by the Society and its sections. It was certainly an unique matter that so many branches devoted to different departments of science should be affiliated together in connection with the Entomological Society of Ontario.

The Reports of the local Branches of the Society were next read; that of the Montreal Branch by its Secretary, Mr. Lachlan Gibb; the report of the Toronto Branch

* By an error it is stated in the last annual Report that "the thirty-fifth annual meeting" was held in 1897. As the Society was founded in 1863, this is manifestly a mistake.

also by its Secretary, Mr. Arthur Gibson; and the report of the Quebec Branch by its President, the Rev. Dr. Fyles. These reports all gave evidence of much good work accomplished, and steady progress in interest and numbers.

The Report of the Delegate to the Royal Society of Canada was read by Mr. John D. Evans, of Trenton, who represented the Entomological Society at the last annual meeting in May. It contained a brief record of the work that had been done during the previous year.

The Report of the Council of the Society was read by the Secretary, Mr. W. E. Saunders, of London, as follows:

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario submits herewith its Annual Report for the year 1897-8.

The Council is pleased to be able to report that the three Branches of the Society in Montreal, Toronto, and Quebec, are in an active and vigorous condition, much good work having been done in all of them during the past season. The membership of the Branches, the meetings held, and the particulars of their work will be found in their respective reports.

The twenty-eighth annual Report on economic and general Entomology was presented to the Minister of Agriculture for Ontario, at the end of December last, and was printed and distributed at the close of the session of the Legislature. It contained one hundred and four pages, and was illustrated with fifty-six wood-cuts and two full-page plates, in addition to an account of the proceedings at the last annual meeting. The report contains the annual address of the President, Mr. John Dearness, and the following valuable and interesting papers: "The Locusts of the Bible," by Rev. T. W. Fyles; "A Study of the Gryllidæ (Crickets)," by Mr. Wm. Lochhead; "The Value of Systematic Entomological Observations" and "Protective Resemblances," by Mr. J. A. Moffat; "On Butterfly Books," by Mr. H. H. Lyman; "Some Household Pests," by Rev. O. J. S. Bethune; "On the Entomological Results of the Exploration of the British West India Islands by the British Association for the Advancement of Science," by Dr. L. O. Howard; "The Work Against the Gypsy Moth, 1897," by Mr. A. H. Kirkland; "Notes on the Insects of the Year," by Messrs. Harrington, Bethune, Moffat, Fyles, Gibson and Grant; "The San Jose Scale," by Dr. James Fletcher; and a short account of the proceedings at the annual meeting of the Association of Economic Entomologists. The report on the whole contains a larger number than usual of distinctly practical and popular papers that cannot fail to be of great value to the community. These papers were specially prepared by members of the Society in order to afford useful information on a great variety of insects, free as far as possible from scientific and technical language, to farmers, gardeners, fruit-growers, and others affected by the ravages of destructive insects.

The *Canadian Entomologist*, the monthly magazine published by the Society, completed its twenty-ninth volume in December last. Eleven numbers of the thirteenth volume have been issued; they contain 296 pages, and are illustrated with six full-page plates, one of which is colored, and a number of original wood-cuts. Among the many valuable papers may be mentioned a series of articles on "The Classification of the Horn-tails and Saw-flies of the World," by Mr. William H. Ashmead, and "The Descriptions of a Number of New Species of Scale Insects," by Mr. T. D. A. Cockerell, and others.

Friends of the Society will note with pleasure, that one of our officers, Mr. Wm. Lochhead, has been appointed to the important position of Professor of Biology, in the Ontario Agricultural College, at Guelph. The College is to be congratulated on having made so wise a choice in filling the vacant position.

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Since our last meeting, great efforts have been made by the Legislature of Ontario and the Federal Government, to eradicate such colonies of the San Jose Scale as have been found in Canada, and to prevent further introductions of this injurious pest. In our last report will be found the Federal and Provincial Acts bearing upon this subject. These Acts have been vigorously enforced during the past season, and orchards, in districts where the Scale has been found, have been subjected to a rigid inspection. Exceptional efforts have been made by the Provincial Government, to wipe out all traces of this pest, the increase of which, as everyone who understands the matter knows, would be a national calamity.

The members of the Council are gratified to know that the excellent work of one of its oldest and most esteemed members has been recognized by the University of Bishop's College, Lennoxville, Que., the Rev. Thomas W. Fyles having received, at its hands, the degree of D.C.L. The excellent work of Dr. Fyles in encouraging the public taste for Entomology, by his popular papers on insects, and by the formation, in 1897, of the Quebec Branch of the Entomological Society is well known to all our members.

The Council profoundly regrets the loss by death of Prof. Panton, of the Ontario Agricultural College, at Guelph, who at the time of his decease was Vice-President of the Society. He was highly esteemed and respected by the members, both for the efficient assistance he has rendered the cause of Practical Entomology in Canada, and the agreeable and courteous manner which ever characterized his intercourse with all who came in contact with him.

The Council has much pleasure in stating that entomological books can now be imported into Canada free of all Customs duty, and that this concession was obtained through the representations of our Society. Early in the year, the President called the attention of the Council to the fact, that under item No. 464 of the tariff, books upon the application of science to industries of all kinds could be imported free of duty, and suggested that an effort should be made to secure the placing in the same category books upon entomology, on account of the close connection between that science and the successful prosecution of agriculture. This was unanimously approved by the Council and a Committee consisting of the President and Drs. Bethune and Fletcher, was appointed to prepare a memorial to the Government. The memorial having been approved, was signed by the President and Secretary, and was duly forwarded to the Finance Minister on the eve of the introduction of the budget, but owing to the pressure of other business was held over until the prorogation of Parliament. It was referred to the Minister of Customs, who requested the President to furnish more information, and to submit samples of books. On this being done, the Hon. Mr. Patterson, at once decided that such books should be admitted free under the item above referred to.

The Society was represented at the meetings in Boston, in August last, of the Association of Economic Entomologists of North America, and the American Association for the Advancement of Science, by its President, Mr. Lyman and the Rev. Dr. Bethune.

The Council desires to express its entire satisfaction with the efficient manner in which the Librarian and Curator, Mr. J. Alston Moffat continues to discharge the duties of his offices.

All of which is respectfully submitted,

HENRY H. LYMAN,
President.

The adoption of the report of the Council was moved by Mr. Dearness, who also said that it would be interesting to have inserted in the report of the Montreal Branch, some details regarding their Saturday afternoon lectures for young people; upon being seconded by Mr. L. Gibb, the motion was put to the meeting and unanimously adopted.

REPORT OF THE LIBRARIAN AND CURATOR FOR THE YEAR ENDING 31ST AUGUST, 1898

The bound volumes received in exchange from Government and public institutions during the year were 9: By gift—From Miss Ormerod, through Dr. Fletcher, Kollar's "Treatise on Insects Injurious to Gardeners and Farmers," and from Rev. Dr. Bethune, "The Life and Adventures of Audubon." By purchase—"A Systematic Arrangement of British Plants," and Grote's "Illustrated Essay of 1882." The number of volumes bound was 34. The number of volumes added to the library during the year was 47. The full number now on the register is 1,553. The number of volumes issued to local members was 19.

Several valuable additions have been made to the collection of native lepidoptera during the year by Mr. J. W. Bice, from his captures at electric light.

An important extension was made in the exotic collection by the receipt of a large number of attractive Japanese butterflies and moths in excellent condition from the Rev. H. Loomis, Yokohama, Japan.

Respectfully submitted,

J. ALSTON MOFFAT,

Librarian and Curator.

REPORT OF THE BOTANICAL SECTION.

The President and Council of the Entomological Society:

GENTLEMEN,—During the season just past, the meetings of the Botanical Section have been held with good regularity, beginning with April 20, and continuing every second week until midsummer was over. The members have been actively engaged in the study of the various departments and three plants new to the district of London have been found and exhibited to the meetings, namely, *Linaria minor*, *Galium cinereum*, *Fraxinus quadriangulatus*; and others of particular rarity have been noted:—*Asclepias* similar to *Purpurea* but whose species was not satisfactorily determined, *Melissia officinalis* and *Ranunculus bulbosa*, Fleshy Fungi have been the recipients of considerable attention on the part of some of the members and a more general interest has been awakened in this branch.

Some points brought out at the meetings which are of sufficient interest to be mentioned in our report are as follows:—*Lactuca scariola* is reported from various quarters and is said to be spreading throughout the County of Middlesex and others adjoining. It is said to be a pernicious weed and some farmers complain very much of its abundance and troublesomeness.

Cuscuta epithimum, a dodder which has been found flourishing only on clover, and of which there were several reports last year, was found again in the same localities this year.

The lateness of the present summer season is also worthy of note. At the time of writing (Oct. 22), wild specimens of *Liatris cylindracea* are in bloom, and in the garden *Anemone Japonica* is full of buds and flowers, while the Phloxes, annual and perennial, and also roses and carnations are still yielding flowers; apple, pear and peach trees in the gardens, maples, elms, and even the ash trees are still in almost full leaf, many of them, particularly the three former, being quite green. Local records show that not for 17 years has there been so late an open a season.

Respectfully submitted for the Botanical Section,

I. BOND,
Chairman.

W. E. SAUNDERS,
Secretary.

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REPORT OF THE MICROSCOPICAL SECTION.

The President and Council of the Entomological Society of Ontario :

GENTLEMEN,—I have the honor to present the report of the Microscopical Section of the Entomological Society of Ontario.

Meetings were begun in November, officers being elected as follows, Chairman, J. A. Balkwill; Sec'y, W. E. Saunders; Committee, Messrs. Rennie, Saunders and Balkwill.

Nine meetings were held at which five sets of papers were given, a good attendance recorded and much interest manifested. A good many slides were mounted by the members and a great deal of interesting and instructive discussion on microscopical subjects was engaged in.

The papers read comprised,—

Shine moulds, by J. Dearness, London.

Bacteria, by Dr. H. A. Stevenson, London.

Radiolaria, by R. W. Rennie, London.

Diatoms, by J. Dearness, London.

Marine Algae, by R. Lees, M.A., St. Thomas.

Submitted on behalf of the Section,

J. A. BALKWILL,
Chairman.

W. E. SAUNDERS,
Secretary.

REPORT OF THE GEOLOGICAL SECTION.

To the Entomological Society of Ontario :

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

The section continued to meet weekly throughout the year. A special study of the fauna of early geological time was made through the medium of fossils from the Silurian and Devonian formations as developed in south-western Ontario, assisted by charts of the characteristic organic life of these periods.

Special trips to interesting points in our western peninsula were made by various members of our section, and reports of their observations were subsequently made. Among other places visited were the following:—Kettle Point (Cape Ipperwash), by Dr. Woolverton, the chairman of the section; the Crystal Cave at Put-in Bay, Ohio, by Mr. Percival; the bituminous shales of Alvinston, Lambton Co., Ont., by Mr. Sangster; the new oil fields in Sarnia township, Ont.; the Guelph formation as developed at Galt, Ont., by Mr. Goodburn. The chairman of the section also visited the new oil fields at Dutton. Commendable interest was manifested in the general study of geological science.

Appended are abstracts of the reports made of field observations.

Dr. Wolverton's report on Kettle Point and its concretions :

"To the lover of natural history, and especially to the geologist, there is no place in our western peninsula that is of greater interest than this.

"Kettle Point is composed of bituminous shales which overlie the Hamilton formation and which are here the highest member of the Devonian series. The chief feature of this point is the large number of concretionary bodies strewn along the shore, washed

there from the shales which extend as shoals far into Lake Huron. These concretions vary in size from a foot to five feet in diameter. Their composition is limestone, colored by bituminous matter. They are crystalline and radiate from a centre. They resemble fossilized wood. When exposed to the action of the air they usually divide through the centre forming hemispheres.

"As they are being wantonly destroyed by visitors there should be legislative protection provided for these curiosities as soon as possible.

"The shales here present a fine tessellated appearance. The vertical cleavage runs in parallel straight lines at different distances, and the general appearance is much the same as it would be had these shales been placed in position by skilled workmen. Quantities of pyrites are found in these shales. The iron oxidizing tinges with red the boulders along the shore.

"By decomposition of the shales, quantities of alum are produced. This the Indians, from time immemorable, have used as medicine and a commodity for barter. Many years ago fire raged among these shales and consumed a great part of the peninsula which previously had extended far into the lake."

Mr. Percival's report on the celestine grotto at Put-in-Bay :

"It having been reported to the section that a curious crystal cave had recently been discovered on an island at the western extremity of Lake Erie, I decided to visit it and report. The cave was discovered a year ago by workmen engaged in digging a well. At a depth of about twenty feet a fissure was discovered at one side of the well, and further excavation revealed a beautiful little cavern everywhere lined with crystalline strontium sulphate (celestine). The owner having lighted the well by electricity the effect is very fine. The crystals are rhombic, of a beautiful azure blue, and vary in size from one inch to twenty inches in transverse axis. As the cavern is everywhere lined by these crystals it may be considered a gigantic geode. The cave is semi-circular in form and about forty feet in perimeter. The arch of the roof however is low owing to the vast deposit of crystals, said to be more than twenty-two feet in thickness, on the floor of the grotto.

"Crevice at several points together with other indications lead to the opinion that this is only one of a series of similar caverns in that vicinity. The owner proposes to continue excavating during the ensuing winter, and probably next summer there will be several grottoes open to the inspection of visitors.

"Strontium is a somewhat rare mineral and occurs nowhere else in large quantity. The element was isolated about a century ago. It is whitish in color, oxidizes readily, decomposes water with explosive violence, and never occurs in organic bodies. It gives a remarkable band of light in the spectrum, by which it is readily detected. Strontium was named after Strontian, in Argyle, Scotland, where it is found as a carbonate. It is also found in Sicily in small quantity. Here however the quantity in sight is quite large. Sr. nitrate is used to give a crimson tint to a flame, and is the chief material used in making Bengal fire (red). Strontium salts are also used in sugar refining to hasten the crystallization of sugar."

Mr. Percival placed beautiful crystals in our geological cabinet in the Entomological Society's rooms, where they may be inspected at any time.

MR. SANGSTER'S REPORT ON ALVINSTON SHALES.

The outcrop measures 1,400 feet in length, and borings made at various points prove that the depth is sixty feet. The river has eroded the bed to a depth of about eight feet. The shales are similar to those exposed at Kettle Point, but contain no concretions. They are highly carbonaceous and contain much iron sulphide. The shales are capped by a stratum of clay forty feet in thickness.

Experiments made with this shale prove it to be a most valuable material for the manufacture of vitrified brick. A leading manufacturer of paving brick declared no

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Mr. Sangster's shales.

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The following Winn (Vice-Presi O. Stevenson, G.

better material for the purpose had hitherto been discovered on this continent. As a company is being formed to manufacture brick from these shales, it is hoped that soon they will rank among the developed economic products of this Province.

Mr. Sangster exhibited fine specimens of vitrified brick manufactured from these shales.

Mr. John Law, who spent some time among the Catskills, southern New York reported that veins of copper, also platinum, besides traces of gold and silver, had been discovered in these regions. He exhibited specimens of drift boulders from this location; gneiss appeared to be the predominating material. He also exhibited a photograph of a famous drift rock called Eagle Rock. He thinks that prospectors would find it a favorable field for exploration.

Mr. Goodburn visited Galt and reported as follows:

The rocks at Galt are dolomite (in some cases pure) and belong to the Guelph group. They vary in colour, from a dirty yellow to a beautiful grey (the grey being the lowest in the series), and are of a peculiar crystalline texture. They furnish excellent building stones. The Guelph group varies here in thickness from 90ft. to 160ft. The underlying mass is the Niagara group. The upper portions of strata are much broken up, and contained many specimens of the *Megalomus Canadensis*. This bed was about 15ft. thick. The lower beds were quite compact, and also contained many fossils. One *Meg. Can.* which I secured is perfect, six inches in length, and larger than any figured in Nicholson's *Palaeontology*. I also found a very good specimen of *Megalomus compressus* four inches long and a little over one inch in thickness, a portion of the outer spiral and the whole of the inner cast of a *Murchisonia Loganii*. The quarry whence I obtained my specimens is near the Grand Trunk track, and about 200 yards from the Grand River.

The Chairman visited the oil fields at Dutton, Elgin Co., Ontario, and reported that the pioneer company operating there had seven producing wells.

Mr. Kirk reported on another new oil field situated in Sarnia Township, Lambton Co., Ontario. One company operating there had thirty producing wells scattered along a line about two miles in length. These produce from 15 barrels per day downwards. They propose to thoroughly develop this tract, and sink a well every 200 feet. The producing area is about one mile in width. Another company working in an adjoining neighbourhood have very recently obtained some good wells, one of which pumps 25 barrels a day. The producing wells are all situated along anti-clinal, which, however, does not appear at the surface, being deeply covered by clay. Oil is obtained here at a depth of about 475 feet. The borings pass through clay 100ft., hard rock 15ft., shale 150 ft., upper lime 15 ft., shale 150 ft., lower lime and sandstone about 45ft. In order to obtain oil each well must be torpedoed, the charge being from 20 to 50 quarts of nitroglycerine. These new oil fields seem to be a northwesterly extension of the petroleum oil belt. The oil is found along a line trending northwest and southeast.

GEO. KIRK,
Secretary.

THE REPORT OF THE MONTREAL BRANCH.

The 215th regular and 25th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held in the rooms of the Natural History Society of Montreal, on May 10th, 1898.

The following members were present: Messrs. H. H. Lyman (President), A. F. Winn (Vice-President), E. T. Chambers, J. B. Williams, Dwight Brainerd, L. Reford, C. Stevenson, G. A. Moore, and L. Gibb; visitor, Mr. M. Waring Davis.

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

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

In presenting their twenty-fifth annual report the Council have much pleasure in being able to congratulate the Branch upon having enjoyed a continuous and fairly prosperous existence for a quarter of a century. This, in view of the small number interested in the pursuit of this particular branch of science, coupled with the fact that in this country almost everyone has to work for a living, is, we think, a highly creditable showing.

During the season eight meetings have been held, at one of which we had the pleasure of the attendance of Dr. Fletcher, and at another of that of Rev. Mr. Fyles, and the following papers were read :

Annual address of the President.

Notes on the Collecting Season of 1897—Dwight Brainerd.

On the Food of the common Grass Snake—J. B. Williams.

A late Autumn Ramble on the Mountain—A. F. Winn.

On the Mounting of Lepidoptera—H. H. Lyman.

The San Jose Scale—Dr. James Fletcher.

Further notes on the Genus *Chionobas*—H. H. Lyman.

Our books and original papers—A. F. Winn.

Our native Pieridæ, a theory—Dwight Brainerd.

Introduction to the Classification of Insects—Rev. T. W. Fyles.

An Arctian : what is it?—Rev. T. W. Fyles.

Life History of *Tæniocampa alia*, Gn—Rev. T. W. Fyles.

The Dytiscidæ—A. F. Winn.

During the season a number of our members again took part in the course of short lectures to young people on Saturday afternoons at the Natural History Museum. This work is now fairly established, and should be productive of good results in the future.

Our small library, which had suffered greatly in the past through the Branch having no permanent quarters, has received some valuable additions through the kindness of one of our absent members, Mr. Jack, and the Cabinet of the Natural History Society has been materially added to by two of our members, Messrs. Winn and D. Brainerd.

Our Branch has also presented a copy of Comstock's Manual for the study of Insects to the library of that Society as a slight return for privileges accorded to our Branch.

Steps have been taken to secure as far as possible the interchange of papers between the different branches of the Society, that all may get the benefit of such papers. Should this scheme be successfully carried out, it should add materially to the interest of the meetings, and cause the several branches to take more interest in each other's work.

At the last annual meeting of the parent Society our Branch was honored by having one of its members elected to the presidency.

The Treasurer's report shows that the finances of the Branch are in a satisfactory condition.

Respectfully submitted on behalf of the Council,

HENRY H. LYMAN,
President.

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The Treasurer then submitted his report, which showed an accumulated balance in hand of \$38.68.

Upon the motion of Mr. J. B. Williams, seconded by Mr. L. Reford, the reports of the Council and Treasurer were received and adopted.

The President then read his annual address, giving a resume of the past year's work, and suggesting the holding of a conversazione in the autumn to mark the completion of the 25th year of the Montreal Branch.

The following officers were then elected for the ensuing year :

President—Henry H. Lyman ; *Vice-President*—A. F. Winn ; *Secretary-Treasurer*—Lachlan Gibb ; *Council*—G. C. Dunlop, J. B. Williams, Dwight Brainerd.

L. GIBB, Secretary-Treasurer.

REPORT OF THE TORONTO BRANCH.

The second Annual Meeting of the Toronto Branch was held in the Education Department (Normal School) on Friday evening, the 1st April, 1898.

The following members were present : Messrs E. V. Rippon, President : Arthur Gibson, Secy-Treas : H. D. Chipman, C. T. Hills, C. H. Tyers, A. J. Cherry, H. C. Austen, S. R. Carter, E. M. Fenwick and Frank Welch.

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

REPORT OF THE COUNCIL : The Secretary read the following report of the Council for the year ending 31st March, 1898.

The Council of the Toronto Branch of the Entomological Society of Ontario take pleasure in presenting the second Annual Report of the proceedings of the Branch for the year ending 31st March, 1898.

Since our previous Annual Meeting one new member, Mr. E. M. Fenwick, has been added to the roll of membership, and it is earnestly hoped that throughout the year now commencing, the members will endeavor to obtain as many new additions to the roll as possible.

During the year, eighteen regular meetings have been held, and the following papers, contributed by the members, tended considerably to add to the interest manifested in, and the success attending these meetings.

"Parasitic Forms of Insects" by Mr. E. V. Rippon.

"Collecting in and about Kingsville, Ont." by Mr. C. T. Hills.

"Some of the Insect Pests of the Niagara District" by Mr. H. C. Austin.

"Muscular Powers of Insects" by Mr. H. D. Chipman.

"The Mosquito" by Mr. A. J. Cherry.

"On the Noctuidæ Occurring at Toronto" by Mr. Arthur Gibson.

On the 23rd November last the Branch had the pleasure of contributing an illustrated lecture on "Our Friends and Foes of the Insect World", through the kindness of one of our members, Mr. T. G. Priddey, to the eleventh Section of the Boys' Brigade. About 200 boys were present, most of whom took an interest in the discourse, and it is hoped that some stray seed may have fallen into good ground.

During the collecting season three field days were held, viz., on the 24th May to "Trout Creek", on the 19th June to "Trout Creek" and on the 1st July to Forks of Credit.

The Branch is indeed pleased to place on record the appreciation it feels towards the Minister of Education (Hon. G. W. Ross) and the Education Department for Ontario, for their kindness in granting the Branch the free use of a room, in which to hold meetings and store the collection and library.

The report of the Librarian-Curator shows that during the year quite a large number of valuable Government publications have been donated to the Branch, also that the collection of insects is steadily increasing.

The Treasurer's report shows the balance carried forward to be on the right side.

All of which is respectfully submitted.

E. V. RIPPON, President.

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

The election of officers for the ensuing year resulted as follows :

President—Mr. R. J. Crew ; *Vice-President*—Mr. C. T. Hills ; *Secretary-Treasurer*—Mr. Arthur Gibson. (accl.) ; *Librarian-Curator*—Mr. H. D. Chipman ; *Members of Council*—Messrs H. C. Tyers and E. M. Fenwick.

The retiring President, Mr. E. V. Rippon, then addressed the meeting. He referred chiefly to the work done during the past year, and while pleased with the result, said he would like to see the members take a more active interest in the work. As regards the collection of insects he hoped the members would contribute as many specimens as they possibly could during the coming season, and pointed out the advantage to all the members in having a representative collection in the possession of the Branch. Of course, it would not be expected that the members would neglect their own private collections, but with a little extra work on the part of each member, he felt satisfied that much progress could be made in the collection during the approaching season. He also referred to the reading of papers at the meetings, and hoped that the members would make an effort to contribute more papers in future. During the past year only six papers were contributed by the members. He encouraged those present to make more notes during the coming season, feeling sure that if such were done more papers would be contributed at the meetings. He mentioned that the outlook for the Branch's future was much brighter than ever before, as the Education Department for Ontario had very kindly granted the Branch the free use of a room in which to hold meetings, and store the collection and Library. He also touched upon the membership and hoped that those connected with the Branch would endeavor to have some new names added to the roll during the ensuing year.

The meeting then adjourned.

ARTHUR GIBSON, Secretary.

REPORT OF THE QUEBEC BRANCH.

The annual meeting of the Quebec Branch of the Entomological Society of Ontario was held on the 26th of February, 1898. Eighteen members were present, the President, the Rev. T. W. Fyles, occupying the chair.

PRESIDENT'S REPORT. The Quebec Branch of the Entomological Society of Ontario is to be congratulated on the success which has attended it during the first year of its existence. Its numbers have increased, its meetings have been regularly held and well attended, and considerable interest in natural history has been awakened in the community through its proceedings. The pleasures of its monthly meetings have been enhanced by the hospitality of its members. This has been so far extended that its gatherings have taken as much of a social as of a scientific character: though the objects of the association have never been lost sight of—"Philosophy in sport" having been made "Science in earnest."

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In the course of the summer a number of rare and interesting specimens were taken, and these were afterwards exhibited and identified. Among them were some the names of which were new to the Quebec lists.

The thanks of the members are due to the authorities of Morrin College for the countenance and encouragement they have given to the association.

The Branch was represented by its President at the annual meeting of the Entomological Society of Ontario held in London, Ont., on the 12th of October. On this occasion many hearty good wishes for the prosperity of the Branch were expressed.

The parent society has reached the 35th year of its existence. Its 28th annual report is now in the press. Its monthly organ, *The Canadian Entomologist*, which has now reached its 30th volume, ranks as one of the leading Entomological publications of the day, and has an extensive circulation, not only in Canada and the United States, but in Europe and other parts of the world. Flourishing branches of the Society exist in Toronto and Montreal. The Quebec branch will, we trust, be no less prosperous than these.

The Society has experienced a great loss by the death of its Vice-President, J. Hoyes Panton, M. A., F. G. S., Professor of Natural History and Geology, in the Ontario Agricultural College, Guelph. He was the author of a useful handbook entitled "Our Insect Foes and How to Destroy Them." His valuable article on "Entomology for Rural Schools," which appeared in last year's report of the Society, is, no doubt, fresh in the minds of many of you. His useful career was cut short while he was yet in his prime. The American Entomological Society has also sustained a great loss by the death of its President, Dr. George H. Horn. The *Entomological News*, of Philadelphia, thus speaks of him:

"The entomological world has lost a shining light and American Coleopterology its greatest votary. As a systematic coleopterist he probably did not have a superior in the world. His large collection of beetles was considered the finest extant in the field he cultivated. It, with his library, and five thousand dollars for the care of the former, he willed to the American Entomological Society."

Entomology in the United States has made great strides. The Division of Entomology in the Department of Agriculture, Washington, D. C., has been of vast benefit to the agriculturists and horticulturists of this continent. Its present able director, Mr. L. O. Howard, and his efficient staff, are not merely supporting, but raising more and more the high character that its services have won for it. Among the valuable bulletins that it has lately issued are:

"The Gypsy Moth in America," by L. O. Howard.

"Revision of the Tachinidæ," by D. L. Coquillett.

"Some Little-Known Insects Affecting Stored Vegetable Products," by F. H. Chittenden.

"Insects Affecting Domestic Animals," by Herbert Osborn.

The insects that are causing the greatest alarm in America at the present time are the Gypsy Moth (*Porthetria dispar*) and the San Jose Scale (*Aspidiotus perniciosus*) Comstock. Specimens of the former species escaped in 1869 from the residence of Professor Trouvelot, at Medford, near Boston; and for eight years the insects increased in numbers without exciting much attention. The species has now extended its ravages through a district of 220 square miles, and the State of Massachusetts has expended \$775,000 in the effort to exterminate it.

The pernicious scale insect was first noticed in the San Jose Valley, California. It has now located itself in spots from Florida to Canada, and from Washington to New Jersey. Its wide and rapid spread is owing to the fact that it has been 'shipped' with fruit and with nursery stock in all directions. It infests deciduous fruit trees, and, unless prompt measures are taken, an orchard attacked by it will be completely destroyed

ENTOMOLOGICAL SOCIETY.

in a very few years. Our Canadian Department of Agriculture has taken the alarm, and posters, drawn up by Dr. Fletcher have been widely distributed to draw the attention of fruit-growers to the danger.

But Entomology has not only to deal with insects, more or less obnoxious to man; it brings to our notice the beneficial labors of hundreds of other kinds. It holds up to our admiration the marvellous beauty with which the Creator has gifted many of his lesser creatures, and it brings home to us the teaching that "His tender mercies are over all His works." As it is in grace, so it is in nature, "He that seeketh findeth." The works of the Lord are great, *sought out* by all them that have pleasure therein.

REPORT OF THE COUNCIL In presenting this, the first annual report of the Quebec branch of the Entomological Society of Ontario, your Council finds that the branch, although not eleven months in existence, has succeeded very well in the objects for which it was instituted, viz.: the inculcating and promoting a lively interest in entomology, the collection and classifying of specimens, and bringing the members together in social intercourse, through entomological excursions, lectures and gatherings at each other's houses.

Our membership is now twenty-six, viz.: eighteen adults and eight juniors. We have grounds for hope that, during the present year, it will be largely increased.

Meetings have been held monthly, with exception of the midsummer months, in Convocation Hall of Morrin College, by kind permission of the College authorities, for which courtesy our sincere thanks are due.

Papers have been read and lectures illustrated by diagrams, delivered in the same Hall, which have been numerously attended. Instruction has been given as to the killing, mounting and preserving of specimens, which has been much availed of; and we are glad to see it, especially amongst our Junior members. Several nicely-mounted specimens, taken during the summer campaign by members of our branch, have been shewn at our meetings and evince keen interest in the study of entomology on the part of almost all.

Papers have been read and lectures given on land beetles, two winged flies, flesh flies, mycetophylidæ (mushroom flies), bombilidæ, parasites, especially those infesting cattle, horses and sheep, and the best means of their extermination (most useful information to the farmer and grazier), as well as the tiger moths—Arctiidæ—*Colias interior*, etc. The caterpillars have not been forgotten and our "woolly-bear" friend, "*Phragmatobia rubricosa*," as he sturdily scampers over the snowdrift, lets us know that life is by no means lacking in even the smaller things of creation during a Canadian winter, for he early shows himself, a harbinger of spring.

The want of a proper cabinet for the conservation of insects arose, and through the kindness of a few of the members and friends of the Association, a very handsome one has been obtained, which is placed in Morrin College, and has already received its first instalment of insects.

Before closing what must necessarily be but a brief report, owing to the short time since the organization of the branch, we must call your attention to an item very interesting to our hive of workers, viz.: the treasurer's report, which shows that, after remitting to the parent society the necessary honorarium and paying expenses, we have, out of our subscription list, a balance in hand of \$6.70.

JOSEPH EVELEIGH TREFFRY,

Secretary.

The officers elected for 1898 were:

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

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Since the annual meeting in February the branch has held four regular meetings, and five field-days. On the latter occasions very happy excursions to the Gomin, the Island of Orleans (twice), and Beauport were made.

The branch now numbers twenty-eight adult members and fourteen junior.

CRAWFORD LINDSAY,
Secretary-Treasurer.

QUEBEC, Nov. 5th, 1898.

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

Having the honor to represent the Entomological Society of Ontario, I beg leave to submit the following report of its work and proceedings during the past year.

The Society still maintains its former position as to its increasing membership. Its Branches are doing good work, and have given a very considerable impetus to the study of insect life. The Toronto Branch having been inaugurated, commenced its life with the New Year, and later a Branch was formed in Quebec, under the most favorable auspices. The Library has been augmented by an unusually large number of additional volumes, numbering no less than eighty-eight; the total number on the register now being 1,506. Important additions were also made to the Society's collections of insects.

"The Canadian Entomologist," the official organ of the Society, maintains its prestige among its class of literature. The twenty ninth volume of 306 pages was issued during the past year (1897), its contributors numbering forty-four, of whom thirty reside in the United States of America, one in Mexico, one in Germany, and the remaining twelve in Canada. These contributed seventy-six articles, in which were described twenty new genera, one new subgenus, ninety-one new species, and six new varieties.

The following are a few of the more important papers above referred to, viz.:

On the Mexican Bees of the genus *Augochlora*.—By T. D. A. Cockerell.

The Coleoptera of Canada.—By Prof. H. F. Wickham. Continued through nine numbers, and being also a continuation of a series of articles on the same subject which have appeared during the past three years, making an extremely useful compilation for students in Canadian Coleoptera.

A Generic Revision of the Hypogymnidae (Liparidae)—By Harrison G. Dyar.

Catalogue of the Phytophagous and Parasitic Hymenoptera of Vancouver Island—By W. Hague Harrington, F.R.C.S.

Some new species and varieties of Lepidoptera from the Western U.S.—By Wm. Barnes, M.D.

Descriptions of some new Genera and species of Canadian Proctotrypidæ—By Wm. H. Ashmead.

Synonymical and descriptive notes on North American Orthoptera—By Samuel H. Scudder.

On rearing Dragon Flies—By James G. Needham.

Contribution to the knowledge of North American Syrphidae—By W. D. Hunter.

Preliminary Studies of North American Gomphinae.—By Jas. G. Needham.

A Generic Revision of the Hypocritidae—By Harrison G. Dyar, Ph.D.

Notes on the Life History of *Colias Interior* (Scud)—By H. H. Lyman.

The Life History of *Epirranthis Obfirmaria*, Hbn.—By Rev. Thos. W. Fyles.

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Curator—

Notes on *Grapta Interrogationis Fabr.*—By H. H. Lyman and A. F. Winn.

Also there appears a number of book notices, correspondence, etc., etc.

The thirty-fifth annual meeting of the Society was held in its new room in the Young Men's Christian Association Building in London on Tuesday and Wednesday, October 12th and 13th, 1897.

The annual report published by the Society to the Department of Agriculture of the Province of Ontario consists of 104 pages, in which is contained a full report of the proceedings of the annual meeting above mentioned, together with the annual address of its President. (The reports and papers contained therein were here enumerated.)

JOHN D. EVANS,
Delegate.

REPORT OF THE TREASURER FOR THE YEAR ENDING 31st AUGUST, 1898.

RECEIPTS.		EXPENDITURE.	
Balance on hand September 1st, 1897.....	\$ 575 52	Printing.....	\$ 7597 85
Members' fees	385 13	Report and meeting expenses	214 00
Sales of <i>Entomologist</i>	196 46	Library	85 92
Sales of pins, cork, etc	74 06	Expense account, postage, etc.....	133 49
Government grant	1,000 00	Rent	175 00
Advertisements.....	26 50	Salaries	300 00
Interest	23 87	Pins, cork, etc	36 03
		Balance on hand August 31st, 1898.....	739 25
	\$2,231 54		\$2,231 54

We, the auditors of the Entomological Society of Ontario, hereby certify that we have examined the books and vouchers of the treasurer and find them well kept and correct and that the above statement is in accordance with the accounts.

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

STATEMENT OF RECEIPTS AND EXPENDITURE FROM SEPTEMBER 1st, 1898, TO 31st DECEMBER, 1898.

RECEIPTS.		EXPENDITURE.	
Balance on hand September 1st, 1898.....	\$ 739 25	Printing.....	\$ 206 45
Members' fees	86 90	Report and meeting expenses	155 73
Sales of <i>Entomologist</i>	15 47	Library	22 51
Sales of pins, cork, etc.....	11 58	Expense account, postage, etc.....	22 53
Advertisements	7 00	Rent	100 00
Interest	13 80	Salaries	50 00
		Pins, cork, etc	9 44
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J. BALKWILL, Treasurer.

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THE PRESIDENT'S ANNUAL ADDRESS.

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

GENTLEMEN,—It is with much pleasure that I welcome you to the thirty-fifth annual meeting of our society, and especially is this pleasure enhanced by the fact that our meeting is held in this city in celebration of the twenty-fifth anniversary of the formation of the Montreal branch.

It is a subject for much congratulation that our society, which started from such small beginnings, has grown to such a large number of members, with associate members all over the world, and that its monthly journal takes so high a place in the field of entomological periodicals. But I think that we in Montreal have some reason to be proud of the fact that we are the third oldest entomological association on this continent, and, without any monetary grant or assistance from Government, have been able to keep our meetings up with great regularity through a quarter of a century.

Two hundred and seventeen meetings have been held, and over 200 original papers have been read by our members, and about 80 of these have been published.

But, to turn to matters of more general interest, when an amateur entomologist, with extremely little leisure to devote to this science, has the honor, or perhaps I should say the misfortune, to be elected to the distinguished position of president of so important a society, the question what he is to do for an annual presidential address becomes at once a serious bugbear.

We amateurs have to take our science in so scrappy a fashion, in such small mouthfuls, that it is generally impossible for us to follow out any continuous line of investigation or experiment, and our work is of too fragmentary a nature to afford material for an important address. True, by reading and study, we might familiarize ourselves sufficiently with the work which has been done in some particular line by other entomologists to enable us to give a fairly accurate review of such subjects, but that seems hardly desirable, unless one can add something of interest from one's own observations.

Many of my predecessors in this office have devoted much of their addresses to a review of the principal injurious insects of the year, but I feel that this subject can be so much better handled by those who are by profession economic entomologists that I prefer to leave that task to them.

It has occurred to me that there are many subjects, some of them small in themselves, perhaps, but which for all that are not without their interest, and I have therefore determined to invite your attention to a sort of entomological omnium gatherum or olla podrida.

But before taking up any of these subjects, it is my painful duty to refer to the sad event which so early in the season, and in the maturity of his powers, deprived our society of our highly respected vice-president. Prof. Pantou was elected at the last annual meeting, though unable to attend on account of illness, but I do not think that any one at that time anticipated a fatal termination, and I, certainly, looked forward with pleasure to meeting him at this annual meeting.

But the greatest loss to entomology in America, using the latter term in a wider sense than our neighbors generally use it, which has occurred during the year was unquestionably that sustained in the death of Dr. George H. Horn, who since the death of Dr. J. L. Leconte has been facile princeps among American coleopterists.

By the death of Dr. J. A. Lintner, American economic entomology has suffered a great loss, and I am sure his memory will be cherished by all who had the privilege of his acquaintance. He was a very able entomologist and a kindly, unassuming gentleman.

Among other losses by death especial mention should be made of Prof. Kellicott, of the Ohio State University, but whom I had not the privilege of knowing.

But to turn to less mournful subjects: If I were asked to state what I consider the chief characteristic of entomologists, I think I should say their patience. Surely a man deficient in this virtue would not continue long in the pursuit of this science. Are we ever thoroughly discouraged? Does not hope spring ever fresh in our hearts? We may secure the eggs of a species whose life history we are anxious to unravel, and after carrying the larvæ nearly through, and just when success seems about to reward our patient care, a mysterious disease may sweep the whole brood away, and yet we only say, "I must try it again; better luck next time."

When I think of the myriads of species whose life histories are waiting to be unravelled, of the comparatively few who are engaged in this work, of the few life histories which we can work out in a single season, and of the very few seasons we have in which to do this work, I am inclined to think that the way we go at this task is almost sublime.

But this reflection leads me to what is perhaps a delicate question, and that is—Would it not be better if some of our friends, when working out these life histories, would give less time to debating as to more generalized and more specialized forms?

Surely it will not be contended that a more specialized form is necessarily higher than a more generalized one? There is evolution downwards as well as upwards, specialization towards degradation as well as towards advancement.

I confess that when I find able entomologists laying such great stress upon such minutiae as one vein being slightly more appressed to another vein in one genus than in some other genus, or the presence or absence of some minute veinlet, when it is admitted that even individuals of the same species show variations in these matters, which fact has to be accounted for on the convenient doctrine of reversion, or when it is proposed to classify families as higher or lower chiefly upon the single characteristic of having or not having the fore pair of legs aborted, my share of the patience to which I have alluded tends to wear thin.

While not a champion of the New Woman, I certainly believe in the doctrine of the equality of the sexes in the case of the Lycænidae, and protest strongly against any attempt on the part of the gentleman Lycænid to lord it over his spouse on account of his aborted fore legs. The bear has a plantigrade foot, and the domestic fowl is a biped, but it is hardly probable that these facts would lead any systematist to place these animals next to man in the order of classification. We shall never have a natural, and therefore scientific and satisfactory classification of these creatures until we know them in all their stages, when our classification will be based upon the sum of their characteristics.

There is one word which I would like to say to our professional friends, and that is, that I think they might show a little more consideration for the amateurs in the way of giving the reasons for any necessary changes of name. Amateurs have neither the time nor the opportunity to keep up in detail with the tremendous output of entomological literature, and when one takes up a number of a journal containing an instalment of a "revision" of some group, and finds that some well-known name has entirely disappeared, and after a protracted hunt finds, let me say, such an old acquaintance as *Euchaetes Collaris*, Fitch, disguised under the name of *Cynia Tenera*, Hübner, and this without a word of explanation of this wonderful discovery, one can hardly be blamed for exclaiming "A plague on all your revisions."

In entomology, as no doubt in other branches of natural science, some men are lumpers and others are splitters. To the latter I would say that the describing of new species should certainly not be done on the chance of their proving distinct, and to the former that once a form has been described as a new species it should not be lumped except upon overwhelming proof. As an example of most unwarrantable lumping may be instanced the case of *Euchaetes Collaris*, Fitch, which on the authority of some wise-

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acre was known for many years as "the common white variety of *Euchaetes Egle*," because, forsooth, entomologists were too lazy or too stupid to secure the eggs and rear the species.

But I find a very curious tendency in many men to be both lumpers and splitters, lumpers in dealing with the work of others, but splitters in their own work.

A man takes up some group with the view of monographing it, gathers specimens from far and near, inspects all the types to which he can gain access, and finally announces that what have passed for half-a-dozen distinct species are merely slight local varieties of one world-pervading species.

Now this may be all right, though I think that such lumping might, perhaps, better be deferred till the forms in question had been bred through all their stages. But look what follows: among the material gathered together he finds one specimen slightly different from any of the named forms, and two other specimens which agreeing together differ slightly in some other direction, and upon these three specimens two new species are founded, although the divergence does not appear to be greater than in the case of the forms which he has just lumped; and thus we have a patent lumper and splitter combined.

What I have already said of the difficulty, especially for amateurs, of keeping up with the literature of the subject leads me to suggest that it would be a great assistance if an annual list of all the new genera and species of North American insects, with the references as to where described, were published in the January number of the "Canadian Entomologist," and I feel sure that our journal would thereby become of greatly enhanced value to all working entomologists.

The insufficient indexing of some publications is a frequent source of vexation and loss of time, and adds materially to the difficulty of those who need to refer to articles some time after their publication. If the index of every journal were begun with the issue of the first number, each article being cross indexed as soon as issued, the work would not be heavy, and when the last number was in type a thoroughly satisfactory index could be completed in a very short time. The late Dr. Lintner placed a very high value upon a thoroughly complete index, and spared no pains to make the indexes of his Reports as perfect as it was possible to make them.

From 1868 to 1873 inclusive we had an Annual Record of American Entomology, edited by Dr. Packard, with a number of leading authorities in the different orders as associate editors. It was a very useful work, and it is, I think, much to be desired that we should have some sort of an annual index of American Entomology. The difficulties in its way are, I know, very great, but if it were possible for it to be undertaken by the Division of Entomology of the Department of Agriculture at Washington, it would be a great assistance to all the working entomologists of the continent.

Another point of great importance is the care of important collections, and especially the preservation and accessibility of types. It is not reasonable for any one to expect types to be lent for study as the risk of loss or damage is too great, but they should certainly be accessible to those who visit for this purpose the museums or private collections where these types are preserved. It is certainly disappointing when one has made an expensive journey for the purpose of examining a collection, or studying certain types, to find that one's journey is wholly or partly in vain, either through the caprice of a museum curator, or through the collection being in too crowded a condition to permit of an examination being made with safety.

To any one who augments his collection by either exchange or purchase, the different styles of pinning and spreading specimens of Lepidoptera are matters of serious concern, as one generally has to reset all specimens so obtained, unless one is willing to have one's specimens at all sorts of heights, and spread in all sorts of ways. The late Mr. Morrison, who collected so extensively for his patrons, used to insert his pins so that there was frequently very little more than a quarter of an inch above the thorax, and as he used very small sized pins, which bent easily, it was very difficult to handle the specimens without knocking off the antennae.

It was a great step in advance when all the principal makers of microscopes were induced to accept the Microscopical Society's screw, as any objective could be used on any stand. Is it too much to hope for, that entomologists on this continent should adopt a standard length of pin, and a standard height at which to place the specimen on the pin, a standard spreading board for Lepidoptera and a standard style of setting? And this brings me to the most important suggestion which I desire to make, and that is, that North American entomologists might with advantage follow the example of the ornithologists and form a "Union" with a limited number of full members, and an unlimited number of associate members, the full members to be chosen from the leading entomologists of the continent, but associate membership to be open to every entomologist.

The American Ornithologists' Union has been a marked success, and I see no reason why a similar union should not work equally well among entomologists. There are many subjects with which such a union might deal, and if its decisions were generally accepted, as I have no doubt they would be, I am sure it would do a great deal to harmonize the work in this branch of science.

To mention a very few of the things which might be dealt with in addition to those which I have already mentioned I may suggest the capitalization or otherwise of specific names, the nomenclature or numbering of the veins in the wings, the designation of the various segments of larvæ, as well as all the questions in regard to nomenclature. If it be objected that ornithology is practically one subject, while entomology is a whole collection of subjects, I answer, "True, but the same principles apply to all the branches." Take the case of the capitalizing or otherwise of specific names. Some capitalize all specific names, as Mr. W. H. Edwards, with whom on this point I entirely agree, others use capitals for names derived from persons and small letters in other cases; others, and I am afraid the large majority, use the lower case letter in all cases. Would it not, however, be better in such a matter as this to waive our personal predilections and for the sake of uniformity accept an authoritative ruling by such an organization as I have suggested.

With regard to venation the question of uniform designation is of much greater importance, as it is impossible for an amateur to familiarize himself with all the systems in vogue, and hence many generic descriptions or articles on structure are quite unintelligible to many readers. The old system of named veins and veinlets or nerves and nervures seems certainly preferable to me to the confused systems of numbering now in use by different authors, and surely this is a matter which could very profitably be settled by such a body, while in the realm of general nomenclature the field is so vast that the Union would have abundant material for business at its annual meetings for many years to come.

Another point in the same connection may be mentioned, and that is in regard to the official organ of such an association. There have been at different times so many different entomological journals started and carried on for a few years only to die out again. There are many entomologists who cannot afford to subscribe to more than one journal, and it might be better if instead of so many journals with small circulations competing for subscriptions there were fewer in the field, but those more generally subscribed to.

But lest I weary you with suggestions which may be regarded as savouring of presumption in an amateur, I would now invite your attention to a rapid glance at a portion of the work which is being carried on by some of the leading entomologists of the continent. While, as I said, I prefer to leave to others who are so infinitely better qualified the task of giving a review of the insect depredations of the year, I can hardly avoid referring somewhat briefly to some of those which have attracted the widest attention.

As Canadians we are naturally especially interested in the work which our own official entomologist is engaged in. Dr. Fletcher is certainly untiring in his work, traveling about the country from the Atlantic to the Pacific to attend meetings of farmers, fruit growers and dairymen, for the purpose of interesting and instructing them in the importance of economic entomology, and in regard to the economic value of particular grasses,

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and the people are thus being brought to see that the aim of the experimental farms is not the providing of handsome residences in a charming locality for a certain number of scientific gentlemen, but that there is a very real money value to the agricultural interests of the country in the work and investigations which are being carried on there. But naturally from the large sums annually devoted by the Central Government at Washington and the various States to the prosecution of economic entomology by a large and highly trained force of entomologists, the work in that country must necessarily overshadow what we are doing in Canada, though I think it is also undoubtedly a fact that from our more northern latitude we are much less subject to insect depredations of a devastating character.

The attack which in recent years has caused the most widespread alarm on account of the serious nature of the damage likely to result from it is unquestionably that of the San José Scale. This most injurious insect appeared in California late in the seventies, was brought east on nursery stock to New Jersey in 1887 or 1888 and had by 1893, when its presence in the Eastern States was discovered by Dr. Howard, spread through portions of almost every one of the Eastern and Middle States causing the death of thousands of trees before its presence became known. Naturally it soon became a subject of discussion at all meetings of agriculturists and entomologists and has been the subject of legislation by sixteen of the States.

From this very necessary publicity it was naturally to be expected that other countries would take alarm and endeavor to protect their agricultural interests from so great a danger. The first country to do so was Germany, the German Emperor issuing a decree on the 5th February last prohibiting the importation of fruits and plants from America, which prohibition was subsequently restricted to living plants and fresh fruits which might be found to be affected by living scale.

Following shortly after the action of Germany came the passing by our Canadian Parliament of the San José Scale Act on the 18th March last, by which Act it was provided that nursery stock should be excluded when imported from such infected countries as might be designated by the Governor-General in Council, and the United States, Australia, Japan and the Hawaiian Islands were immediately so designated, the plants not subject to the attack of the Scale being exempted from the operation of the Act.

A month later the Government of Austria-Hungary issued a decree barring out living plants, grafts and layers, as well as the packings and coverings, but not excluding fruit except such as might upon examination be found to be infected. Following this the Government of the Netherlands sent an expert to the United States to investigate and report, and Sweden also sent an expert partly for the purpose of making a similar investigation.

The Legislature of Ontario has passed a law for the destruction of badly infested trees and providing reasonable compensation for loss so incurred, while in the United States a bill governing inter state commerce in nursery stock and providing for quarantine in the principal ports of the country was reported favourably upon by the Committee on Agriculture at the last session of Congress and will doubtless become law at an early date.

In this connection attention may be directed to the obvious limitations of the use of natural enemies of insect pests, the attempted introduction of Californian beetles into New Jersey in the hope of their multiplying and checking the San José scale having proved a failure, as has also the attempt to infect the scales with a parasitic fungus from Florida.

The present year has been an important periodical cicada year, the broods occurring this year being the brood XVII. of the Septendecim race and brood VII. of the Tredecim race. In this connection especial attention should be called to the very important pamphlet upon this subject prepared by Mr. C. L. Marlatt, First Assistant Entomologist at Washington, and issued as Bulletin No. 14 of the new series of the U. S. Department of Agriculture. This paper extending to 148 pages copiously illustrated, is certainly the most

important contribution which has yet been made to our knowledge of this wonderful and interesting insect.

Last winter, the Legislature of Massachusetts appropriated \$200,000.00, the full amount asked for, to continue the work of exterminating the Gypsy Moth, and as a consequence very remarkable progress has been made in this work during the past season, and it now seems probable that if similarly liberal appropriations are continued for several years longer this important, but tedious, work will be crowned with success. The work of destroying the Brown-tail Moth has also been intrusted to the same force and is being carried on in connection with the Gypsy Moth work.

Other work in Economic Entomology which may be referred to is the progress made by the Division of Entomology at Washington in the accumulation of data concerning the distribution of injurious insects in the United States.

Mr. Pergande, in furtherance of his investigations of the Lecanium scales affecting the fruit trees, spent the summer in Europe and collected large material.

In the early spring, Dr. Howard visited Mexico to investigate the possibilities of preventing the introduction of the Morelos Orange Fruit Worm into California.

Mr. R. A. Cooley, an assistant to Prof. Fernald, has been at work upon the genus *Chionaspis* and has accumulated an enormous amount of material, and it is anticipated that his paper, when published, will give more than twice the number of species formerly known.

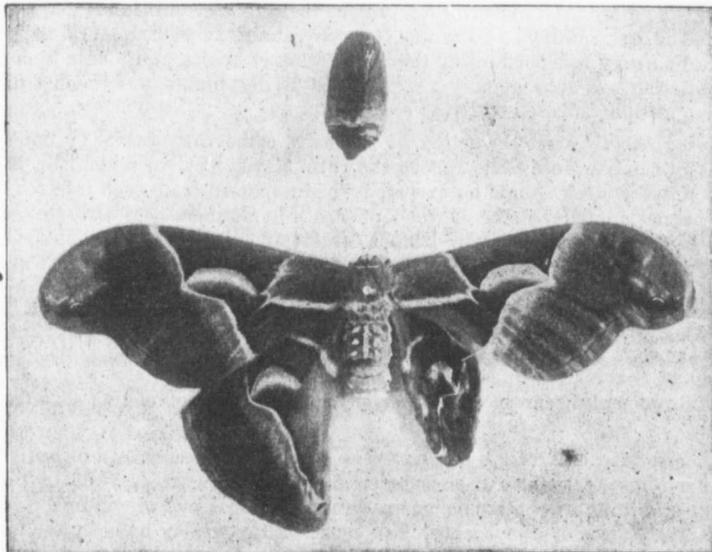


Fig. A. Operation of the first category. A compound pupa and a compound moth of *P. Cynthia*.

But while the economic side of the science is that which is of chief interest and importance to the community, I confess that my own interests lie rather in the direction of the purely scientific side of the subject.

From this point of view the experiments of Mr. Henry E Crampton, Jr., of the Department of Zoology of Columbia University, are of surpassing interest.

Mr. Crampton, following up the experiments of Mr. G. Born upon frog and toad embryos, determined to try similar experiments in grafting upon Lepidoptera in the pupal period and has obtained some truly marvellous results. Mr. Crampton selected the pupæ of the large Saturnians, *Cynthia*, *Cecropia*, *Promethea* and *Polyphemus* as being the most suitable, though he also experimented with success upon *Vanessa Antiopa*, but had no success in his operations upon *Danais Archippus*.

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The butterflies are not so well suited to these experiments as these large moths, partly because of their status being higher than that of the moths, and in the case of those which winter either in the larval or imago state, the chrysalis period is too short.

Naturally, failure resulted in a good many cases, the average of successful operations amounting to about ten per cent.

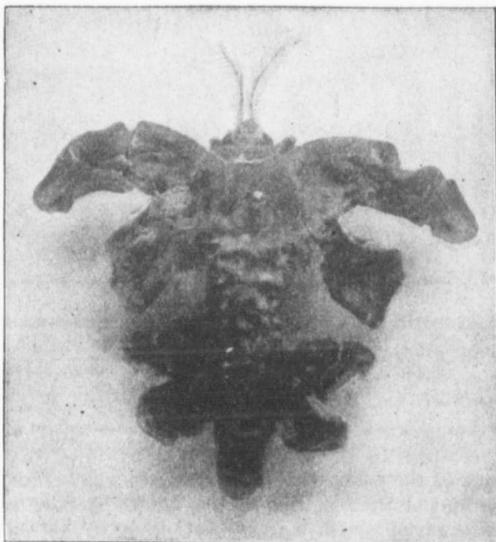


Fig. B. Operation of the second category. Union in "Tandem" of *P. Cynthia*, anterior, and *C. Prometheus* posterior.

The operations were of great variety, the anterior end of one pupa being joined to the posterior end of another either of the same or of a different species, or they were joined in tandems or in pairs back to back, while in one case the tip of the abdomen of one moth was grafted to the upper side of the abdomen of another. One pupa had had its head cut off and was still alive and the abdomens of some were cut off about the middle to see if regeneration would take place. No cases have been successful where the division has been made longitudinally through the centre of the pupæ, and the nearer this line is approached the fewer there are which are successful, and conversely the less that is taken off the more likely are the subjects to survive.

The modus operandi is to slice the pupæ with a razor and effect the junctions with melted paraffin. The paraffin ring cannot be removed, as the coalescence is only effected between the interior portions, the two portions of the pupa case never uniting. The paraffin ring naturally tends to prevent the imagos emerging and they have to be helped out when they seem, from the papery condition of the pupa case, to be ready for emergence, the case being picked off bit by bit.

In general, the wings fail to expand and as a consequence the abdomen remains distended by the hæmolymp. In some cases the wings, or a majority of them, expand very well, one, perhaps, being aborted. In the case of a tandem junction, the anterior one may expand and the posterior one not. In such a case the former had only lost the tip of its abdomen, while the lower one had lost its head. In one case where two portions of pupæ were joined laterally, one eye in one part had coalesced with the neighbouring one in the other part to form a common eye. As a rule, the operations greatly retarded the development of the specimens.

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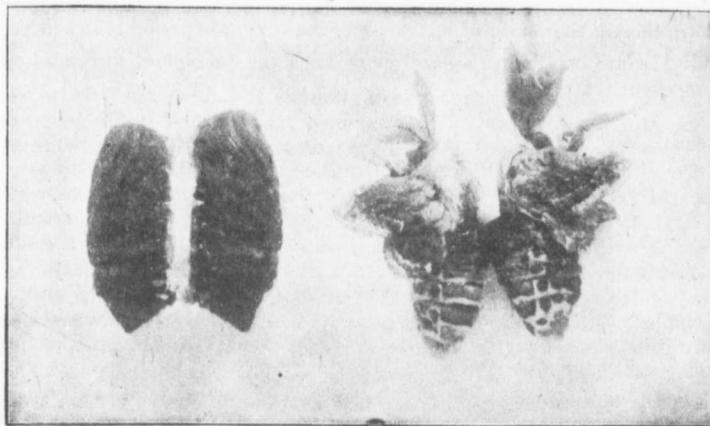


Fig. C. Operation of the third category. United pupae and united imagines of *S. Cecropia*.

One of the objects of these experiments was to see what effect, if any, the unions would have on the colours of the resulting moths, but the results were rather negative, as nothing very definite was obtained.

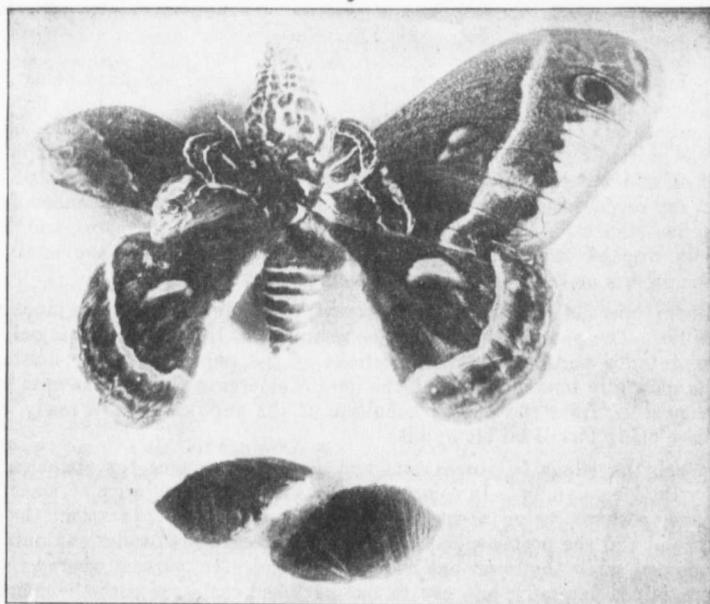


Fig. D. Operation of the third category. United pupae and united imagines of *S. Cecropia*.

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Another object was to ascertain if it would be possible to breed from such monstrosities, but though some individuals had shown symptoms of desiring sexual connection, no union had ever taken place, and so no eggs had been obtained, and as these operations must greatly lower the vitality of the subjects, it seems very improbable that any attempts at breeding from these monstrosities could ever be successful*.

Another man who is doing good work, though in a much less startling field, is Dr. Otto Seifert of New York, in his experiments with heat and cold applied to the pupae of butterflies and moths. Following up the work of Dorfmeister, Weismann, Edwards, Stange, Merrifield, Standfuss, and Eimer he has made extensive experiments upon a considerable number of species.

Pyrameis Atalanta, which seems very susceptible to these influences, *Papilio Asterias*, *P. Turnus*, *Colias Philodice*, *Grapta Interrogationis*, *Melitæa Phaeton*, *Danais Archippus*, *Limenitis Disippus*, *Vanessa Antiopa*, *Junonia Coenia*, *Arctia Arge*, *A. Nais*, *Philosamia Cynthia*, and *Samia Cecropia* have all been experimented upon with more or less success.

The operations were carried on by means of an incubator and an ice chest, the temperature in the former being maintained as nearly as possible at 38° C. equal to 100° F. while in the latter it varied between 4° C. and 6° C. equal to 39° F. and 43° F.

In summarizing his results Dr. Seifert informs me that the effect seemed to depend more upon the susceptibility of the individual than upon the length of the exposure to these artificial conditions, as in some cases chrysalides kept ten days on ice produced more aberrant forms than resulted from others kept for thirty days on ice.

Cold and heat did not always have opposite effects in some particulars, as for instance *Limenitis Disippus* exposed to heat was deepened in colour along the costa to the middle of the wing, the mesial band of secondaries narrowing or being omitted altogether. Subjected to cold the colour was turned darker also but in a different way, the darker tone being chiefly produced by many black scales along the veins, and the mesial band on secondaries being more marked.

While heat in general tends to produce a more marked or defined design, when accompanied by an excess of moisture Dr. Seifert found a tendency to almost destroy the colour but never to affect the design.

Heat and cold were also found to affect the shape of the wings, in some cases the apex of primaries becoming more pointed, while in *P. Turnus* and *G. Interrogationis* cold caused a remarkable development of the scallops and dentations of the wings.

Cold changed the rounded secondaries of *Junonia Coenia* to a form more elongated towards the anal angle, while heat shapes the wings of *Limenitis Disippus* nearly to those of *Danais Archippus*.

Pyrameis Atalanta was affected in the most interesting manner by cold, the red transverse band on primaries above being broken up into four spots while below the secondaries are much changed in appearance, the buff tone of the lower two-thirds of the outer margin being greatly strengthened and spread inwards, while a violet bloom tends to spread over the wing.

In *Arctia Arge* the prominent black spots on the abdomen vanish entirely or are much diminished by heat, and the black marks on primaries are also reduced.

By cold the black spots on the abdomen are enlarged, sometimes in the female becoming transverse bands, while on the secondaries blackish streaks originating from the base spread outwards towards the margin.

Dr. Seifert also experimented upon eggs but could only find that heat hastened development while cold retarded it. Eggs of *Colias Philodice* exposed to a temperature of

*The cuts illustrative of these experiments have been copied from those in "Biological Lectures," published by Messrs. Ginn & Co., of Boston, by the kind permission of Mr. Crampton, who delivered the 11th lecture at the Marine Biological Laboratory of Wood's Holl in the summer session of 1897.

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100° F. hatched in 36 hours, while cold if not carried too far, 8-10 days, merely retarded the hatching, but eggs of *A. Luna* exposed to cold for 20 days were all killed.

The chief point which Dr. Seifert is seeking to elucidate is whether the variations obtained can be transmitted to the offspring and become hereditary. This field of investigation, while much less startling than that in which Mr. Crampton is working, certainly seems likely to prove more fruitful.

Among the most important publications on the Lepidoptera of North America which have appeared during the year must be mentioned Prof. Fernald's monograph of the Pterophoridae, with its sixty-two pages of text and nine plates devoted altogether to structural details, which work has been accorded the highest praise by those best able to judge of its merits.

Mr. Beutenmüller has laid us under a further debt of gratitude by the issue of his "Descriptive Catalogue of the Bombycine Moths found within Fifty Miles of New York City," which appeared last month. This is on the same plan as his previous catalogues of Butterflies and Sphingidae, and extends to ninety-six pages, with nine excellent plates. One hundred and eighty-one species are described, of which ninety-three are illustrated, but from lack of space the author had to omit all generic descriptions. At present this work is only available to those having access to the "Bulletin of the American Museum of Natural History," or are so fortunate as to receive a copy of the author's edition, but I am glad to be able to announce that Mr. Beutenmüller, on completion of the series, contemplates re-issuing the whole in book form, which will then be generally available.

Mr. Beutenmüller, in addition to carrying on this important work, is also engaged upon studying various genera of the Lepidoptera with a view to revision, and has recently issued a review of the genus *Euchloë* or *Anthocharis*, to be followed later by a paper on *Argynnis*.

Dr. Dyar has been carrying on his important studies on structure, especially of larvae, and is engaged in conjunction with Dr. J. B. Smith upon a monograph of *Acronycta*, and is also at work upon a new catalogue or check list which, it is promised, will render the Lepidoptera scarcely recognizable by those who have accustomed themselves to Dr. Smith's Check List of 1891.

Dr. Ottolengui of New York has taken up the *Plusia* group and has gathered specimens of nearly, if not quite, all the known North American forms, and has secured either specimens closely agreeing with all types which he has not been able to see or, where this was impossible, carefully executed colored figures of such types. He is thus in a position to monograph the group, and has discovered some extraordinary errors which have been current for many years. If I may be pardoned for saying so, his work has been carried on on precisely similar lines to my study of the *Callimorphas* some years ago, namely, by finding out first what each author meant by his description, fixing the types absolutely, and then working from that basis, instead of taking things for granted and going by guesswork, and this, I contend, is the only true method.

In Coleoptera, as I am informed, the illness and death of Dr. Horn has produced almost a standstill.

In Hymenoptera valuable contributions have been made chiefly by Mr. Ashmead, aided by Dr. Howard, Mr. Marlatt and Dr. Dyar, the latter in Tenthrenid larvae, and the growth of knowledge in this order has been almost phenomenal, while Dr. Smith has been engaged in most interesting work on the underground forms, the Digging Bees, by means of the plaster cast method.

In Diptera the works of Messrs. Coquillett and Johnson, especially the very important "Revision of the Tachinidae" by the former, have added much to our knowledge, and it is encouraging to note the increase in the number of students in this order.

In Orthoptera the event of chief interest has been the issue of Dr. Scudder's most important "Revision of the Melanopli," a work which must have involved an immense amount of labor and research, extending as it does to over 400 pages, and illustrated by

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twenty-six plates. In connection with this order attention may be called to the interesting discovery that the large Mantid, *Tenodera Sinensis*, Saussure, from China and Japan, has been introduced into the United States and has been breeding for at least three years in the vicinity of Philadelphia.

In regard to Hemiptera, I have already referred at some length to the San José Scale and the work in connection therewith, but mention should also be made of Prof. Cockerell's pamphlet on the other scale insects closely allied to the San José Scale and liable to be confounded with it.

The completion early last year of Mr. W. H. Edwards's magnificent work on the Butterflies of North America, which was undertaken in 1868, caused something like a pang to those who for so many years had been receiving as they appeared the successive parts of this splendid work, and the hope has been expressed on many sides that the talented author might be willing to undertake the issue of a supplementary volume of, say, twenty-five plates, for which he has ample materials, provided one hundred subscribers at \$1.00 per plate could be secured.

But if the closing of Mr. Edwards's labors produced a temporary lull in the issue of beautiful illustrations of our North American butterflies, we are now about to see issued a work which is surely destined to popularize the study of the Lepidoptera on this continent if anything can.

Dr. Holland, the talented Chancellor of the Western University of Pennsylvania, who has amassed an enormous collection of Lepidoptera, including that of Mr. Edwards with all that author's types, has undertaken the publication of a large edition of a popular book on the North American butterflies, to be called "The Butterfly Book, A Popular Guide to a Knowledge of the Butterflies of North America," and has authorized me to make the following announcement in regard to it:

It will be brought out, probably about the end of November, by the Doubleday & McClure Co. of New York,* and will be illustrated by forty-eight coloured plates done by the same system of photographic reproduction and printing which has become so familiar through the publication on Birds issued monthly by the Nature Study Publishing Co. of Chicago and New York. These plates will represent 526 species of diurnal lepidoptera, in many cases giving both the upper and under sides of the insect. The figures are, in the main, taken from the type specimens contained in the Edwards collection, and many of the species are represented for the first time, having never previously been figured. In addition to the representations given of the imago, Dr. Scudder has most kindly granted permission to reproduce the plates contained in his Butterflies of New England in which the early stages of these insects are represented. There are, furthermore, to be about 200 cuts in the text, representing anatomical details of structure which are useful in the determination of genera. A cut representing the neuration of each genus is given, and in some cases additional cuts showing the subgeneric forms. Brief descriptions of the imago, egg, caterpillar and chrysalis, when the latter are known, are given in the text. Interlarded in the somewhat dry technical details are extracts from the writings of other authors, which are calculated to interest the general reader, and quotations amusing and pathetic, gathered from out of the mass of butterfly lore.

All this is to be put before the American and Canadian public in good binding for the sum of \$3.00, but it will be necessary to sell 7,000 copies of the book, unless a monetary loss is to result, but surely among the 70,000,000 of the United States and the 5,000,000 of Canada there should be no difficulty in disposing of 7,000 copies of such a book at such a price.

A fair idea of the character of the plates can be obtained from the rough proofs which Dr. Holland has sent to be shown at this meeting.

A Canadian edition has been published by Mr. William Briggs, 29-33 Richmond St. West, Toronto.

In regard to the publication "Birds," which title has recently been enlarged to "Birds and all Nature," and which has begun giving excellent illustrations of butterflies and mammals in addition to the plates of birds, it seems a great pity that with such beautiful plates it is not considered worth while attempting to make the text of some scientific value.

Another popular book under the name of "Every-Day Butterflies," from the facile pen of Dr. Scudder, is announced and will contain familiar and fully illustrated accounts of sixty or more of the commonest butterflies, taken in the order of the season.

In conclusion I have to express my indebtedness to Dr. Howard, Dr. Smith and Prof. Fernald for the kind manner in which they responded to my inquiries, and for the valuable information afforded and suggestions offered, which have materially contributed to any interest which my address may possess, and to you, gentlemen, my acknowledgments are due for the patience with which you have listened to me.

Dr. FYLES, in rising to move a vote of thanks to the President for his valuable and interesting paper, said that he approved of the address with one exception namely, that when so good a worker, so good a collector, read so good a paper as the address just given, he should not call himself an amateur. Dr. Wm. Saunders seconded the motion. He had listened with great pleasure to the address, so full of admirable suggestions showing the keenest interest and deep insight into the needs of the active entomologist. He called attention to the many interesting statements of the investigation now progressing. *Carried.*

Mr. Lyman briefly acknowledged the vote, saying that as he was not a professional entomologist he must be an amateur.

Mr. W. E. SAUNDERS, referred to the President's suggestion of the formation of an American Entomologists' Union, and spoke of the good work done by the American Ornithologists' Union, in preventing needless changes of nomenclature and in other important matters. Mr. A. E. Norris spoke on the importance of uniformity of setting, strongly approving the President's suggestion of a Union to authoritatively settle all such matters. He would favor the giving of greater attention by the societies to the working out and making complete exhibitions of the life histories of insects, as such exhibits are at once the most interesting and instructive.

A paper entitled "Some International features of Economic Entomology" by Prof. F. M. Webster, Wooster, Ohio, was then read by Dr. Fletcher.

SOME ECONOMIC FEATURES OF INTERNATIONAL ENTOMOLOGY.

BY F. M. WEBSTER.

When that massive ridge of Archæan rock, the backbone, so to speak, of the future American continent, was first laid down, stretching away from northwest to southeast, it is hardly to be supposed that it was cut in twain from east to west by some huge chasm, which, in future ages, was to separate from each other two distinct worlds of animal life, with no inter-communication between them.

Nor is it more likely that, after the ponderous ice sheets of the Glacial Period had plowed their way from the far north, crushing and grinding the solid rock and transporting huge boulders from the area that we are now pleased to term Canada, far to the southward, and depositing them along what is now the Ohio River, there should have been thrown athwart this pathway an invisible barrier across which animal life could not by any possibility make its way.

It was nature that hollowed out the beds of the great, turbulent lakes and furrowed out the course of gigantic Niagara, but it was uncivilized man who first chose to make these barriers between himself and his enemies; and while civilized man has followed the

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example thus set for him, this is no part of nature's handiwork. Though the Cross of St. George may now proudly float from the one side, and the Stars and Stripes as proudly respond to the northern breezes from the other side; though there may be martialled, armed hosts on either side, the coats of one being red and the other blue, this is but following in the footsteps of the uncivilized aborigine, and not in the pathway of nature.

The feathered migrants of the air will, each recurring spring, make their way from the far south and rear their young in your woods and fields and along your inland lakes and streams, gathering their progeny together and making their way southward again in autumn, though a Queen might issue her edicts and a President promulgate his orders to the contrary. Again, the finny tribes of the sea and lakes seek their food and deposit their spawn wherever their inclinations and a favorable situation may tempt them, wholly unconscious of the tribulations that they bring upon the enthusiastic angler from the cities of the United States, who suddenly finds himself and his craft in the hands of British law in case he attempts to follow them. The moose, the wild deer, the wolf and the bear are no less free to go and come, roving northward or southward as their inclinations prompt them, totally ignorant of the terrors lurking in invisible, arbitrary lines and the questionings of custom house officers; for these are the belongings of men and not of nature.

In the light of what has been stated, then, it may be said that at present Canada and the United States are separated by an imaginary, arbitrary, political line, which we as subjects of two powerful nations are bound to respect in matters outside of natural science, but it seems to me that the naturalist must be permitted to demand that this condition is not allowed to extend farther. We are dealing with nature, and nature, as has been shown, knows no national lines. With us, as entomologists, the fact that we are all Americans must stand paramount to any other considerations. America is separated more or less widely from other portions of the world by depths of sea, which form a far more effective barrier to insect migrations than any that human minds can conceive or human hands erect. Unaided by man or his agents, but few insects could make their way from the eastern to the western hemisphere, or vice versa, though those neo-tropical might and probably have, unaided by man, spread from thence northward into the nearctic regions. Two illustrations of these last will suffice, one the Harlequin

Cabbage Bug, *Murgantia histrionica* (Fig. 1), known to inhabit Central America and the West Indies, has lately pushed its way northward, in Ohio, to within twenty miles of Lake Erie, or to about Lat. 30° 15' N, while the Chinch Bug, *Blissus leucopterus* (Fig. 2, highly magnified), in all probability originally a neo-tropical species, has,



Fig. 1.

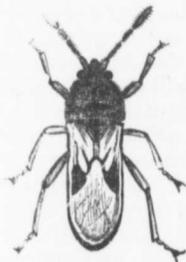


Fig. 2.

as you know, spread northward over a portion of the Dominion of Canada, and while it has not as yet been known to depredate upon your crops to any noticeable degree, yet it may do so in the future, in which case it may be expected to first make its presence known in your timothy meadows rather than in your grain fields, and quite likely will work considerable injury before it is recognized by your agriculturists. Another phase of this problem of insect migration is illustrated by the Colorado Potato Beetle, *Doryphora decemlineata*, which at one time was restricted to the country about the base of the Rocky Mountains, and its food-plant consisted of vegetation having no economic value. But now came the eastern emigrant farmer with his indispensable potato, a plant closely allied to the natural food-plant of this insect, and thus the potato patches of the settlers became as so many stepping-stones to the beetles and enabled them to make their way eastward to the Atlantic coast and Canada, transcontinental railways probably hastening their arrival, as they are shown to have appeared along the lines of railways earlier than elsewhere. So much for this aspect of the problem, but let us now turn our attention toward some other phases of a more international character.

Many years ago, probably about 1856 or 1857, the Cabbage Butterfly, *Pieris rapae* (Fig. 3), was introduced about Québec, and possibly also again about 1891, since which time it has spread westward and southward until it now extends from the Atlantic to the Pacific and nearly to the Gulf of Mexico, even its numerous parasites not being able to entirely prevent its ravages. The Codling Moth, *Carpocapsa pomonella*, was in all probability first introduced into the United States, but Canada has as you all know sustained her full share of injury from its ravages. These two species have been brought to our shores from the mother country, and they are by no means the only ones that have been introduced from Europe or Palearctic regions, and, I fear, those that we now have with us will not be the last to come this way. The latest and most serious introduction of all, the San Jose scale, *Aspidiotus perniciosus*, is in all probability another contribution from the Palearctic region, as I have been able to prove almost conclusively that it came to us from Japan, and we therefore received it from the west instead of the east. Recent experiences are amply sufficient to show that it will destroy the orchards of Canada as well as those of the United States, within whose domains it first made its unwelcome appearance.

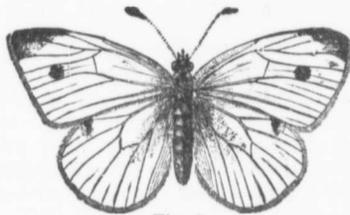


Fig. 3.

The foregoing illustrations will certainly be sufficient to convince anyone that we cannot by simple Legislative or Parliamentary enactment erect a Chinese wall, so to speak, that shall keep Canadian insects, whether native or introduced from making their way into the United States, or similar species escaping from the latter into Canada. We in the United States are more likely to import more insect pests than you, and, owing to our geographical situation, will suffer most from their depredations, but, put the matter as we will, we are much in the position of a large family threatened with an attack of some contagious disease; if one member contracts it all will be alike exposed, and to attempt prevention by individual isolation, will result in no end of trouble and aggravation without accomplishing the end desired, precisely as we have found our State laws to do. What we need, primarily, is an international quarantine measure that shall apply uniformly to all North America. A judicious, properly enforced measure that shall mean the same from the mouth of the St. Lawrence to the mouth of the Rio Grande, and from there to Vancouver or the mouth of the Yukon, and as far beyond as is found necessary. It is all very well for your Canadian law-makers to say that it is none of Canada's affair what is done in the United States, and our politicians will make the same plea, but we who are continually dealing with these problems of nature know better! We know that there is a power higher than that of our combined nations, that rules these natural elements, which power we cannot control, but, may oftentimes utilize to our advantage. International entomology and international insect legislation are matters that we are being confronted with for the first time—matters of the future rather than of the past—but the next century will see them brought to the front. There will arise important questions which must be settled calmly, judiciously and justly, and entomologists must be ready to advise and counsel in these matters. The Entomological Society of Ontario ought and will have its influence in solving these international problems, as these come up one after another for solution and in accordance with nature's unyielding laws. I look for the time to come, and in the comparatively near future, when these matters will become far more important factors in international law than they are at present, as, indeed it seems impossible that the situation can be otherwise.

If we look about over the world at the present time, we find Cape Colony prohibiting the importation of all American nursery stock, whether from the United States or Canada. Several European nations have gone even farther and attempted to prohibit American green fruits from being brought within their respective domains. Queensland quarantines against New Zealand, South Australia against New South Wales, and Tasmanian fruit is condemned and destroyed in Melbourne; British Columbia destroys infested fruit from the United States as well as from other parts of British America, while

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Canada prohibits the importation of nursery stock from the United States; at the same time several of these States have enacted laws which enforced to the letter would become quite prohibitory in their effects. The most of this trouble has come from the appearance of that pernicious little pest the San Jose Scale, *Aspidiotus perniciosus*, which we, in all probability, first received from the west.

Now, this method of dealing with the problem of insect control cannot be said to be all wrong, as some of it is quite necessary and proper, but there is certainly a great deal of misdirected effort being put forth and commerce is suffering therefrom to a considerable extent. It is the beginning of insect legislation, and first attempts at anything are usually more or less crude and capable of improvement. It is all right for Cape Colony to protect her growing fruit interests by keeping certain fruit pests out of South Africa, by prohibiting the importation of nursery stock, liable to infection, and keeping these Acts in force until such time as the pests have either become exterminated or some method discovered whereby the nursery stock can be effectually disinfected and rendered safe. If the Australasian Colonies had, years ago, united on a uniform code that would apply to all ports alike and admitted nursery stock and green fruits after an examination and disinfection, as has been done at the port of San Francisco, California, during the last few years, they would not now be contending against each other. If we in America had taken similar steps in the matter of insect legislation fifty years ago, we would in all probability have escaped much of the insect depredations of the present, as the major part of our seriously injurious species in this country are of foreign origin.

It is of course, too late, now, to prevent what has already been done, but it is not too late to take measures to prevent further importations from both east and west. In our efforts to suppress the insect pests that we already have with us, we are overlooking the greater problem of prevention of future similar introductions. We are laying altogether too much stress upon individual effort, as put forth by States, Colonies or Provinces against each other, and entirely losing sight of the international aspects of the problem. We cannot seem to diabolize our minds of the idea that political lines have something to do with the management of these natural organisms, and cannot apparently grasp the idea that natural barriers may be utilized by one or more nations acting in unity, and for the direct benefit of all thus acting. Sometime in the future, though neither you nor I may live to see it come to pass, these arbitrary, imaginary lines will, in problems of this sort, be lost sight of, and there will appear in their stead lines of another sort, far less imaginary and more natural, and these will encompass not one nation alone, but one or many as the case may be. We shall then designate these areas by a term now unknown, except to scientific ears, viz., Zoogeographical Regions, and while these may vary somewhat from the outlines laid down by Wallace, in his "Geographical Distribution of Animals," yet they will probably cover much the same areas as there indicated. There will probably continue to occur cases like that of the Colorado Potato Beetle, where a species may spread from one section of a Zoogeographical Region over, and become destructive in, many portions of the remainder, yet these phenomena are likely to occur but rarely. We may learn that the Almighty can make a better barrier, over or around which insects cannot make their way, than the wisest of men or the mightiest of nations. There are phenomena connected with the geographical distribution of insects for which we cannot, with our present knowledge, account. There are boundaries beyond which certain species do not make their way, though to the human eye and mind there are no obstructions in the way of their doing so. The science of applied entomology is yet in its infancy, and we have very much to learn even of our most common species of insects, but we can even now see the unnatural and impractical methods that we are trying to apply toward their control, as between one portion of the world and another. We try to erect legal barriers where none exist in nature, and ignore those which nature has provided. All of this, of course, applies to protection from future importations, and not to such as have already gained a foothold, these last being beyond the scope of my paper, as I have restricted it, and the management of these will depend largely upon the energy and care of the people inhabiting the territory over which such species are now distributed. There is, however, a very important phase of the problem of controlling these pests,

already imported from foreign countries, and which will be discussed later on in my paper. While it has not been deemed best to discuss, in detail, legislative control of such destructive species as have already been colonized here in this country, and many of them widely diffused, yet their possible control in many cases at least, by the application of nature's own forces seems to me to constitute a very important feature of International Entomology.

Forms of both plants and animals, unaided by the influences of man, make their way over the face of the earth but slowly if at all, and it is probable that a species often becomes so influenced by the change that it loses its specific identity and takes on new characters, so that the specialist rechristens it and gives it another name. The result of all of this is that wherever a species makes its way, naturally, its enemies usually follow, or else while undergoing the process of adaptation, new enemies come to exert their influence. In other words, the difference between an artificial and a natural introduction is much the same as suddenly dumping an iceberg into a pond, as against allowing the same amount of water to make its way into the pond, from the same source, but through a small spring or brook. In the former case both equilibrium and temperature are disturbed, while in the latter the effect is too gradual to cause any radical changes.

The legitimate introduction of plant life from one country into another has come to be a matter of vast commercial importance, and, adding as it does to our health, comfort and pleasure, such introductions are in every way commendable. Accidental introductions may, however, not always prove so satisfactory. Now, all of this brings me to the second phase of the subject of International Entomology, viz., the intentional, if not indeed necessary, introduction of exotic insects in order to re-establish the equilibrium that has been upset by the importation of plant life, or, as is sometimes the case, to enable the plant introduced to become permanently established.

Of species of insects purposely introduced from one country into another, there are those whose products constitute articles of commerce, of which the honey bee and silk worm are well known illustrations. The importation of large quantities of the ova and imagines of two species of American aquatic hemiptera, *Corixa mercenaria*, Say, and *Notonecta americana*, Fabr., from Mexico, where they are used for human food, into England, where they are to be used as food for birds, game, fish, etc., is another illustration of a different feature of this commerce in insect life.

The relations of insect to plant life are, however, so various and intimate; and, because of their reaching out over the face of the globe for the fruits, grains and ornamental vegetation of other climes, men are finding themselves more and more driven to import insects foreign to their respective countries. In some instances it has been found impossible to permanently establish an exotic plant without insect assistance. We all remember how impossible it was to get the red clover plant established in New Zealand until humble bees were also imported to fertilize the bloom, as the plant is not one that will perpetuate itself indefinitely from the roots; and at present we in the United States are unable to grow the perfect Smyrna fig owing to a lack of the good offices of a little foreign insect, *Blastophaga pensens*, which actually represents the male element in its fertilization.

Lastly, we come to what appears to be the most important of all insect importations, viz., the introduction of foreign, carnivorous insects, whose office in their native country is to prey upon and destroy those that are destructive, which last we have unintentionally imported into this country on trees, plants and shrubs, or in the fruits and grains coming to us from these same countries. That is to say, when we find that we have introduced a destructive species of insect, we are to go to the native habitat of this and there secure its native insect enemies, and introduce these to hold the former in check, as they do at home.

Parasitism is nature's insecticide—one of the forces that is employed by nature to restore equilibrium, so to speak, among natural organisms in point of numerical strength. The observing entomologist may every year witness proof of this, for he will observe some species to increase very rapidly during a short time, and, knowing of their fecundity, will

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often be led to predict a serious outbreak. But at the opportune moment, Presto! a change! and the species that was but yesterday, as it were, literally swarming, is now reduced to a minimum, while the dead are everywhere thickly scattered about. Two instances of this sort have, the present year, come under my own observation. Early in May, the females of the grain aphid, *Siphonophora avenae*, appeared on the growing wheat and were soon surrounded by their young. These insects were in a short time as plentiful as they usually are, at that season, in years of excessive abundance, and there seemed every indication of an outbreak of the pest. But now there appeared a little Braconid parasite, *Aphidius avenaphis*, and within ten days there were few living adults to be found, though the distended, brown bodies of those that had succumbed to their minute enemy were everywhere plentiful. It was as if a Mighty hand had been stretched forth accompanied by the command, Peace! be still. During August and early September there were great numbers of caterpillars of *Spilosoma virginica* (Fig. 4, *a* caterpillar, *b* chrysalis, *c* moth) and to a less degree of *Arctia acraea*, in Northern Ohio, and, if they had all developed moths, there would have been much injury caused by the caterpillars next year. But this was not to be, as by September 20th the dead and dying were hanging to weeds, grass and fences, in myriads, having been attacked and killed by a fungous enemy, probably *Empusa aulicea*, Reich., and neither of these caterpillars will probably be at all abundant with us next year. The same phenomenon was noticed in Ohio six years ago.

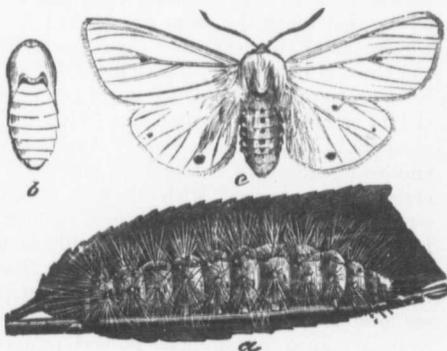


Fig. 4.

Scattered through our entomological literature, are hundreds of such illustrations of the value of parasites in holding in check the hordes of destructive insects that occur in this country, and there is hardly a working entomologist who cannot add to these from his own unpublished notes.

Of our most destructive insect pests nearly all have been brought to this country from abroad. Lack of their natural enemies here, together with the fact that, in many cases, these introduced pests are not known as such in their native homes, leads us to conclude that we, in our importations, have left these enemies behind. The case is much as though we were to import from some foreign country a huge piece of machinery, but on its arrival we find that the balance wheel has been omitted, and in such a case what are we to do? Cable back for the missing wheel, or attempt to run our machine without a balance wheel? There are, doubtless, instances where introduced species can not be subdued in this manner, by the importation of their ancient enemies, but, generally speaking, this appears to be the rational method of accomplishing this end. The history of the introduction of the Orange Scalc, *Icerya Purchasi* (Fig. 5), from Australia into California, is probably familiar to most, if not all, of those present. The orange industry of the United States and, as was afterwards learned, of other countries also, was threatened with a most destructive enemy to citrus fruits. In California orange groves were being destroyed to such an extent that it looked as though the cultivation of this fruit would have to be abandoned. But a natural enemy of this pest was discovered in Australia and imported, artificially, into this country, and as a result the pest has been subdued, and with us, before it had spread beyond the Pacific coast. Not only this, but

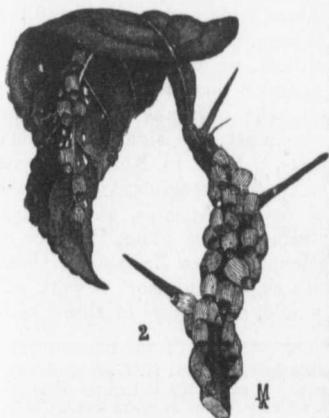


Fig. 5.

fruit would have to be abandoned. But a natural enemy of this pest was discovered in Australia and imported, artificially, into this country, and as a result the pest has been subdued, and with us, before it had spread beyond the Pacific coast. Not only this, but

this natural enemy, one of the Coccinellidæ, has been sent wherever the Orange Scale has been introduced and the effect has been the same as in this country. All of this has been an object lesson in the application of Nature's forces in overcoming the evil results of man's influences in the artificial diffusion of destructive insects. In North America, and also in Australasia, men are at present wrestling with another important pest, allied to the Orange Scale, and introduced into California many years ago, but in this case probably from Japan. I refer again to the San José Scale, *Aspidiotus perniciosus*, which has, with us, spread over a vast range of country and already caused great losses. From all that I have been able to learn by observation of this pest, both in the orchards of the United States and on nursery stock immediately on its arrival from Japan, and also from the writings of others, it would appear that the natural enemies of this pest have been left in their native homes. Probably, as with the Orange Scale, these are Coccinellids whose habits are such that it would be impossible to get them in connection with their hosts at the time when the trees are packed for shipment to this country, as this is done at the season of the year when these insects have finished their development and abandoned the trees, if not wholly, remaining only in the adult state and would promptly desert the trees on being disturbed. If there had been important internal or fungous enemies we should certainly have gotten these with the host insect long ago. Now, it would certainly seem that in the introduction of *Aspidiotus* and its suppression we have a problem in applied international entomology, precisely like that presented by *Icerya*, and it would as certainly appear that, with our past experience, the very course of all others to pursue would be to learn what the natural enemies of this insect are in its native home and then introduce these as promptly and diffusely as widely as possible, not only in one state or province, not in the United States or British America alone, but in North America.* It is Americans that are suffering from the ravages of this pest, where they are located, geographically or politically, does not matter in the least. International boundary lines cut no figure in this problem whatever, and have no more influence on these natural objects than they have on the winds. We should seek to introduce living organisms from the Palearctic Life Region into the Nearctic Life Region, no matter what or how many nations may lay claim to the territory of either one or both of these regions. What we are really trying to do is to help natural selection to keep pace with artificial selection, and, if we accomplish anything in this direction, it will be by aiding nature and not in any sense by attempting to circumscribe her by imaginary lines of separation which have no existence in fact.

Now, lest I be misunderstood, let me say that true naturalists can only exist among loyal men and women. We must, all of us, be true to the nation that protects us by its wise and judicious legislation. Science stands for truth and right and honesty, and, for this very reason we must stop whenever and wherever these national lines cease to represent the truth, and be guided by others. In matters political, we must respect political lines, but in dealing with natural phenomena, we must abandon these and be guided by such as have been laid down by the hand of the Creator, who outranks either Queen, President or any other human potentate. Therefore, we must lose sight of national boundary lines and unite upon those laid down by nature. Here, in North America, there should be the closest relations between the United States Department of Agriculture and similar Departments of the various Provinces of British America, and absolute unity of action wherever this is possible. This quarantining of one State, Province or Nation against another may possibly do in cases of isolation, like New Zealand or Cuba, or as applied to some of the ills that we already have with us, but this sort of work will never protect in the sense that a combination certainly would, if we were to throw aside

*NOTE—Since the above was written I have received the following from the Rev. H. Loomis, of Yokohama, Japan, which will be of interest in connection with this paper. "I see in the *Canadian Entomologist*, for July, an article in which you recommend that some one be sent to Japan to make a study of the enemies of the San José Scale. I think it a most excellent suggestion. There are many varieties of Lady Beetles here, and I am quite sure that it is due to them that the Scale is not more injurious in Japan. I am strengthened in this opinion because the Gypsy Moth is found all over Japan, and yet it is not especially harmful. This is entirely due to a parasite that feeds upon the larvæ so universally as to prevent its rapid increase. I have watched the results with great interest and would recommend that both insects be made a matter of careful study."

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arbitrary lines and unite on others laid down by nature. This is a phase of international entomology that will sooner or later be thrust upon us by the necessities of international commerce in articles that harbor injurious insects. We must have broader measures of protection than we have had in the past. We must take necessary precautions against the introduction of injurious species, and, after the most thorough and searching investigations, introduce the beneficial species. In all of these matters, Canada and the United States are one, and, this being true, there must be no lines of separation between the entomologists of these two countries. We must work together, shoulder to shoulder, and God speed the day when we shall do this, to even a greater degree than we are now doing! The coming century will be fraught with work for the entomologist, and his loyalty to his country will be best shown by his careful, conscientious labors.

On concluding the reading of this paper Dr. Fletcher said that he thought it was one of unusual importance and particularly so just at the present time when such great efforts were being made to prevent the spread of the San Jose Scale, a danger the magnitude of which was by no means appreciated by the fruit growers and fruit consumers of the Dominion. It was, too, eminently proper that the subject should be introduced by the writer of the pages which he had had the honour of reading to the meeting, for few people had done so much to present the subject to the public of America as Prof. Webster. It was well pointed out that the political limits of the two great countries mentioned were not recognized by the natural denizens of the faunal and floral zones which we had as naturalists to study, although by accident owing to the great lakes this was somewhat the case. International economic entomology was only in its infancy, but it was being rapidly acknowledged at its right value of importance owing to the vast interests at stake. Dr. Howard, in his letter regretting that he could not be with us to-day, had been good enough to say that he considered the relations existing between the entomologists of the Dominion and of the United States to be of an ideal nature. The speaker felt sure that all present would agree with him that this was actually the case, and further, that this happy state of affairs was largely due to the constant and unfailing courtesy of Dr. Howard himself and his assistants at Washington, too numerous to mention now by name separately, but well known to every student who required help with regard to any special family of insects; to such men as the late Drs. Riley and Lintner, to Professors Webster, J. B. Smith, Oomstock, Slingerland, Hopkins, Alwood, Johnson, Ockerell, Fernald, and many, many others who were not only always ready to help, but had in the past frequently helped with most valuable papers published in our reports and in the *Canadian Entomologist*. In his official position he was brought frequently into contact with these gentlemen and found invariably the utmost kindness and ready assistance. Last spring he had by invitation taken part in a conference of economic entomologists, fruit growers and nursery men held at Washington, for the purpose of laying before Congress the advisability of passing legislation for the suppression of the San Jose Scale. A committee waited upon the Congressional Agricultural Committee and explained the wishes of the conference and a favourable report was made by the Agricultural Committee to Congress. Legislation would undoubtedly have been enacted almost identical with our federal San Jose Scale Act but for the unfortunate outbreak of the Spanish-American War—Canada however had done her part and Dr. Fletcher believed that this law was a most useful provision. The Minister of Agriculture had considered the matter most carefully and the present popular measure was due to the minister's careful enquiries and legislative skill. The Hon. John Dryden had also put forth strenuous efforts for the protection of the fruit interests of the Province of Ontario. Too much could not be said of the excellent work of Mr. W. M. Orr the Superintendent of Spraying and of Mr. G. E. Fisher who had pushed most energetically and tactfully the inspection of orchards for the San Jose Scale.

Dr. Fletcher congratulated the members of the Montreal Branch on the splendid work they were doing; he paid a well merited tribute to the persistent work which Mr. Lyman the president had been doing during many years and characterized the many papers which had appeared from his pen as being prepared with the greatest care as to detail, complete-

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ness as to research, and richness as to scientific facts they contained; his example had done much to stimulate the other members of the Branch to continue the good work they were doing for the Science of Entomology, particular attention being drawn to some of the collections exhibited at the present meeting, as those of Mr. Dwight Brainerd, who had prepared some beautiful cases illustrating the life-histories of several species of insects, of Mr. A. F. Winn, Mr. Dunlop, Mr. Williams and Mr. Norris, all of which contained many specimens of great interest. In conclusion the speaker begged to move a hearty vote of thanks to Professor Webster for his suggestive, timely and valuable paper.

This being seconded by Rev. Dr. Fyles, was carried unanimously.

NOTES ON PAPILIO BREVICAUDA, SAUNDERS.

By A. F. WINN, MONTREAL.

This species is either extending its habitat or has always had a wider range than credited to it, for I can now record its occurrence at Kamouraska, Que., a village on the south shore of the St. Lawrence about 85 miles below Quebec. (Lat. 47° 33' N.)

Its locality as given in Scudder's Butterflies is "Newfoundland and the shores and islands of the Gulf of St. Lawrence both north and west," but I think Percé (Gaspé Co.) is the only recorded place on the south coast.

In July, 1889, a specimen was sent to me from Bic (Rimouski Co.) and arrived in a battered condition, but during the many seasons that I have spent my fortnight's vacation at Metis, about 30 miles further down, I have never seen the butterfly on the wing.

Rev. Dr. Fyles stated that a specimen had been taken last summer on the Island of Orleans, P. Q., by Mrs. Turner, of the Quebec Branch.

In 1896 I had not made up my mind where to spend my holidays and wrote Mr. L. Reford at Metis, asking him whether he was finding any good specimens and whether there was any hotel accommodation. He replied that he had taken a number of good things, among others a Papilio larva, and that there were plenty more to be found on a beach plant resembling celery.

I left for Metis on August 16th and found on my arrival that most of the larvae were nearly full grown, but a few were in their third stage. Some that Mr. Reford had in his house were just entering the chrysalis stage. We boxed all the mature larvae we could find and left the younger ones to feed on the archangelica plants during our stay, and before starting home gathered all we could find along with a supply of growing plants in tomato tins. The plants stood the journey well and grew nicely in the garden and we had no difficulty in getting all the larvae into chrysalis, but neither of us was successful in breeding a butterfly. All of my chrysalids were attacked by the parasite, which destroys so many P. asterias chrysalids—Trogus exesorius, ^{Beault?} pulpinus Gravenhorst?

Thinking the species might be different I sent a specimen to Mr. Harrington of Ottawa, who has kindly determined it as the dark form of T. exesorius.

From larvae obtained the following year (1897) Mr. Reford managed to get one fine imago, which hatched in midwinter.

During the past summer I spent my vacation at Kamouraska, arriving there on August 13th and remaining until the 28th, spending part of 13th with Dr. Fyles at Levis. On the morning of the 14th while walking along the beach I noticed some rocks of the same slate formation that we had found the food plant of brevicauda among at Metis and after a few moments was pleased to find two or three plants but could find no larvae. A few yards further on, however, there were a number of plants and on them several larvae in their second stage, some in the first and some eggs.

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Regarding the are very suscepti when not feeding stones." My exp ments, for not havi solutely light-proof many as sixty in at rest certainly lie a full-grown one in and smelt too. Se and found that all some were seen feed this kind.

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The species is r the first half of July

The eggs are pale yellow, smooth and spherical except that the base is considerably flattened, and are attached mostly to the upper surface of the leaves, but sometimes to the lower side and on the stem and a few were on surrounding objects including a stick which lay across the rocks and on the rock itself.

Before hatching the egg becomes slate color. The larva has already been described and is so like *P. asterias* in all its stages that I could observe no points by which the two species could be distinguished.

I sent some larvae to Dr. Fyles at Levis and some eggs to Mr. Brainerd of Montreal, keeping a few eggs myself, and of these the first hatched August 15th and the first chrysalis was formed August 31st, making a larval period of 16 days—a remarkably short one, as Scudder observes, for such a high latitude. A number of larvae and eggs were found during the whole of my stay and when I examined the plants for the last time on the 28th the full grown larvae were crawling over newly laid eggs, and larvae of all sizes were side by side.

The first butterfly I saw was on the afternoon of the 14th, a little way back from the shore, but I afterwards found that the foodplant grew in a ditch in the same field. I failed to capture this female, and saw no more until the following Sunday (21st) when a party of us went to Tache's Point, a rocky promontory covered with trees, about a quarter of a mile north of the church. Several broken males were caught, but not having my net I could not catch the few that were in good condition. After lunch I returned with my net and caught one male in fair condition, and a number that were otherwise. On the 22nd I took a run on my bicycle along the main road towards Riviere du Loup, and got off at the bridge crossing the St. Paschel river, and followed the dyke, which the farmers have built to keep the sea out of their fields, and along the dyke the *Archangelica* grows in profusion. Eggs and larvae were plentiful, but in no case more than four larvae on one plant. I put my net together and waited for butterflies, but a strong wind was blowing which almost made me give up for the day, when a female fluttered through the fields, stopping to lay an egg here and there. I saw that the specimen was a damaged one, and thought that it would be best to watch it for a while, so got into a ditch where the food plant was most abundant, and the butterfly soon settled close to me and laid an egg on the top of a leaf, then went underneath and laid another, and finally crawled down the stem, or rather backed down, laying a third egg at the juncture of the three footstalks of the leaves. As it was flying off I caught it and boxed the eggs. Two of these hatched August 31st, the third did not hatch, although the larva was fully formed within. The egg stage is thus about nine days, and from laying of eggs to chrysalis is less than a month under favorable circumstances.

Regarding the feeding habits of larvae, Scudder says (authority Mead) that "they are very susceptible to cold, prolonged darkness, or confinement of any kind, and when not feeding they either rest on the leaves in full sunlight or bask on the hot stones." My experience at Metis and Kamouraska does not corroborate these statements, for not having any proper breeding cages with me I kept my larvae in the absolutely light-proof boxes used for photographic plates, and though I had at times as many as sixty in a box, I never had a healthier lot of larvae. The young larvae when at rest certainly lie on the top of the leaves in the sunshine, though you will rarely find a full-grown one in this position, but search the stem and the old ones are easily seen, and smelt too. Several times I visited the plants before breakfast, about 6.30 a.m., and found that all were at work and none at all on the stems, and on August 26th some were seen feeding at 8.30 p.m., though moonlight is not good for observation of this kind.

In the chrysalis there are two distinct forms, the green and yellow, and the light and dark brown, and I find that all my larvae which suspended themselves on stems of the plant have produced green pupae, while those that crawled into boxes and shelters that I provided for them have assumed the brown form.

The species is regarded as single brooded, quoting Scudder again, "flying in June and the first half of July, and is most abundant the latter half of June. Eggs have been ob-

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tained from June 14th for a month, some chrysalids carried south gave out the butterfly the same year, one in eighteen days."

If in the northern part of its range the butterflies fly through June and begin to lay eggs before the middle of the month, it seems probable that it should occur in a warmer region, such as Kamouraska, even earlier, and there would be ample time for a second brood before the middle of August, but to settle this point it would be necessary to see the butterflies on the wing and eggs laid in June, and chrysalids in July, and some member of our newly formed Quebec branch could easily solve the matter. Finding the species in so many stages at the same time seems to me to favor the idea that there are two broods, as in my experience in species that are single brooded the imagos appear for a short period with great regularity, and in the early stages the moulting and pupating of all are within a comparatively short time of one another, but in two brooded species the first brood is regular and the second not, while in many brooded species, such as *Pieris rapae* and *Grapta interrogationis*, the last broods seem hopelessly mixed up.

The last female that I saw on the wing at Kamouraska seemed to be a perfect specimen and if single brooded must have spent at least eleven months in the chrysalis, which Gosse states (Can. Ent. XV, 45) is the period of this species in Newfoundland.

Dr. Fyles, in commenting on the paper, said that he had received some of the larvæ from Mr. Winn, with a supply of food-plant; when this was exhausted he endeavored to find a substitute, but the larvæ were very hard to please. Eventually he succeeded in getting them to eat the leaves of parsnip, though they would not touch carrot, on which the larva of *P. asterias* feeds. He found that the chrysalids formed on the stem of the plant were like it green in color, while those which transformed in the box were brown. (Specimens of both were exhibited). He had five chrysalids in good condition, from which he hoped to obtain the butterflies,

Dr. William Saunders, the original describer of the species, upon being called upon said his specimens were sent to him from Newfoundland by a collector there, and he had never met with it personally. He was very much interested in the careful work detailed by Mr. Winn; just such work should be done in every species, studying it in every stage until its life history was completely known. The society has shewn by its publication of so many original papers in the *Canadian Entomologist* that it fully appreciates this line of work, and he believed that in no other publication had so many and such valuable papers appeared as in our own magazine.

The meeting then adjourned, it being six o'clock p.m.

THE CONVERSAZIONE.

On the evening of the 8th November a very enjoyable Conversazione was held at the Natural History Society's Museum.

This was got up by the Montreal Branch in celebration of the 25th anniversary of its formation, and with the kind assistance of the Natural History Society and Microscopical Society of Montreal and the Parent Entomological Society, which all gave grants towards the expenses as well as other assistance.

Unfortunately there were other powerful attractions as Lord and Lady Aberdeen were making their farewell visit to Montreal and it was also the opening week of the much advertised new theatre, Her Majesty's, but in spite of these other attractions about two hundred guests accepted the invitation. The guests were received by Mr. Henry H. Lyman, President of the Entomological Society, and Mrs. Clarence Lyman, Dr. F. J. Adams, President of the Natural History Society, and Mrs. Adams, Mr. Albert Holden, President of the Microscopical Society, and Mrs. Holden. Among those present were noticed Mr. Samuel Finley, a Governor of McGill University, and Mrs. Finley, Dr.

and Mrs. Wm. Saw Girdwood, F.R.S.O. Rev. Dr. and Mrs. C. McGill University. Mrs. G. O. Dunlop Miss Cassels, of Wa Misses Dunlop, Dr. Lyman, Mr. and Mrs. Sola, Mr. and Miss C. Mr. J. B. Williams Gibson, of Toronto

Shortly after 9 decorated with palm Dr. Fletcher of Ottawa to order, the guests so welcomed the guests its formation on the was the third senior e by the American Ent Ont., and stating the original papers had b

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and Mrs. Wm. Saunders of Ottawa, Mr. and Mrs. Fyshe, Mr. and Mrs. Beaudry, Dr. Girdwood, F.R.S.O., Prof. of Chemistry in McGill University, and Mrs. Girdwood, Rev. Dr. and Mrs. Campbell, Mr. J. H. Joseph, Prof. MacBride, Prof. of Zoology in McGill University, Mrs. Cox, Mr. Sumner, Mr. J. D. Evans, O.E. of Trenton, Mr. and Mrs. G. O. Danlop, Prof. and Mrs. Donald, Mr. F. S. Lyman, Q.C. and Miss Lyman and Miss Cassels, of Washington, Mr. and Miss Scott, the Messrs. and Miss Brainerd, the Misses Dunlop, Dr. Shirres, Dr. Deeks, Mr. Winn, Mr. Clarence Lyman, Mr. Walter Lyman, Mr. and Mrs. Plimsoll, the Misses Redpath, Mr. and Mrs. Lighthall, Mr. De Sola, Mr. and Miss Cramp, Mr. and Mrs. Gibb, Mr. C. T. Williams, Mr. Stevenson Brown, Mr. J. B. Williams, F.Z.S., Mr. Dearness and Mr. W. E. Saunders, of London, Mr. Gibson, of Toronto and many others.

Shortly after 9 o'clock the three presidents proceeded to the platform, which was decorated with palms and chrysanthemums, along with Rev. Dr. Bethune of Port Hope, Dr. Fletcher of Ottawa, and Rev. Dr. Fyles of Quebec. Mr. Lyman called the gathering to order, the guests seating themselves to listen to the addresses, and in a brief address welcomed the guests to this celebration and traced rapidly the history of the Branch from its formation on the 16th October, 1873, pointing out that so far as he could ascertain it was the third senior existing entomological society in North America, being only antedated by the American Entomological Society of Philadelphia and the parent society at London, Ont., and stating that 217 meetings of the branch had been held, at which over 200 original papers had been read, of which some 80 had been published.

Mr. Lyman briefly referred to the vast economic importance of the study and as an illustration mentioned that during the current year the State and Federal authorities of the United States were devoting no less a sum in the aggregate than about \$350,000.00 to the prosecution of economic entomology.

Mr. Lyman expressed his regret that he had been unable to secure the attendance of any entomologists from the neighbouring Republic although pressing invitations had been sent to Dr. Howard, Dr. Holland, Prof. Webster, Mr. Slingerland and Mrs. Slosson.

After announcing that Dr. Bethune, Dr. Fletcher and Dr. Fyles would also deliver addresses, Mr. Lyman resigned the chair in favour of Dr. Adams.

The Rev. Dr. Bethune, Port Hope, one of the founders of the original society, and second President, spoke briefly of the work done by the parent society, and of the rise and progress of entomology in Canada.

Dr. Fletcher, the Dominion Official Entomologist, Ottawa, touched upon the economic aspect of the subject, and the value of a knowledge of entomology.

The Rev. Dr. Fyles, President of the recently formed Quebec branch, spoke briefly of the work done in that city. He also presented greetings from his branch to the Montreal branch.

On the conclusion of the addresses the majority of the guests repaired to the museum up stairs, though some lingered in the reception hall to examine the many beautiful objects, chiefly of an entomological character, which were exhibited under a large number of powerful microscopes by members of the Microscopical Society. The stairway and entrance to the museum had been tastefully decorated with flags, butterfly nets and other entomological paraphernalia, two long handled nets for working electric arc lights being especially noticeable.

The orchestra under the direction of Mr. Charles Reichling, which had been playing during the reception of the guests, took up a position in the gallery and discoursed sweet music during the remainder of the evening.

In the museum hall a fine exhibit of insects, chiefly Lepidoptera, was displayed the show cases being further embellished with potted plants.

The exhibits were chiefly furnished by the members of the Montreal branch, Mr. Lyman, the President and Mr. Winn, the Vice-President, each showing 30 cases exemplifying all the families of North American Lepidoptera except the micros. Mr.

Brainerd showed six cases beautifully illustrating the life histories of a number of interesting species, while Mr. Dunlop contributed an equal number of cases of striking exotic species. Mr. Norris showed about half a dozen drawers illustrating Montreal species as well as the method of preparing and spreading lepidoptera, while Mr. J. B. Williams exhibited an interesting case showing the life history of the Walking Stick (*Diapheromera Femorata*). In addition to these exhibits by members of the branch, the Museum Committee of McGill University contributed six large cases of strikingly beautiful tropical butterflies mounted on the Denton tablets, while the Natural History Society showed its collection of Canadian Coleoptera and a few drawers of exotic Lepidoptera.

Refreshments were served about half past ten o'clock and a very enjoyable evening was brought to a close shortly after 11 p.m.

ELECTION OF OFFICERS.

After a meeting of the Council had been held for the transaction of business, the general session of the Society was resumed at 11 o'clock a. m., Dr. Bethune occupying the chair at the request of the President. The first proceeding was the election of officers for the ensuing year, which resulted as follows: See page 2.

THE FARMERS' GARDEN AND ITS INSECT FOES.

REV. THOMAS W. FYLES, D.O.L., F.L.S., SOUTH QUEBEC.

Once upon a time some new tenants came to a farm-house in the neighborhood in which I was residing. A former owner of the place had enclosed a piece of ground on one side of the house and had formed a lawn and flower-beds, and planted fruit bushes and ornamental shrubs. The place was a quarter of a mile from my home; and one day I walked down to see the new-comers. I found them busily engaged in driving half-a-dozen hogs into the enclosure I have mentioned. I ventured to suggest that the animals would play sad work with the flowers. This was the reply—"from a heart as rough as Esau's hand,"—"Flowers, flowers! The only flowers we care about are cauliflowers!" The answer expressed the prevailing contempt, in that comparatively new settlement, for everything like home adornment. I ought not to say *everything*, for an exception must be made in favor of bed-quilts. The females of that neighborhood spent much of their spare time in the manufacture of bed quilts. The choicest kinds were white, and had Turkey-red flowers and fruits, and intensely green leaves of impossible shapes trailing all over them. The possessor of a dozen varieties of such "spreads" was a proud woman. She would occasionally hang her art-treasures in the open space in front of her house, to excite the envy and admiration of her female neighbors, who would occasionally light their pipes and stroll round to examine the patterns.

The typical farm-house, at that time, and in that part of the country, was a story-and-a-half, oblong building, covered with rough, unpainted, hemlock boards. The main door was at one end and opened into the living-room. It and a trap-door into the cellar were, in some instances, sheltered by a rude veranda. In the door, near the bottom, was usually found a circular hole with a lengthened slit above it, in which a light shutter fitted to the opening, was suspended on a wire to allow egress and ingress to the cat. A story was told of a man who had two such openings made—a larger and a smaller—for the convenience of the cat and the kitten.

This primitive dwelling usually stood on a knoll in a yard open to the road. The yard, which was the receptacle for the refuse of the house thrown from windows and doors, was encumbered with logs drawn up for fuel, and was littered with chips. It was the common play-ground—if I may be allowed so to *generalize*—of the poultry, pigs and pickaninnies; and in it, in the summertime, one or two "smudges" were kept burning to drive away the mosquitos and black-flies.

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The vegetables used by the people of that locality at that time were chiefly of field growth,—potatoes, Swedish turnips and pumpkins. The fruits were apples, from seedling and ungrafted trees, and the wild berries of the country,—strawberries from the meadows, raspberries from the pastures and roadsides, and "high-bush" cranberries from the swamps. The raspberries were spread on sheets of hemlock-bark, and dried in the sun for winter use; the strawberries and cranberries were preserved with maple-sugar. I remember my only experience of cranberry jam. It was at a party to which I was invited. I found myself incommoded by the large, flat, crustaceous seeds with which the preserve abounded. I stole a glance around to see how my neighbors disposed of these seeds and I found that the orthodox plan was to swallow them whole. I tried this for the occasion, but from that day forth I carefully avoided "cranberry sass"—as it was called in the vernacular.

Happily the race I have spoken of have passed away. Many of them were seized with the "Western fever," and moved to North Dakota and other distant places, to retard civilization in them. Their rude dwellings also are gone, or have been altered out of recognition. The succeeding generation is more enlightened and refined. The change has been largely brought about by the agricultural association and county fairs, which, through their prizes given for the best-cultivated farms, the best gardens, the finest vegetables, fruits, and flowers, and the choicest productions in the arts of life, have done a vast amount of good. Improved schools, superintended by well-trained teachers, have fitted the rising generation to appreciate the agricultural and horticultural literature that has been widely circulated—reports and bulletins from our Experimental Farms and Scientific Associations; papers and magazines on rural affairs; and last, and I venture to say not least, illustrated catalogues from our seedmen and florists. These last have done much to create and foster a taste for horticulture. Now moreover improved machinery and garden implements enable the farmer to carry on his gardening operations with ease and expedition; so that good results around the homestead may be obtained without detriment to the operations on the farm at large.

My ideal of a farmer's homestead is this: a house facing the road, but a little back from it, having convenient verandahs—that to the front being furnished with wide-meshed wire netting extending from its base to its roof, for the support of such climbing plants as the English honeysuckle and Jackman's clematis. The Virginia creeper, which is a favorite on account of its free growth, is apt to hold moisture and rot the wood-work. If grown at all it should be often trimmed.

Behind the main building should be an extension connected with the dairy, woodshed, etc., and facing this a yard, approached by a sideroad, and bounded by a shed for vehicles. Beyond this shed should be the cattle-yards with shelter for the animals, and then the barns.

In the lee of the buildings, though not in their shadow, I would have the ground for small fruits, and beyond it the orchard. The bushes should be planted in rows, and far enough apart to allow a steady horse with a cultivator to pass between them. Nothing is gained by crowding plants. The use of the cultivator and hoe should keep the ground around and under the bushes clean.

The kitchen-garden proper should be unincumbered with bushes and permanent paths, so that the manure carts may be driven anywhere over it, and the ground thoroughly ploughed in the fall, and again in the spring. I would have no partitions of beds except such as might be made with the hoe or shovel as occasion required.

The drive to the front of the house should come with a sweep round the central bed, and be flanked with flower-borders. Beyond these would be the lawn, with ornamental shrubs planted singly or in clumps: syringas, Tartarian honeysuckle, *viburnum plicatum*, the purple-leaved berberry, and lilacs white and purple.

In the front bed the house-plants moved from the windows when the green blinds were replaced would find suitable summer quarters, and a vase in the centre of it containing trailing and other plants would add to its beauty.

For the flanking beds, plants that require little attention and make a good show are desirable. To my mind the old favourites are the best—low shrubs like the Mahonia, moss-rose, and flowering currant; St. Joseph lilies; perennials such as iris, Chinese peony, dicentra, perennial phlox and bee-larkspur; biennials as the Sweet William, Canterbury bell, foxglove and hollyhock—the last named, judiciously placed, produces a fine effect. Such plants require but little time for their cultivation. The forking in of a dressing of manure, an occasional shifting of place and dividing of them to prevent overgrowth, are the main operations required.

Around the whole should be a sheltering belt of evergreens—young pines, hemlocks, and Norway spruce. A few inexpensive rustic seats placed here and there under the trees would give an air of repose to the scene.

Supposing the buildings, yards, gardens and orchard to occupy five acres out of a hundred acre farm, the space will be well and profitably taken up.

Now what insect foes would the owner of such a property have to contend with. The insect spoilers are numerous. For convenience we may group them into—

- (I.) Those that suck.
- (II.) Those that bite.

Each group may be sub-divided into—

- (1) Open workers.
- (2) Hidden workers.

And the methods to be taken against them may be spoken of as:

- (a) Preventive.
- (b) Destructive.

Of insects that suck the different kinds of plant-lice and scale-insects are most to be dreaded. They belong to the families APHIDÆ, COCCIDÆ and COCCINÆ in the order HEMIPTERA.

Some species of them are familiar to many persons. Their fondness for house plants has brought them into notice; and the difficulties experienced in exterminating them have created a desire for further information as to their nature and habits.

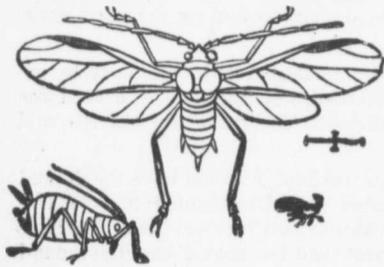


Fig. 6.

The stem-mother of the aphid has a flask-like body from which project two small spouts. Its head is furnished with a proboscis, which the insect drives into the substance of the leaf or bark of its food-plant, for the purpose of imbibing the sap. In the process of digestion, the sap imbibed is converted into the "honey dew" which the insect now and again ejects from the spouts above mentioned.

The plant is injured, in the first place by the withdrawal of nourishment from it, and in the second, by the clogging of its stomata, or breathing-pores by the accumulation of the viscid honey-dew.

Now it is evident that the aphides cannot be assailed through their mouths by poisonous spraying, as the leaf-eating insects can. They cannot be poisoned, but they can be suffocated. Whatever effectually closes their spiracles brings death to them. Spraying with kerosine emulsion, applications of whale-oil, size, pyrethrum, tobacco smoke, are all effective.

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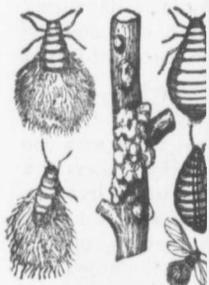


Fig. 7.

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Insects even m scrubbing-brush and we have yet consider operate under grou *Gicada canicularis*,

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I made acquaint on Mountain Street,

To witness the deadly effects of oil upon an insect, apply with a feather or camel's-hair brush a drop of linseed oil to the body of a troublesome hornet or bumble-bee buzzing in the window. The end comes quickly! The oil is not taken into the stomach of the insect, but is spread over its body, and clogs its breathing-pores, and the insect dies.

The aphides left to run their course, at length give rise to a generation of winged insects; and these proceed to make the preliminary arrangements for the next year's round of aphidean gatherings and festivities.

The aphides are named according to the plants they frequent. Thus we have:—

- The aphid of the apple, *A. mali*, Fabricius.
 " " plum leaves, *A. prunifolia*, Fitch.
 " " currant, *A. ribis*, Linnæus.
 " " cherry, *Myzus cerasi*, Fabricius.
 " " cabbage, *A. brassicæ*, Linnæus, etc, etc.

An easy way of smoking a house-plant is to turn an empty flour barrel over it, at the same time inserting a suitable vessel containing two or three pinches of tobacco and a small live coal. The smoke will soon do its work.

For the destruction of that troublesome insect the woolly aphid or "American Blight" (*Schizoneura lanigera*, Hausmann) (Fig. 7) which is found in white patches on the apple trees, the use of a scrubbing brush with diluted soft soap is recommended. By this means the insects are crushed and the tree cleansed at the same time. The house plants may be freed from that trouble-pest, the common mealy-bug (*Dactylopius adonidum*, Linnæus) by more gentle treatment of like nature.

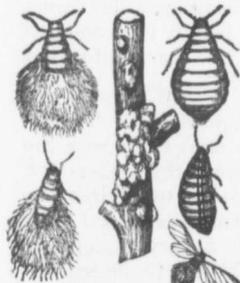


Fig. 7.

The aphides have many natural foes. Among them are various kinds of lady-birds, the lace-winged flies and syrphus flies, all of which are predaceous upon them—destroying them from without; and an aphidius which is parasitic, destroying them from within.

Insects even more difficult to deal with than the aphides are the scale insects. The scrubbing-brush and soft soap may be used for their discomfiture. All the insects that we have yet considered work in the open air. There are others that live by suction, but operate under ground. The most formidable of these is the Dog-day Harvest Bug, *Eicada canicularis*, (Harris).

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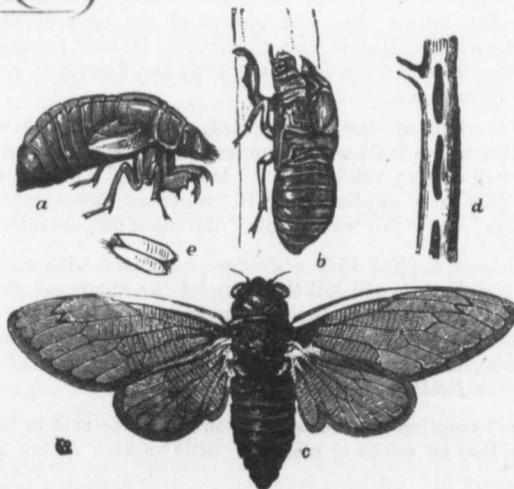


Fig. 8.

I made acquaintance with this insect many years ago, in Montreal. I was walking up Mountain Street, and, when near the top of it I saw a very seedy looking individual

Prof. W. H. M.
L. S.

of the bug tribe creep from the soil at the foot of a large elm-tree (Fig. 8a) and begin to climb the trunk. I sat down and watched it. After ascending about two feet it dug its claws (It was very well provided with claws!) into the irregularities of the bark and took a firm hold. It then commenced to writhe and twist as if it were taken with a violent internal disorder. Surely something will come of all this commotion I said to myself; and something did result—its skin was suddenly rent from the head to the abdomen (Fig. 8b), and the creature began coolly to crawl out of its own skin, drawing out its legs as if it were taking off its boots. When quite free it shook out its wings, and in a few moments presented the appearance of a perfect cicada. (Fig. 8c.)

The female cicada is furnished with a remarkable organ, one part of which resembles a double key-hole saw. With this she cuts into the bark of the tree and forms a receptacle for her eggs. These eggs she carefully deposits. After a while they hatch, and the larvæ which come from them find their way to the roots of the tree, into which they thrust their beaks. Then commences the work of suction that lasts for a length of time—the juices of the tree being the only nourishment the creatures receive. One species of cicada (*C. septemdecim* Linneus) spends 17 years at this employment.

It is in orchards of some standing that the cicadas are most likely to establish themselves; and it may be that the operations of these hidden foes have more to do with the occasional shortage of fruit than people have an idea of. How to reach the spoilers is a problem. Probably one of the best suggestions that has been made is, to enclose the orchard with a sufficient fence, and then, to do as the people above-mentioned did with the garden—turn the hogs into it. The animals will grub (*grub* is a very appropriate word!) about the roots, and destroy a variety of larvæ and pupæ. They will loosen the sod and let in the air; and their droppings will help to fertilize the soil. The use of the bush-harrow and the rake, and the scattering of a little grass seed after the animals have been removed will repair the damage they may have done.

Against the biting insects the campaign should begin after the leaves have fallen. The fruit-trees should then be carefully examined for the eggs of some kinds and the cocoons of others. The beadlike eggs of the Brown Vapourer (*Orgyia antiqua*, Linneus,) attached to the vacated cocoons of the mother insects, and the egg-patches of the Gray Vapourer (*O. leucostigma*, A. & S.), covered with a protective that resembles sugar frosting, will be found readily enough where the creatures are plentiful. The brown elongated masses of the eggs of the Lackey Moths (*Chisocampa Americana*, Harris, and *C. distria*, Hubner,) should be looked for on the twigs (Fig. 9), and when found cut away and destroyed, as should also the cocoons of the Saturnians.

As soon as the buds appear in the spring, Paris green and water well stirred should be applied to the fruit trees by means of a force pump and spraying nozzle. This spraying will destroy the injurious "bud-worms," "leaf crumplers," "canker worms," etc., and later applications will overcome those troublesome pests the Fig. 9. "tent-caterpillars" and "fall web-worms," and other less conspicuous foes.

White hellebore, applied with a dredger, or mixed with water and sprinkled with a can over the fruit-bushes will kill the larvæ of the "currant saw-fly" (*Nematus ventricosus* Klug) Fig 10, and those of the span-worm (*Enfitchia ribesaria* Fitch) Fig 11. A like application to the rose bushes will free those plants from "slug-worm" (*Selandria rosæ* Harris), and from the leaf-crumpling caterpillars of the pretty little brown and white Tortrix *Penthina nibatana* Clemens).

With one notable exception our butterflies can hardly be said to be injurious. The larvæ of most of them feed on weeds or plants of little value. A few of them feed on cultivated plants.

Papilio turnus Linneus, feeds on the apple, etc.

P. asterias Fabricius, feeds on the parsnip, carrot, etc.

Pieris olivacea
Grapta
G. prognos
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Fig 12.

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Pieris oleracea Bd. feeds on the potherbs.

Grapta interrogationis Fab. feeds on the hops, etc. :

G. progne Oramer, and *G. gracilis* G. and R. feed on the currant.

Thecla strigosa Harris, feeds on the plum.



Fig 10.



Fig 11.

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But these insects are few in number, and so widely scattered, that they do little, if any, harm.

The one exception is *Pieris rapae* Linnæus, the "cabbage-butterfly" (Fig 2). This is an exceedingly troublesome insect. The best method to check its ravages that I know is to set an intelligent child to work to pick off the caterpillars (Fig 12 a) from the plants, and to crush them under foot. The chrysalids (Fig 12 b) of this species, and of others, may often be found attached to fences and buildings.



Fig 12.

I lately had the opportunity of witnessing the proceedings of a *Papilio brevicauda* larva when about to change to a chrysalis. It spun, on the side of a twig, a little pad, to which it attached itself, having climbed into a proper position for doing so. When it had settled itself, it turned its head to its back and ejected, through its mouth, a drop of mucous which it drew out in a silken thread, and attached to the twig. It then turned its head round on the other side, and deposited another drop on the same spot, drawing it out and fastening it as before, thus making a complete loop. The ends of this it strengthened with a branching web. Having completed its arrangements it curved its shoulders, drew in its head, and remained quiescent for two or three days—that is, till its loop and other fastenings were firm and dry. Then its skin was rent at the thorax, and, by a succession of heaving and swaying motions, was worked back, segment by segment, till it reached the extremity or cremaster, from which, in a little while, it fell away, leaving a delicate green chrysalis with a row of yellow knobs on either side, and with pretty salmon-coloured spiracles.

The farmer no longer dreads the Colorado potato-beetle, *Doryphora decem-lineata* Say (Fig 13). He knows how to deal with it; and its numbers are diminishing, thanks to the information spread through the country by entomologists, on the use and efficacy of Paris green.



Fig. 13.

hold busily engaged in beating off the "bugs" with small sticks, and catching them in milk cans; now and again emptying their prey into the fire over which soap was in the making, or pig's food in the cooking. "All was fish that came to net," and so beetles and their parasites—"friends and foes," were—

— "in one red burial blent."

Men are sometimes surprised to find the potato-beetles feeding on the tomato and tobacco plants in their gardens. The insect in its native haunts fed on the wild potato, *Solanum rostratum*. Of the *Solancee*, or Nightshade Family, to which the potato belongs, there are in north America six genera—not counting the South American genus *Petunia*, now so largely cultivated in gardens. They are (1) *Solanum*, nightshade; (2) *Physalis*, ground cherry; (3) *Nicandra*, apple of Peru; (4) *Hyoscyamus*, henbane; (5) *Datura*, thorn apple; (6) *Nicotiana*, tobacco. The first of these includes the potato, the egg-plant, and the tomato, all of which are eaten with avidity by the beetle. Deprived of its favourite supplies, the insect turns to such other members of the family as may grow within its reach. I have found it upon *Physalis* and *Datura*, as well as upon *Nicotiana*.

Of enemies working covertly, the cut-worms are among the most troublesome. They are larvæ of certain kinds of Noctuid, or night-flying moths. Whenever a farmer sees a

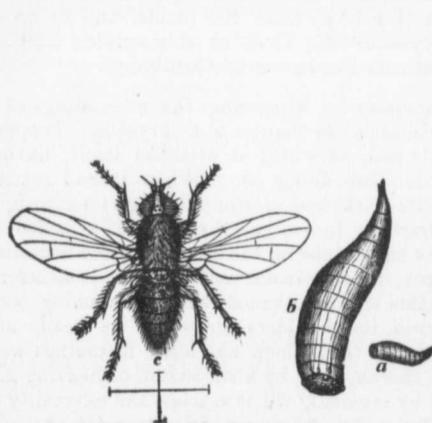


Fig. 14.

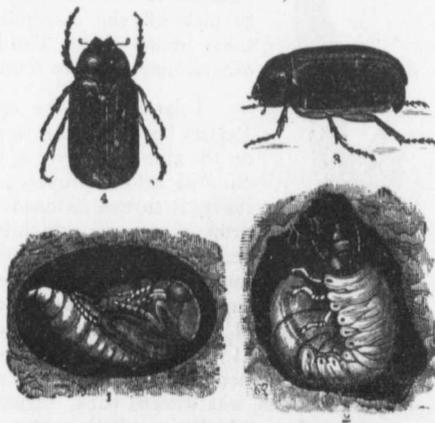


Fig. 15.

blade of corn falling over and turning yellow, or a cabbage-plant bitten off near the ground, he may be very sure that a cut-worm is working there, and should use a spud or

pointed stick to unearth up as soon as night, and cannot

Young onions fly, *Phorbia ceparu*. Both should be carefully examined. It is believed to be seen

The "white-grubs" are well-known pests in its wake, he worked garden the

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The apple-tree young trees, and so off. The larvæ bet be thrust into the soap applied to them.

There are other woodpeckers work fruit-grower's allies



Fig. 17.

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For some time Noctuids to be my thought a few rema

pointed stick to unearth the spoiler. To foil these pests the young plants should be earthed up as soon and as far as possible, for the creatures crawl over the surface, at night, and cannot ascend a mound of crumbling earth.

Young onions are damaged both by the cut-worms and by the maggots of the onion-fly, *Phorbia ceparum* Meigen (Fig. 14). The former work singly; the latter, in groups. Both should be carefully dug out and destroyed. Dry soot scattered over the onion-bed is believed to be serviceable in keeping away the fly.

The "white-grubs," or larvæ of the May-beetle, *Lachnosterna fusca*, Frohl. (Fig 15) are well-known pests. In the fields the plough unearths them; and the poultry, following in its wake, hold high carnival, and become fat and well-liking. In a thoroughly-worked garden the grubs find but little harborage.

The hidden pests above mentioned can be dealt with more easily than some others.

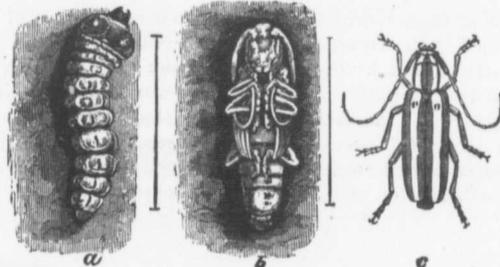


FIG. 16.

The apple-tree borer, *Saperda candida* Fab. (Fig. 16), works near the ground, in young trees, and so weakens the stems that sometimes, in a high wind, the trees are snapped off. The larvæ betray their presence by their *frass*. When this is the case a wire should be thrust into the tunnels, for the destruction of the occupants. A thick wash of soft soap applied to the stems in June will deter the beetles from laying their eggs upon them.

There are other borers that injure other trees. It is in search of these that the woodpeckers work so systematically around the stems. The woodpeckers are among the fruit-grower's allies, and should not be molested.

The borer of the currant stems is the larva of a pretty little clear-wing moth, *Egeria tipuliformis* Linnæus (Fig. 17). Late in the fall all unhealthy-looking stems in the red, white and black currant-bushes should be cut out and burned. The moths appear in June, and consort for safety with the small black wasps of the genera *Odynerus* and *Gorytes*, which they somewhat resemble. A child can soon learn to distinguish them from these, and can spend a few bright midday hours profitably in capturing the moths with a butterfly net. The capture of one female will save many currant stems from damage.

We have, then, glanced at some of the worst of the insect pests that frequent the farmer's garden. The study of them in their native haunts will be found full of interest, and a knowledge of their proceedings and the various methods of counteracting them, will prove of great value, and ought not by any to be lightly esteemed.

ON THE NOCTUIDÆ OCCURRING AT TORONTO.

BY ARTHUR GIBSON, TORONTO.

For some time past, in fact ever since the season of 1896, I have considered the Noctuids to be my special favourites amongst the Lepidoptera, and in view of this I thought a few remarks under the above heading might interest those present.

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Fig. 17.



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The Noctuidæ comprise that large family of Lepidoptera known as the "Owl-let" moths, or night-flyers. As a rule, the members of this family feed by night and rest during the daytime. Some of the larvæ of these moths, commonly known as cut-worms, are amongst the most destructive of our caterpillars. The ravages which they have been recorded as making, resulting in the losses of certain agricultural products, have been enormous. Around Toronto, as far as I know, their devastations have not amounted to very much, comparatively speaking. In the regions most infested with these pests, the loss to agriculture is tremendous, but the ravages thus caused have been reported so fully in Government publications that it is not necessary for me to say anything further about their destructive propensities. It might not be out of place, however, to mention that on account of these larvæ being night feeders, all of their devastations are perpetrated after dark, in the daytime the caterpillars hiding under crevices, stones or any other article under which they can escape notice.

To the collector of these moths there are various novel ways of procuring specimens. The two most indulged in, in Toronto, are taking advantage of the electric lights, especially in the outer districts, and by the still better way of "sugaring" the trees. In the early part of the season, say until towards the last week in June, the Noctuids that are then flying seemingly prefer the electric lights to the "sugar"—such is my experience. By the first of July they start to come to the "sugar," and from then until the end of August, and even beginning of September, lots of good work can be accomplished. Some Noctuids which are often taken at "light" are seldom captured at "sugar," while on the



Fig. 18.

other hand specimens like the catocala are generally taken at "sugar." *Relicta* (Fig. 18) is about the only catocala which I have noticed around the lights to any extent. During the end of August of last season quite a number of *Relictas* were to be seen at "light," while I have, as yet, only met with one specimen at "sugar." Collecting with the aid of "sugar" is much the better way, not only as regards the number of specimens taken, but also in view of the variety of Noctuids secured. The season of 1897 was an ideal one for "sugaring" purposes in Toronto. One evening as many as 26 specimens of catocalæ were taken by Mr. McDunnough and myself while out together, besides a large number of smaller interesting Noctuids.

It is safe to say that among the Noctuids we find some of our most beautiful moths, but on the other hand some of them are most inconspicuous in color, being of a dull gray, brown, or black, or these colors combined.

In North America, according to Prof. J. B. Smith's List of Lepidoptera of Boreal America, there are recorded no less than 1841 distinct species of this great family of Noctuidæ, and since the compilation of this list there have been several new species described. On my list I have marked off about 160 different species, which I have taken at Toronto, besides quite a number of unnamed species. Probably there occur several hundred more representatives.

Among the various genera there are to be found some very interesting species. The first thing I have marked of on my list is *Raphia frater*. This moth is of uncommon occurrence, the specimens I have being taken at light.

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Prodenia flavim

Trigonophora p

Helotropha reni

Hydroecia velat

Hydroecia catay

Pyrrhia umbra,

20th June, 1896.

Orthosia ferrugi

Scopelosoma Mc

20th April, 1896; al

Scopelosoma cer

I have never taken e
understand they hibe

The genus *Acronycta* is an interesting one, some of the members being beautiful insects. Around Toronto, I have taken 10 different species, viz., occidentalis (Fig. 19),



Fig. 19.

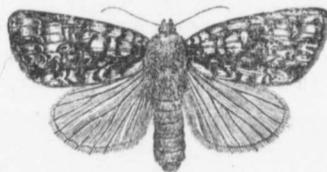


Fig. 20.

morula, *populi*, *Americana*, *dactylina*, *hastulifer*, *luteicoma*, *brumosa*, *superans* (Fig. 20), and *funeralis*. Of these probably *funeralis* is the most rare, while *morula*, *dactylina* and *luteicoma* are very scarce.

Harrisimemna trisignata, the only one of the genus, is a rather pretty moth; the three specimens I have were taken at light.

It is not necessary for me to mention every species of *Noctuidae* which I have taken, so I will just confine myself to the names of those which to me are considered of rare and of uncommon occurrence in the neighborhood of Toronto. In cases where it is possible I have mentioned whether the specimens were taken at "light" or at "sugar."

Microcoelia diptheroides, fairly rare, taken at light.

Rhynchagrotis cupida, at sugar, very few taken. First time I took it was in 1896; very scarce since then.

Semiophora tenebrifera, one specimen at light.

Feltia venerabilis, only one specimen, taken at light.

Dicopis Grotei, one specimen taken at sugar, 13 June, 1896.

Mamestra imbrifera. Took one specimen of this beautiful insect, resting on the trunk of a tree, on the afternoon of 18th July, 1896.

Mamestra purpurissata, 1 sp. at light.

Mamestra grandis, 2 sp. at light.

Mamestra adjuncta, 1 sp. at light.

Mamestra latex, 1 sp. at light, 30th May, 1895, and one 9th May, 1896.

Mamestra rosea, very rare, two sp. at light, last capture 26th May, 1897.

Hadena lignicolor, rather uncommon, taken at sugar in June and July, 1895.

Dipterygia scabriuscula, 2 sp. taken at sugar.

Prodenia flavimedia, one sp. at light.

Trigonophora periculosa, 1 sp. at sugar and 1 at light.

Helotropha reniformis, fairly common, at sugar in 1896, rather scarce since then.

Hydroecia velata, 1 sp. taken at light.

Hydroecia cataphracta, 1 sp. at light, 9th May, 1894.

Pyrrhia umbra, 2 sp. at light, 4th May, 1896, and 2 sp. of the variety *angulata* on 20th June, 1896.

Orthosia ferruginoides, 2 sp. taken 21st Sept., 1895.

Scopelosoma Moffatiana, one of the early appearing Noctuids, 2 sp. taken at light, 20th April, 1896; also observed last season.

Scopelosoma ceromatica, also an early Noctuid, 4 sp. taken at light, 20th April, 1896. I have never taken either of the last two named, in the fall of the year, although I understand they hibernate in the imago state.

Calocampa curvimacula, very nice thing, 2 sp. taken at light, 20th April, 1896, and 1 sp. 17th May, 1897.

Cucullia asteroides, 2 bred specimens.

Cucullia intermedia, 3 sp. at light, 2 on 20 April and 1 on 16th April, 1896.

Among the *Plusias* there are some fine things. I have taken 8 different species marked off on my list, viz, *aerea*, *areoides*, *balluca* (Fig. 21), *striatella*, *bimaculata*,

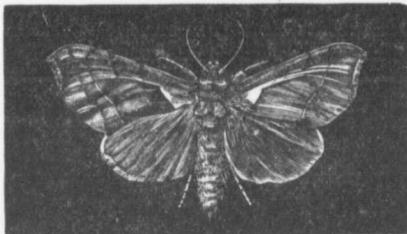


Fig. 21.



Fig. 22.

precatonis, *ampla*, and *simplex* (Fig. 22), together with one un-named. Of these *striatella*, *balluca*, and *ampla* are the rarest, with *simplex* and *precatonis* the commonest. All my *Plusias* were taken at light.

Heliothis armiger, one sp. taken 22nd Sept., 1895.

Alaria florida, very pretty moth, 4 specimens taken at light in 1894, never very common.

As to the *Catocalas*, I have taken 14 different species at sugar, the principal captures

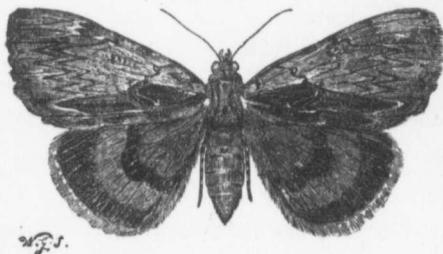


Fig. 23.

being, *grynea*, *ultronia* (Fig. 23), a beautiful variety of *ilia*, *briseis*, *relicta*, (Fig. 18), *habilis*, *neogama* (3rd Aug., '96) and *retecta*. The season of 1896 was by far the best I have yet experienced in collecting *Catocalas*, such species as *ilia*, *cerogama*, *uniguga*, and *parta* (Fig. 24) being very common. During the past season I did not notice a single specimen of *ilia*. I understand that *C. cara* was taken in Toronto last season.

Panopoda rufimargo, one specimen, taken at light.

Homoptera nigricans, one specimen at light.

Bomolocha baltimoralis, 2 sp. at light.

Brephos infans, one specimen taken on 11th April, and one observed on 16th April, 1898.

I have brought to the meeting some of the species mentioned in my paper, also a few "uniques" which, as yet, I have not got identified. Some of these will no doubt interest certain of the members present.

At a future date I may be able to relate, in a much better manner, something on the "Noctuidae occurring at Toronto," which may be of more interest than the article I have just read.

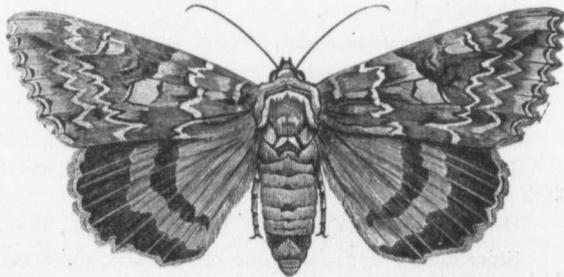


FIG. 24.

Mr. Gibson was so fortunate as to capture a *Brettus*; also *Pyr...* twice taken before our Canadian list.

Mr. D. Brain was so fortunate as to capture a *Brettus* of light to sugar at light. It was the best bait until June. 160 specimens taken.

AND HIS

The insect collector, minister, doctor, or walls of a county or ten hours of the camped for months respite of a few weeks of these being engaged or recreation by the and healthy sort occurs that a collector his work in wide world who managed to readily attracted takes him from on taken at almost all and in as great a

Outside of province, love, with no hope appear to be the science of entomology

While much the services of the appeared to me the between the careful collector at all. care, neatness and condition of affairs to humbly submit specialist, after coming in the case of new and describing the California or Texas thought to be typical was often faulty, material getting into place a lot of careful is simply a species result will be not entomology that s

Mr. Gibson also exhibited specimens on the following very rare butterflies which he was so fortunate as to have captured at Toronto: *Thecla Ontario*, *Pamphila Baracca* and *Brettus*; also *Pyrameis carye*, which was taken by Mr. Tyers. *T. Ontario* has only been twice taken before in the Province from which it is named; the other three are new to our Canadian list.

Mr. D. Brainerd disagreed with the writer of the paper regarding the superiority of light to sugar as an attraction for moths. Mr. Winn said that he had found sugar the best bait until June 15th, but after that flowers were the most attractive. He had taken 160 specimens between 7.15 and 8.15 one evening.

THE COLLECTOR AND HIS RELATION TO PURE AND APPLIED ENTOMOLOGY.

BY F. M. WEBSTER, WOOSTER, OHIO.

The insect collector may or may not be a professional entomologist. He may be a minister, doctor, lawyer, merchant, soldier or sailor. He may be confined within the walls of a counting-room, bank, office, study or other place of occupation, during eight or ten hours of the six days of the week, for eleven months of the year, or he may be camped for months in the wilderness, or spend months on the sea, with an occasional respite of a few weeks on shore. There are few professional collectors, the major portion of these being engaged in other pursuits, and spending the time generally devoted to rest or recreation by the majority of people, in the collection of insects, in itself a most pleasing and healthy sort of recreation, provided ones tastes trend in that direction. Thus it occurs that a collector may be confined to a limited area, or he may be able to carry on his work in widely distant localities. I know of a soldier, wounded and in a hospital, who managed to make a considerable collection of insects and especially such as are readily attracted to light, and another whose business, that of a commercial traveller, takes him from one end of the country to another. I have in my own collection, specimens taken at almost all hours of the day or night, under almost every condition imaginable, and in as great a diversity of localities.

Outside of professional entomologists, the collection of insects is largely a labor of love, with no hope or expectation of any compensation whatever. This, then, would appear to be the proper place to discuss the value of these self imposed labors to the science of entomology.

While much has been said and written, both pro and con, relating to the value of the services of those men and woman who collect but do not study insects, it has always appeared to me that in this, as in almost everything else, we should make a distinction between the careful collector and the one who, strictly speaking, could hardly be termed a collector at all. Of course industry and energy here as elsewhere, count for much, but care, neatness and accuracy are imperative. Then, again, there has existed a certain condition of affairs, happily now fast disappearing, under which a collector was obliged to humbly submit his hard earned material to a specialist for determination, which specialist, after condescending to go over it, retained the specimens for his trouble, and in the case of new forms, frequently forgot to give credit to the collector when naming and describing them. It was thought sufficient to state that specimens were from Canada, California or Texas. The description being sometimes drawn up from a single specimen, thought to be typical of course, because it was the only one in the hands of the describer, was often faulty, so that the danger to the pure science from discolored or deformed material getting into such hands was very considerable. It goes without saying if you place a lot of carelessly collected and prepared material in the hands of a specialist, who is simply a species maker, and whose judgment and accuracy is not above question, the result will be not only n. gen. et sp., *ad infinitum*, but time has shown that the sort of entomology that such work represents had best be spoken of in connection with an f.

But this is one extreme and one that is fast being eliminated, all specialists of repute now giving full credit to the collector for material placed at their disposal, and frequently this is done at the request of the specialist himself. It seems to me that this is one of the most encouraging evidences of progress in entomological research, as the collector soon finds that with credit there, invariably, goes more or less responsibility, and we therefore get better and more careful collecting, while the specialist or systematist is placed in possession of better material and more elaborate data, and is thus better enabled to avoid mistakes and synonyms. But we must not lose sight of the fact that this material and data must be supplied by the collector, who may be so situated that he is not able to work up his material properly, while the systematist is often equally unable to secure these by his own efforts; and we thus have a division of labor, which, if faithfully carried out by both parties, can only result in much good, and material progress in our beloved science.

For my own part, I have come to look upon the labors of the careful collector, as having much the same relation to the science of entomology, as those of Livingstone and Stanley have to the advance of civilization in Southern Africa. These latter gentlemen did not fell trees and plow and sow, but they paved the way for these, and made civilization possible. The collector is the advance discoverer, who must be followed by the systematist before the biologist can commence his labors. We first must get our species, and then so define it as to prevent its being continually confused with other forms, else we cannot study either its own life or its relation to other species. In the history of the advance of civilization we have, first, the discoverer, next, the pioneer agriculturist with his log cabin, followed by cities and schools and churches and railways, all the accompaniments of civilized life, but all preceded by the one who first made his way through the trackless wastes and told of what he saw.

Now, about the collector and his work. He who cares nothing for habits, variations and geographical distribution, will accomplish the least for the advancement of the science, though, as has been stated, industry and push are neither one to be despised, and it is better to know that certain species are to be found in Canada, California or Texas, than not to know of their existence at all. It would be much more satisfactory to know just where in these areas the species were found, as all extend over a wide area and great variety of country. But just here let me call attention to a serious defect, and one that does not seem to be confined to the careless or inexperienced, viz., giving as localities of occurrence, isolated points, having local names which are unknown a few miles away, and are not to be found indicated on any of our maps. Such give no clue whatever to the one who is engaged in tracing out the geographical distribution of a species, as I have myself experienced after hours of fruitless search, finally giving up in despair. In all cases it is better to give exact localities with reference to their proximity to some point which is indicated on our maps; the approximate latitude and longitude will be the most stable and valuable of all, as the information can be used in any country and by the aid of very ordinary maps and charts. To those who object to taking the trouble to do this, let me suggest that other entomologists will there take up our work after we have followed Harris, Fitch, Riley, and more recently, Lintner and Maskell, on that long journey from which none return. We cannot, now, see what problems those who are to follow us may have to solve, nor can we determine the nature of the data that will be required for such solutions. Then, too, the foreign entomologist has frequently to turn to us for information regarding the distribution of both species and genera, and it is but justice to our fellows if we present our data in a manner that will be most intelligible to them. Some very good collectors, and not all of them American either, have overlooked this matter, and as a consequence we are sometimes left in the dark where we most needed light, and our colleagues really intended to supply it to us.

Altitude will not come amiss when you go over your notes, possibly twenty years hence, while food plants, food habits, relative abundance, and, indeed, almost any facts relative to the "sociology" of a species will be sure to be of use sometime, for someone. I am continually using data secured ten, fifteen, or twenty years ago, some of it at the time seeming to be hardly worth recording, but it is surprising how many good things

in the way of specimens oftentimes not recorded. Faithful observation substantiates and clarifies their distribution, something that has been observed by Mr. W. H. Harris. We have been observing that, if they were doing something going on in a gone several hundred things that they found to be engaged probably had been fact.

Of late we are aware that we have at times localities of occurrence very easy to say to be distributed. Almost everywhere, sometimes in abundance, while in other localities almost every locality is rich in insect life. In a ravine or a secluded something rare or dreeds of other places greater number of where, and, somehow, an entomologist collector can find insect of problems other words, before amount of information. Not only must this record where it can be aware that there is variations and a tendency sufficient for an exact a different light. large as *Aetna* or face of the earth, a dimensions, are separate. The fragments brought together form so that the material being discovered by include a species, or propose that a collector in some distant parts of science, some been filled in by collecting different individuals in his fragment the two together, so to

in the way of specimens and facts we are continually turning up, by accident, as it were, oftentimes not realizing the full value of our "find" until years afterwards. A careful, faithful observation is never without value, as it either brings a new fact to light or else substantiates an old one. Insects do not necessarily act alike over the entire area of their distribution, and the man or woman who uses their own eyes is almost sure to see something that has not before been observed. Why! I have gone to your fellow member, Mr. W. H. Harrington, again and again for facts regarding some of our insects that I have been observing for years, but he, with his close observation, has observed things that, if they were to be seen in my locality, were overlooked by me. We do not see everything going on about us, by any means, even we that are most in the field, and I have gone several hundred miles from home, and found certain insects there doing certain things that they were not observed to do at home, but as soon as I returned they were found to be engaged in precisely the same way that I had observed them elsewhere, and probably had been doing so all the time, but I did not happen to be a witness to the fact.

Of late we are hearing much relative to life zones, and, while it is hardly probable that we have at the present time sufficient definite information regarding the exact localities of occurrence among insects to enable us to say much in regard to these, as it is very easy to say too much, yet we all know that our species are not all of them generally distributed. Almost every collector will get species in his immediate neighborhood, sometimes in abundance, that are to be found rarely, if at all, elsewhere. There are certainly areas, over which a certain species will be found to occur in a greater or less abundance, while a few miles away it will appear to have given way to another. In almost every locality there is sure to be some particular spot that will be found especially rich in insect life. These favored spots may be a bit of woodland, a bank, a shaded ravine or a secluded valley, to which one can go with the assurance that he will secure something rare or new. The vegetation here may not differ materially from that of hundreds of other places, seemingly equally favored also by climate and elevation, yet a greater number of species seem to have gained a foothold, so to speak, here than elsewhere, and, somehow, are able to retain their hold. Just why this is true is not exclusively an entomological problem, but involves animal and vegetable life as a unit, and the insect collector can, if he will, pile up facts that will go a long way toward the settlement of problems not at present considered in connection with entomology at all. In other words, before we can do much with mapping out life zones, we must have a vast amount of information that can only be secured by the careful collector and observer. Not only must this data be secured, but it must be made available by being placed on record where it can be found by the great army of scientific men and women. I am well aware that there is in some quarters, an aversion to publishing detached notes and observations and a tendency to hold fast to all such until a mass of material is thus secured sufficient for an extended and exhaustive discussion, but it has always appeared to me in a different light. Let us suppose that the science of entomology is an immense vase, as large as *Ætna* or *Vesuvius*, and this is shattered into fragments and scattered over the face of the earth, and entomologists, without definite knowledge of its original form or dimensions, are set to work to gather up these scattered fragments and reconstruct the vase. The fragments will of course be of every conceivable size and form and when brought together fit into each other perfectly, but many of them will be much alike in form so that the misplacing of a fragment will not infrequently occur, the mistake only being discovered by the proper one being found and fitted into place. A fragment may include a species, or any fact connected with its life history or habits. Now, let us suppose that a collector in Canada or elsewhere discovers a new species, while an entomologist in some distant part of the world discovers an allied form. Here are two fragments of science, separated, how widely we cannot know, until the intervening space has been filled in by collections, breedings and observations carried on by perhaps a dozen different individuals, possibly speaking half as many different languages, each contributing his fragment that is to fill in the space that divides the two forms and cements the two together, so to speak. Let me illustrate again, taking this time *Diaspis amygdali*,

which has recently been discussed by Mr. Cockerell, Mr. Tryon, Mr. Lounsbury and myself, each presenting some new phase of its habits in various parts of the world. But one of my contributions related to a parasitic foe, described by Dr. Howard and reared by myself from the Coccid just mentioned, on trees recently imported from Japan, and also by Professor Marchal in Paris, Mr. E. E. Green in Ceylon, the late Mr. W. M. Maskell from Coccids received by him from Sydney, New South Wales, and at the United States Department of Agriculture, from an *Aspidiotus* from Georgia. Here we have fragments of our imaginary vase gathered from all quarters of the globe, not only fitting into the *Diaspis* fragment, but into others as widely separated as well. But suppose each one had kept his fragment to himself until such time as he could secure sufficient material for an exhaustive paper; how long would each have stood in the way of the other in attempting to make use of his information? "Rushing into print" is not to be commended, but a collector owes it to his fellows, and to entomology in general, to collect carefully and make all possible observations in connection with his material, placing the former on record for the benefit of his colleagues. The value of such work as is being done by Messrs. Harrington, Kilman, Bean, Fletcher, Lyman, Fyles and other Canadian entomologists, is not to be measured by our present knowledge, nor are the facts gained by these gentlemen to be taken separately, for, individually, they may be nearly or quite worthless and yet contain the very missing link that some other worker is hunting for, and through the lack of which he is unable to proceed in the solution of his own problem. Isolated from his fellows, working for the love of nature with little or no encouragement from those about him, it is not to be wondered at that a collector should think only of himself and his individual pleasure, becoming satisfied with dried corpses pinned in his cabinet and caring nought for the habits of these forms of life when active. But there is a world of riches at the door of every collector, isolation frequently becoming a blessing in disguise, for if he will but keep his eyes open and tell the world what he sees, he will ere long be surprised at the wealth of facts that he will accumulate.

The unknown in entomology may be likened to an ocean whose shores are lost in infinity, while the known is as a mill pond. There is so much to observe, so much to learn and life is so short. The collector, more than any one else, has opportunities for observation such as, if made with care and accurately recorded, may outweigh volumes of compilations that are too frequently permeated by the opinions of men, while original observations come direct from the hand of the Creator.

In conclusion, then, if there is any kind word of encouragement or of admonition that I can offer to the collector, whether he be located in city or country, let me do so here. Gather up these fragments of which I have been telling you, as you would grains of gold from among the sands, for sooner or later there will be a mint open for their reception and you will be surprised at their value. You will be more than once astonished to find that what you took for a worthless, fragmentary observation, will really turn out to be the keystone of an arch which has long been unfinished for lack of your fragment.

ENTOMOLOGY IN SCHOOLS.

By WM. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

The Annual Reports of this Society for 1896 and 1897 contain several very suggestive papers relating to the study of insects in our schools. Ex-President Dearness dealt somewhat fully with the subject in his two Presidential addresses, and the late Professor Pantou outlined a method of presenting the subject from an economic standpoint. These three addresses, I remember, gave rise to a discussion among the members present on those occasions, and showed plainly that the time was ripe for introduction of nature-study into our schools. The members were unanimous in the opinion that insect life should form a portion of the children's study, at least, in our rural schools.

Mr. Dearness d study in his own Ontario. It is to be County Inspector w compulsory study of the way to a parti curricula.

As a teacher of I may be permitted towards this object

This paper will i.e., why should teach its introduction is a taken up?

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Pupils properly selves many of the handed down as tru in the various pursu deductions count for trained while young case of survival of judgment which are the successful farme accurately observe th which agriculture ha successful in managin his life and fortune?

2. Apart from the study of nature r the wondrous transfc plants and insects, ar and the persons who and recreation, but a weary in soul and b nature, and can estab

A writer with w most lacking in our c children need above s state their observati farm or in the towi wonders of the trees s house, float like shad

Mr. Dearnness deserves much credit for his efforts towards the introduction of nature-study in his own County of Middlesex, and, in a general way, throughout the Province of Ontario. It is to be hoped that a little leaven will leaven the whole lump, and that every County Inspector will endeavor to the utmost to further this most desirable object. The compulsory study of Botany in the lower forms of our High Schools has already paved the way to a partial recognition of nature study as one worthy a place in our school curricula.

As a teacher of science for several years in some of our largest Collegiate Institutes, I may be permitted to use whatever influence I possess in urging on this good work, and towards this object this paper has been prepared.

This paper will consider the subject under the headings *Why?*, *How?*, and *When?*, *i.e.*, why should teachers introduce the study of insect life into their schools? Supposing its introduction is a wise procedure, how should it be taken up? and when should it be taken up?

WHY?

1. Because the study of insect life trains the eye to see, and the mind to draw proper conclusions from certain observed facts. The child learns clearly the relationship between causes and effects. It is remarkable the number of people who jump at conclusions without taking the time to relate cause and effect. Traditions and superstitions are still rampant, and many erroneous ideas of our forefathers are still too often accepted as truth in spite of the great advances that science has made during the last fifty years.

Pupils properly guided in their observations of nature will soon correct for themselves many of the errors that imperfect observers have made, and which have been handed down as truths. When the pupils have grown older, and have become engaged in the various pursuits of life, where alertness of mind, close observation, and accurate deductions count for much in the struggle for wealth, those who have been most carefully trained while young will, other things being equal, be most likely to succeed. It is a case of survival of the fittest in a struggle for existence. Comparisons, relations and judgment which are cultivated by a proper study of insect life are indispensable to the successful farmer, merchant and statesman. "If the farmer's boy learns how to accurately observe the process of nature with which farm produce deals, and the foes with which agriculture has to contend, are not the chances vastly increased that he will be successful in managing nature so as to get the greatest favors from this coy mistress of his life and fortune!"

2. Apart from the direct bearing on a successful life from a commercial standpoint, the study of nature reveals beauties and wonders all about us. Our eyes are opened to the wondrous transformation of insects, to the inter-relationships which exist between plants and insects, and among insects themselves. These are subjects of perennial interest, and the persons who have observed nature carefully will find in her not only "a resource and recreation, but an ever-faithful friend holding out comforting arms to those who are weary in soul and body." I think no one can be unhappy who has a true friend in nature, and can establish a living sympathy with everything about him, for Coleridge says:

"He prayeth best who loveth best
All things, both great and small;
For the dear God who loveth us,
He made and loveth all."

A writer with wide experience says: "The element of education which is at present most lacking in our common schools is the training of the powers of observation. The children need above all things else to be taught to observe carefully and correctly and to state their observations in clear and terse language. The ordinary child, whether on the farm or in the town, actually sees comparatively little in the world about him. The wonders of the trees and plants in park or meadow, of birds and insects flying about the house, float like shadowy visions before his eyes. "Seeing, he sees not." He needs a

teacher who can open his eyes and fix his mind on the realities among which his daily life is passed. This accurate observation of natural objects and facts is the only foundation on which scientific attainments can rest. The scientist is chiefly a man who sees better than his fellow men. But it is also a great help in practical life.

3. "No branch of science means more in actual dollars to the people of the country than Entomology. At least one-tenth of our crops is lost owing to the depredation of insects." It is surely a proper thing to instruct our children about the insects. They should learn to distinguish insects which are enemies from those which are friends. If our farmers and gardeners understood the method of dealing with the foes, and acted promptly and efficiently, the money value of this knowledge and action would equal the richest Klondike ever discovered. When Governments spend millions, and individuals risk their lives in opening up a mineral Klondike, it is not unreasonable to ask that more attention be paid to this insect Klondike at our doors. Let us educate the children to take an interest in insects, for in a few years they will have the control of the great money-producing areas, viz., the farms of our land. Dr. Fletcher has already treated of the value of Entomology from an economic aspect at a previous meeting of this society, and Mr. C. C. James, the Deputy Minister of Agriculture of Ontario, has also ably handled the subject in several addresses before Farmers' Institutes.

How.

Every good teacher will have his own method of presenting the subject, the one best suited to his own individuality, but there are general principles which he must follow:

1. As far as our rural schools are concerned, Entomology should be studied "without reference to systematic order or relationships." The whole study should be thoroughly informal in every respect; it should be natural. No stated lesson should be assigned as a task beyond the general collecting of insects which the teacher may ask to be done occasionally. At first the teacher will simply guide the pupils by adroit questions such as these: Where did you find it? What was it doing? On what plant did you find it? Did you see it fly? How did it fly? Did you hear it sing or chirp, etc. The difference in structure among insects brought before a class should also be studied by means of questions put by the teacher, the number of wings,

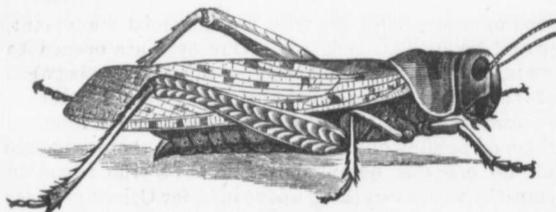


Fig. 25.

legs, and eyes, (Fig. 25) its mouth, and its breathing apparatus. The pupil will soon see that insects are unlike in many features, the observation of which will tend to increase his interest.

Occasionally injurious caterpillars will be caught in the act of eating leaves (Fig. 26); this occasion should be well used by the skilful teacher, and useful lessons learned. It is wonderful what a variety of insects will be forthcoming when the interest of the pupil is thoroughly aroused. Very often the best teacher will be incompetent to answer all the questions



Fig. 26.

asked him by the
experts will very

2. Encourage
clearly in his last
every teacher who
equipping both him

3. Encourage
in every respect.
accuracy as to the
any department of

Fig. 27, the caterpillar
the perfect butterfly.



Fig. 29.

4. Make this
good English form a
subject cannot help
foreign topics alone

asked him by the curious naturalists, but that should not deter him in his work, for even experts will very often tell of their ignorance in matters relating to insect-life.

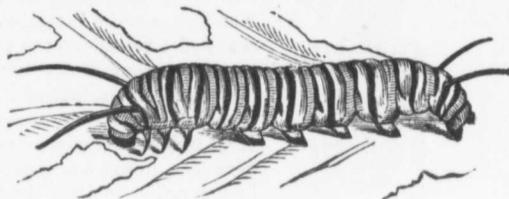


Fig. 27.

2. Encourage the pupils to make collections. Mr. Dearness has explained very clearly in his last year's Presidential address the simple method of collecting, so that every teacher who feels a living interest in this informal work, will find no difficulty in equipping both himself and his pupils with the necessary appliances.

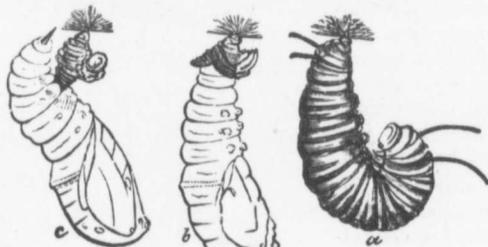


Fig. 28.

3. Encourage the study of life-histories, for after all this part is the most important in every respect. The wonderful transformations should excite intense curiosity, and accuracy as to the observations forms one of the most valuable trainings to be obtained in any department of science. (See Figures 27-32).

Fig. 27, the caterpillar; fig. 28, the caterpillar changing into a chrysalis; fig. 29, the chrysalis; fig. 30, the perfect butterfly.



Fig. 29.

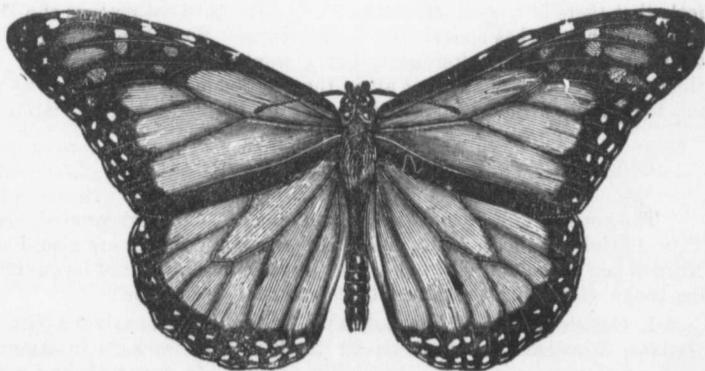


Fig. 30.

4. Make this nature-study the basis of composition lessons, and informal talks, where good English form and style must be insisted upon. A child full of enthusiasm for a subject cannot help but talk, and write too, if required to do so. Let abstract and foreign topics alone till his reading has become wider and his mind more fully developed

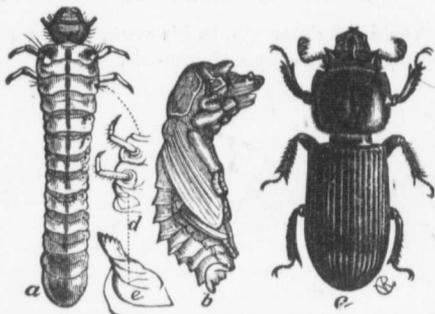


Fig. 31, grub, pupa and beetle (*Passalus Cornutus*).

5. Let the study of insects be one of relaxation from the more arduous duties of the school. The pupil must never have "Examinations" on the subject, else the knowledge of facts will soon be considered by pupils the chief aim of the study. Even the observations to be made must be incidental, just as the questions must be informal.

The child mind craves for informal instruction along such lines, and "the school becomes a delightful place, and the teacher an angel of light."

WHEN?

The amount of time allotted to this study should not be much. Let it creep in whenever the teacher feels that there is a need of relaxation, or when he has material for a good lesson. Some have advocated devoting a period to the work on Friday afternoons, but I would not limit the period to any particular time. It should not appear at all in the programme of studies. The youngest child; is not too young to make observations and to try to give explanations.

TEACHER'S EQUIPMENT.

The greatest difficulty at the present day is to secure properly equipped teachers. This difficulty will gradually disappear as nature-courses are placed on the curricula of Normal and Model Schools, but a few words, I think, will not be out of place here regarding books with which the nature teacher should be familiar.

1. Comstock's *Insect Life*, published by the Appletons, is the best hand-book of suggestions, directions and methods for teachers that we have in America. Outlines of studies are given on pond life, brook life, orchard life, forest life and roadside life, while methods of collecting and preservation of specimens are sketched very clearly. Price \$2.50.

2. Comstock's *Manual for the Study of Insects* takes easily first place as an Identification Book, and should be in every Entomologist's library. It contains keys to the

The logical expression of the sequences in the development in insect life, if repeated frequently, will become one of habit, and will tell powerfully in many other ways. Not long ago the Principal of one of our largest Model Schools stated to me during a conversation, that almost invariably he could pick out the teachers-in-training under him who had received a science training in the High Schools. Science-trained pupils could develop a lesson along natural lines in proper logical order, so that they were thoroughly pedagogical in all their work.

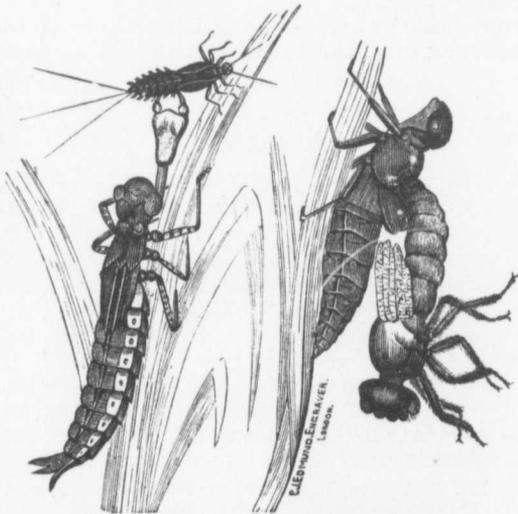


Fig. 32, transformations of a Dragon-Fly.

orders, and families, monly occurring inse

3. Prof. Pantou would like to know

4. *Insecta*, by H pays much attention

5. Scudder's *Gu* former pays much att *Butterfly Book*, with

6. Other special \$3.00; *Leconte & H* and *Packard's Works*

7. In *Economic Fruits*, price, \$2.00; *ogy*, price, \$2.50; W

8. Last, but not logical Society, in w from year to year. \$1 00 a year; for in and a copy of the A

TWO AVIAN I

In the month of which I was making sized fly that, judgin rapidly through and l with well-developed w

Looking at a sp morphosis is complete the second wonder: l is complete, in what imagine eggs deposited. But then, what would living on the exterior

[In a Catalogue *Americana* Leach note

As the Broad-wir *latissimus*, I assumed

In September of same purpose as my h but of a different spec length, with wings ne flat and smooth; the

orders, and families, and gives brief descriptions and engravings of nearly all the commonly occurring insects. Price, \$3.75.

3. Prof. Panton's *Insect Foes* (30c.) is a very convenient book for the busy man who would like to know the most injurious insects and the methods used in destroying them.

4. *Insecta*, by Hyatt & Arms, is a very neat and interesting book for beginners, and pays much attention to the anatomy of types from each of the orders. Price, \$1.25.

5. Scudder's *Guide to Butterflies and Life of a Butterfly* are very useful books. The former pays much attention to identification of larvæ. Price, \$1.50. Also Dr. Holland's *Butterfly Book*, with 48 coloured plates. Price, only \$3.00.

6. Other special works are: *Williston's Diptera*, \$2.25; *Cresson's Hymenoptera*, \$3.00; *Leconte & Horn's Coleoptera*, \$2.50; and *Banks' Neuropteroid Insects*, 50 cents; and *Packard's Works*.

7. In Economic Entomology there are Saunders's Classic Work, *Insects Injurious to Fruits*, price, \$2.00; Harris' *Insects Injurious to Vegetation*; Smith's *Economic Entomology*, price, \$2.50; Weed's *Insects and Insecticides*, price, \$1.50.

8. Last, but not least in importance, are the *Annual Reports* of our own Entomological Society, in which will be found splendid accounts of the injurious insects from year to year. Every teacher should subscribe for the *Canadian Entomologist*, \$1.00 a year; for in doing so he would get twelve monthly numbers of the Magazine and a copy of the Annual Report of the Society's Proceedings.

TWO AVIAN PARASITES: NOTES ON THEIR METAMORPHOSES.

BY R. ELLIOTT, BRYANSTON, ONT.

In the month of April, 1897, I noticed among the feathers of a Broad-winged Hawk which I was making up as an ornithological specimen several examples of a medium-sized fly that, judging from its peculiar structure, the faculty it possessed of passing rapidly through and hiding among the feathers, its reluctance to leave although provided with well-developed wings, must be a parasite, alive and well and quite at home.

Looking at a species of the highly organized order Diptera, in which the metamorphosis is complete, my first surprise at seeing the insect there soon merged into the second wonder: If the parasite remains for life on the host, and the metamorphosis is complete, in what manner is the routine of reproduction carried on? One could easily imagine eggs deposited on the feathers, an excellent environment to ensure development. But then, what would become of the larva? One could scarcely conceive of a maggot as living on the exterior of a living bird.

[In a Catalogue of Insects, under the family *Hippoboscidae*, I found *Olfersia Americana* Leach noted thus:—"Lives on *Bubo virginianus* and *Buteo borealis*."]

As the Broad-winged Hawk is a near relative of the last-named, is in fact *Buteo latissimus*, I assumed that I had found the name of the insect.

In September of this year, while manipulating a White-throated Sparrow for the same purpose as my hawk, I found another parasite fly, possibly of the same family, but of a different species from the first-named. It measured about five millimeters in length, with wings nearly, if not quite, as long as head and body. The thorax was flat and smooth; the skin leathery and tough; the legs (a light olive-green) long and

strong and provided with curved hooks—an admirable contrivance to enable the parasite to travel through the maze of feathers while the troubled host travelled through the mazes of the northern forest.



Fig. 33.
Foot of Parasite of
White-throated Sparrow.

Through the kindness of my friend, Mr. Dearness, I am enabled to present herewith a drawing made by him under the microscope, which shows the structure of the fly's foot. (Fig. 33.)

The most interesting feature of the particular specimen described above lay in the fact that when found its condition gave me hopes that I might receive some light on its method of reproduction. Its abdomen was much larger in proportion than that of its congener found on the hawk.

Having placed the fly, living and uninjured, in a small phial, I watched and awaited developments. Within twenty hours I found the fly dead at the bottom, and a single large pupa (Fig 34) sticking to the side of the bottle. As it appears incredible that the young could have subsisted by itself in such a place, it seems reasonable to conclude that the egg and larval stages were passed within the body of the parent, thus accounting for two important phases in the course of its life. The pupa measured $2\frac{1}{2} \times 2$ millimeters, blackish brown, smooth and shining, flattish, oval, suggesting in form and outward structure some minute trilobite.



Fig. 34.
Form of the
shining black
pupa.

Mr. J. Dearness submitted the specimens of the two parasitic insects, and the curious larva, adding the following notes :

With the specimens submitted herewith, Mr. Elliott has afforded some of us our first opportunity of examining a pupiparous insect. He shrewdly suspected the curious fact in the life history of the insect under notice that the earlier metamorphoses take place in the abdomen of the parent, and that the young insect emerges therefrom in the pupal stage. The adhesiveness of the pupa, as shown by its sticking to the side of glass bottle, may be an important agent in keeping the pupa among the feathers during the brief time between its expulsion and its exit as an imago.

The only book I had at hand at the time of making these notes which relates anything of the Pupiparæ was Van der Hoeven's. Speaking of the Pferde-laus (*Hippobosca equina* L.) he says: "If we were told that a bird laid an egg that produced a young one at once as large as the mother we should think the account fabulous and ridiculous; the fabulous part would not be diminished were the bird ever so small, or even a winged insect. Of this insect—the Pferde-laus—the story is actually true."

The smaller of the two parasites was the one that deposited the pupa in the bottle; it is in the genus *Ornithomyia*, Latr., and is characterised by having distinct eyes, ocelli usually three, wings distinct, claws of tarsi tri-dentate. *Hippobosca* has no ocelli, and the tarsi are bi-dentate.

The author above quoted says of the family to which these insects belong that they lay no eggs, but are viviparous. That which seems to be an egg laid by these insects, and which is sometimes as big as the abdomen of the mother, ought to be regarded as a pupa. From it the perfect insect (imago) comes to view after an interval of time dependent upon the temperature to which the pupa is exposed.

Early in 1898 this Rye, N. Y., concerning usually referred him to *Hydræcia appassionata* in our collection. I regret that I have no specimen of it extant. The discovery of it would be a great find, and was also entertained.

This *Hydræcia* was described by E. Baynes Reed, and is mentioned in the *Canadian Entomologist*. The date of the description is at the latest. There is a specimen of which the description was given to the British Museum. It has generally been considered to be a new species, and run closely into *ea* (Vol. 30, p. 130) to the point in deciding to which species it should be referred. *Marginidens* Guenée and regarded *Marginidens* as a synonym. A statement made by Dr. H. J. Dearness had been convinced that this was a new species, and he undertook to examine the material together for the Entomological Society's specimens of the same. It was to be sent by express, and was received by U. S. Custom officers here. I sent to him a note and from these he chose a specimen to be sent by mail. Amongst them was "Rutila." One was found by C. G. Anderson, of London. It was sent for determination by Mr. Bice in 1898. To identify it, I sent it also to Mr. Bice. It was considered as an illustration of the history of Dr. Smith's statement.

In due time the species was found in various forms attached to the host. On his returning the specimen was found a decent example known to me. There are only a few others known to me, not without interest. The collection and I did not find it. Anderson's capture of 1898 was from the Hamilton collection, and was not as if "Rutila" had not to belong elsewhere. *Hydræcia* *passionata*, Harvey in collection.

A BIT OF HISTORY.

BY J. ALSTON MOFFAT, LONDON, ONT.

Early in 1898 the Rev. Dr. Bethune had received an enquiry from Mr. H. Bird, of Rye, N.Y., concerning certain specimens in the Society's collection. The Doctor naturally referred him to me. Shortly after I received from Mr. Bird a letter enquiring if *Hydracia appassionata* Harvey, was represented amongst the species of that genus in our collection. I replied that it was not, and that I suspected that there was but one specimen of it extant; and that one was in the the British Museum; and that a re-discovery of it would be a matter of very great interest; and this opinion I afterwards found was also entertained by Mr. Bird.

This *Hydracia appassionata*, Harvey, is a species that was taken at London, by Mr. E. Baynes Reed, and described by Dr. Leon F. Harvey in the August number of the *Canadian Entomologist* for the year 1876, page 155, under the generic title "Gortyna." The date of the description indicating that the capture had been made the previous year at the latest. There is no mention made of the number of specimens taken, or upon which the description was made; the presumption is, that it was a unique. At all events, a type specimen had gone into Mr. Grote's collection; Mr. Grote's collection went to the British Museum, and that specimen went with it, and there I presume it is now. It has generally been considered that some of the species of this genus are rather variable and run closely into each other. Reference is made by Mr. Bird in his paper (*Can. Ent. Vol. 30, p. 130*) to the difficulty that seems to have been experienced by the describers in deciding to which species certain forms belonged. Guenee is reported as considering *Marginidens* Guen and *Limpida* Guen as possible varieties of *Rutilla* Guen, whilst Walker regarded *Marginidens* as a doubtful variety of *leucostigma*. I have read somewhere a statement made by Dr. J. B. Smith, that as the genus then stood a specimen might be yellow or mouse-colored, with or without spots and yet be the same species. Dr. Smith had been convinced that the genus was in a most unsatisfactory condition and wanted revision, and he undertook the task. The first thing to be done was to get as much material together for study as possible, so early in the year he requested the loan of the Society's specimens of that genus for comparison. I replied, that then they would have to be sent by express, and that he would remember that the unreasonable demands of the U. S. Custom officers had erected an effectual barrier to anything more being sent in that way. I sent to him a list of the genus as it was represented in the Society's drawers, and from these he chose those he wanted most to see, and they were sent to him by mail. Amongst them were three specimens which I had under the specific name "Rutilla." One was from my former Hamilton collection. Another was taken by Mr. C. G. Anderson, of London, in 1895. And as it did not correspond to anything I could find, it was sent for determination and returned as "Rutilla." The other was a specimen taken by Mr. Bice in 1896, of which he took several that season, and as I could not identify it, I sent it also for a name, which was also returned as "Rutilla." This I considered was an illustrious example of the variability of the species, and quite confirmatory of Dr. Smith's statement already referred to.

In due time the specimens were returned with Dr. Smith's determination of the various forms attached to them. In his letter to me of August 15th, 1898, announcing his returning the specimens he remarks: "The specimen of *Appassionata* is the only decent example known to me in collections. *Circumlucens* is a new species of which there are only a few other examples known to me. So, though the lot was small it was not without interest." So there had been an example of the long lost *Appassionata* in the collection and I did not know it. This specimen of *H. Appassionata*, Harvey is Anderson's capture of 1895. *H. Circumlucens*, Smith, is the specimen from my old Hamilton collection, and "Rutilla" is the 1896 capture of Mr. Bice. It would then appear as if "Rutilla" had been a kind of general repository for anything that was known not to belong elsewhere. I believe there are two or three other specimens of *H. Appassionata*, Harvey in collections in London.



Fig. 34.
Form of the
shining black
pupa.

By my ordinary method of collecting fall moths, searching for them in the daytime, or beating bushes and weeds; all species of *Hydroecia* seemed to be rare and difficult to find, except *Nictitans*, which is more or less plentiful every season; whilst other species are obtainable only in single specimens at long intervals. In Mr. H. Bird's valuable paper on this genus (*Can. Ent.* Vol. 30, P. 126,) mention is made of *Nitela* as being a well known species; here it is seldom taken, and its variety *Nebria* has yet to be reported present. Referring to *Cataphracta*, Mr. Bird says: "At light the Imago would be considered a rarity." Here it is the most abundant form presenting itself at light. Dozens of it might have been taken in the season of 1897. It was less plentiful in 1898. *Inguasita* would come next in point of numbers. This is an illustration of changed results in different localities.

THE GYPSY MOTH.

By E. H. FORBUSH.

Ever since the Gypsy moth exterminative work was placed under the management of the Massachusetts Board of Agriculture the plan of operations has been to work from the outermost limit of the known infested region toward the centre.

Obviously such a method, if properly executed, would best carry out the purpose of the State law, first, for the prevention of the spread, and second, for the extermination of the moth. In accordance with this plan it has been the policy of the Board to clear the outer towns from the moth and, at the same time, to reduce, so far as the money granted would permit, the number of the moths in the central towns. It was hoped that when the outer towns were cleared the force could largely be concentrated in the inner towns, clearing them also. If the Board had each year received the sums it has deemed necessary and annually requested this policy would by to-day, it is believed, have been carried on to complete success. But since the necessary legislative grant annually asked for by the Board has been cut down year after year from one-third to one-half, the moths have so increased in the central towns that they have been scattered into and have seriously threatened the towns cleared or nearly cleared in the outer belt.

Under these circumstances it has been found necessary during the seasons of 1897-98 to concentrate large bodies of men in the central towns to prevent a further wide dissemination of the larvæ into the outer towns; the outer towns, meanwhile, receiving less than their full share of attention.

The present year the full amount asked for (\$200,000) was granted for this work by the legislature. Unfortunately the grant was so delayed that much of the necessary work of egg-destruction (by burning, before hatching time) could not be done. The heavy rains, too, which prevailed through May and June greatly hampered the spraying. Nevertheless, the burlap-work, which was done more extensively than ever before and over most of the territory known as infested, proved so successful that nowhere in the whole burlapped territory were any considerable number of trees stripped by gypsy moth larvæ.

We have also this summer done extensive burning, beginning in August; burning will be continued where needed.

On the whole, the granting this year of the full sum asked will make it possible for us to accomplish far more in 1898 than has been accomplished in any previous year.

While it is true that two colonies of the moth (one in Lincoln, discovered in 1897, the other in Manchester, discovered this year) are known, immediately outside of the limits of the territory hitherto defined as infested, these discoveries, under all the circumstances, do not in the least surprise me, since I have believed from the first that a few of such extra-limital colonies might confidently be looked for. Still these discoveries emphasize the necessity of far more inspection work outside the limits of known infesta-

tion. We have been to do nearly all that possible was done in

Efficient work Manchester colony immediate vicinity next year. The danger of dissemination

Nevertheless the extermination in Lincoln has been dispersed, will

The work of improved apparatus and in part invented

Information adjacent to the infested watch for it. The by citizens. To secure it is planned to distribute the infested region, something of its his

In no previous the season. The divisions of the infested year have I been in extirpate the Gypsy

If the Legislature strictly limited to the can be no doubt of the

Dr. Bethune, in scene of operations chances and methods exterminating the detrees with poison in clusters, the burning bish in rough localities of trees with burlap. was largely the impression by the State in different private gardens, public round with burlap inspected. He felt workers the extermination

It was then mo That the thanks of and that this Society State of Massachusetts restrain the spread eventually. Had not States and even to

tion. We have been absolutely unable in past years, with the money hitherto granted, to do nearly all that needed to be done in this line of work. This year as much as possible was done in this line, revealing, however, no infestation.

Efficient work has been done both in Manchester and Lincoln. The centre of the Manchester colony appears to be stamped out. Much work will be necessary in its immediate vicinity this fall and the country surrounding it must be carefully watched next year. The Lincoln colony has been brought to such a condition that there is little danger of dissemination from it.

Nevertheless the moth is scattered through hundreds of acres of woodland there and extermination in Lincoln and the adjoining town of Weston, into which a few larvæ have been dispersed, will be costly.

The work of spraying and burning the past season has been greatly facilitated by improved apparatus prepared under the direction of Mr. E. C. Ware, of the Department, and in part invented by him.

Information about the Gypsy moth has been widely scattered through the region adjacent to the infested territory. People have learned to dread the moth and are on the watch for it. The Lincoln and Manchester colonies were discovered and reported to us by citizens. To secure still further the intelligent co-operation of citizens in this work, it is planned to distribute from house to house, within the towns immediately bordering the infested region, an illustrated bulletin descriptive of the Gypsy moth, its habits and something of its history.

In no previous year have we been able to speak so confidently of progress so early in the season. The great wooded tracts, especially in the eastern, western and northern divisions of the infested territory are now in excellent condition. More than ever this year have I been impressed with our power to cope with and in due time to utterly extirpate the Gypsy moth, when we are sufficiently supported by Legislative grants.

If the Legislature promptly provides for several years to come an appropriation strictly limited to the Gypsy moth work and equal to the amount granted this year, there can be no doubt of the final extermination of the Gypsy moth from Massachusetts.

Dr. Bethune, in commenting on the paper, said he had visited in August last the scene of operations of the Gypsy Moth Commission, and had been shown all their appliances and methods of operation in carrying out the work of controlling and ultimately exterminating the destructive insect. He described the spraying of the foliage of tall trees with poison in order to kill the caterpillars, the scraping off and destroying egg-clusters, the burning by means of a hose discharging blazing kerosene of weeds and rubbish in rough localities which were known to be infested, and also the banding of trunks of trees with burlap. The apparatus employed was of the most perfect description and was largely the invention and product of the members of the force. He was especially impressed by the magnitude and thoroughness of the work; in traversing many miles of the State in different directions he noticed that every tree, large or small, whether in private gardens, public streets and parks, or woods and swamps, had its trunk wrapped round with burlap and a code mark painted upon it indicating the dates when it had been inspected. He felt sure that if the Commission is maintained with its present staff of workers the extermination of the insect will before many years be accomplished.

It was then moved by Mr. Dearness, seconded by Mr. J. D. Evans, and resolved: That the thanks of the Society be conveyed to Prof. Forbush for his interesting paper, and that this Society desires to place on record its admiration of the work done by the State of Massachusetts, under the able direction of Professors Fernald and Forbush, to restrain the spread of this most destructive insect, and if possible to exterminate it eventually. Had not such energetic measures been taken the consequences to neighboring States and even to our own country might by this time be appalling.

THE COTTON BOLL-WORM IN CANADIAN CORN.

BY J. DEARNESS, LONDON, ONT.

On the 10th of October Mr. E. T. Shaw, residing near Dorchester Station on the G. T. R., east of London, drew my attention to a larva which he said was damaging his corn by burrowing from the top downward between the rows of grain on the ear. I went over into the field—one of about four acres—and with his assistance soon obtained a number of specimens of the larva. I estimated that in the part of the field we were collecting them that about one ear in five was affected.

On taking the larvæ home I was surprised to find that it agreed exactly with the descriptions of the Cotton Boll worm (*Heliothis armigera* Hubn.) and that in a Canadian latitude it could be so numerous as to possess an economic interest.

On making further inquiries I learned that the "worm" was reported in the corn-fields of most of Mr. Shaw's neighbors and indeed was said to be much more prevalent and injurious in a large corn-field of Mr. McNiven's than in Mr. Shaw's.

Last week Mr. Paul Hunter informed me that he had been husking corn in a field near Gladstone, Ont., a village in another part of the same township, and that "nearly every ear had a worm in it." He described the insect so well without any suggestions from me that I felt sure it was the same that had attracted the attention of the Dorchester Station farmers.

I visited Mr. Shaw's farm again on the 3rd instant (November) in the hope of finding some more specimens, the numbers of my first collection having been reduced by cannibalism. In confinement the larvæ seem to prefer the tissues of each other's bodies to the corn I placed in the jars with them. Possibly, indeed probably, they could not bite the rather hard shelled corn placed in one of the jars. In another jar in which two or three ends of ears of corn had been placed, when I returned after a week's absence only one specimen was living. Therefore, as just stated, I went last week to Mr. Shaw's to collect some fresh specimens to bring to this meeting. He happened that day to be hauling in unhusked corn. In the load just brought in we found relatively few affected ears, not more than one in twenty or thirty, but in the next load they were quite common, one in every two or three ears.

The affected ears usually had but a single larva in them, the largest number I saw in one ear was three. The damage done to affected ears by the burrowing and milling of the grain is not very great, less than five per cent., but some of such ears showed a mould that had made an entrance and was following the channel burrowed between the rows of the injured grains.

Dr. Fletcher informed me last night that a farmer near Orilla had reported damage to 75 per cent. of the ears of his corn by an insect which the doctor found to be the same species as the one under consideration. He will doubtless refer to it in his Notes of the Season.

The life-history of this interesting insect has been so well studied and so fully reported in the Fourth Report of the U. S. Entomological Commission and in subsequent bulletins of the Division of Entomology of the U. S. Department of Agriculture that but little remains to be done by Canadians. However its appearance here in the role above described may justify a brief synopsis of what has been recorded of its history and habits.

From the elaborate report of the Commission above cited we learn that in many parts of the Southern States the Boll-worm is regarded as more destructive to cotton than all other insects combined and that in some parts of the Southern and Western States it has been very injurious to corn. In the three years preceding the labors of the Commissioners they reported very marked damage to corn all through the South and West, it being a common experience to find fields in Virginia and southward in which almost every ear was pierced.

Glover, in 1866 contained about 500 insect for the U. S. is oval in shape, which would make a line probably it would seem of by the cotton grass serve as a trap crop, effect the maximum larva which is various some of these are not an inch and a half in is amber colored and by a fine white line. the side a very distinct are three or four rows on the anterior segment small hooks.

The first food of devouring the tissue In August it is said two or three weeks the life history are c

The perfect moth illustrated in the 4th

The series of specimens Hamilton, some years

Although this year economic entomology of serious injury in it permitted the development it to remain and extend obviously difficult. eye. When observed to. Obvious difficulties

After the mention Mr. Dwight Brainerd for the first time. My referred to the mention Bethune had found fruit of the tomato.

In the month of "Highlands of Ontario

Port Sydney, west north of Toronto, being 5½ miles long and 2

To a person who that district, and well arranged, so to speak meets the eye is truly

Glover, in 1866, wrote that a dissection of a female boll-worm moth showed that it contained about 500 eggs. Mr. F. W. Mally, who made an exhaustive study of this insect for the U. S. Division of Entomology obtained 687 eggs from one moth. The egg is oval in shape, whitish in color, and beautifully sculptured, fifty of them side by side would make a line an inch long. The eggs are laid singly on various plants, but preferably it would seem on the young silk of ears of corn. This preference is taken advantage of by the cotton growers who plant patches of corn here and there in the plantations to serve as a trap crop, the corn being harvested at a time when the planters think they will effect the maximum destruction of the larvæ. The egg hatches in 2 to 4 days. The larva which is variable in color undergoes well marked changes in its earlier moltings, some of these are noticeable in the specimens exhibited. The mature worm is an inch to an inch and a half in length and rather less than a fifth of an inch in diameter, the head is amber colored and the body is strikingly marked by a dark stripe along the back centred by a fine white line. On either side of the dark stripe on the back are paler ones and on the side a very distinct and whitish stripe in which the spiracles are found. On the sides are three or four rows of tubercles each bearing a rather stiff hair. The two legs (the six on the anterior segment of the body) are dark in color and the prolegs have each fifteen small hooks.

The first food of the young larva is its own egg shell, but it soon settles to work devouring the tissue of its host plant, whether that be cotton, corn, tomato or some other. In August it is said to pupate in about 21 days, and the pupal stage then to extend over two or three weeks. The last brood hibernates in the pupal stage. These remarks on the life history are condensed from Mr. Mally's reports.

The perfect moth like the larva is variable in color. It is fully described and well illustrated in the 4th Report of the Entomological Commission.

The series of specimens in our collections at London were taken by Mr. Moffatt, at Hamilton, some years ago. I do not find any Ontario record of it since until this year.

Although this year it is present in sufficient numbers to warrant the attention of the economic entomologist, I do not suppose there need be much apprehension on the score of serious injury in the future. The unusually prolonged season in Ontario may have permitted the development of an additional brood as compared with other years. Were it to remain and extend its area it would be most unwelcome as the question of remedy is obviously difficult. Its presence in the green ear of corn can be detected by an observant eye. When observed the tedious remedy of pinching or hand-picking might be resorted to. Obvious difficulties stand in the way of spraying with poisonous solutions.

After the members present had examined the specimens brought by Mr. Dearness, Mr. Dwight Brainerd reported that he had met with the insect in Massachusetts this year for the first time. Mr. Winn said that a few specimens had been found in Montreal and referred to the mention of the insect in Mr. Gibson's list of moths taken at Toronto. Dr. Bethune had found it this year also at Port Hope, where the larva burrowed into the fruit of the tomato.

MUSKOKA AS A COLLECTING GROUND.

BY ARTHUR GIBSON, TORONTO.

In the month of August last I had the pleasure of spending two weeks in the "Highlands of Ontario," Muskoka, my destination being Port Sydney.

Port Sydney, with a population of about 50 inhabitants, is about 138 miles due north of Toronto, being situated at the southern extremity of Mary Lake, which is about 5½ miles long and 2 or 3 wide.

To a person who has never visited Muskoka, the Lakes which abound everywhere in that district, and which as a rule, are filled with numerous small islands, beautifully arranged, so to speak, and the mainland with its wild picturesque scenery, the sight that meets the eye is truly wonderful, and worth going some distance to see.

In Mary Lake there are seven small islands of various sizes, one probably covering an acre or even two, while another would only contain about enough room upon which to build a fair sized house. These islands for the most part are composed of solid rock, with only probably a few feet of earth on the surface. In fact throughout the whole district there is nothing but rocks, rocks, rocks. On some of the islands there is a considerable growth of trees, shrubs etc., while others seemed to be quite bare. A curious sight often observed in the Muskoka country is large trees growing out of a crevice in what appears to be solid rock. To a casual observer there is considerable mystery in this, and as I have not looked into the matter, I am unable to throw any light thereon.

Certain rocks, on the islands, as well as on the mainland, sink, as it were, straight down into the water often to a depth of 30 feet and more. These rocks are not loose, in the ordinary sense of the word, but are a part of and joined to the mainland or island as the case may be, and often reach a height of probably one hundred feet or more. It will be readily seen, therefore that even the most delightful resorts, are not always the safest, but have their treacherous surroundings, and it is a wonder more drowning accidents do not occur throughout the many lakes that make Muskoka the attractive place it is.

From an entomological point of view, Muskoka ought to offer grand inducements to the collector, as vegetation in most places is simply in the wild state, and many good captures could no doubt be recorded. The month of August, the time of the writer's visit, is too late for general work, but for the collector of Noctuidae there should be a good harvest during that month, as there are numerous good places for "sugaring" purposes. About the 1st of July, I think, would be the most profitable time to visit Muskoka, as insects generally are most to be had about that time.

However, during my vacation at Port Sydney I noticed the following species of butterflies, viz *Argynnis Cybele*, *Atlantis*, *Aphrodite* and *Myrina*, all of which seemed fairly common, with *Myrina* the most plentiful. The first three named were mostly worn specimens, only a few of those taken being presentable. *Pieris rapae*, *Colias Philodice* and *Chrysophanus Hypophlaeas* were also common. The latter was the commonest of all those noticed. Everywhere this little butterfly was to be seen flitting about, and the majority of the specimens were in good condition. A few specimens of *Danais archippus* (Fig. 30), and *Grapta progné* (Fig. 35), were observed, and of the *Limenitis disippus* (Fig. 36) seemed fairly plentiful,



Fig. 35.

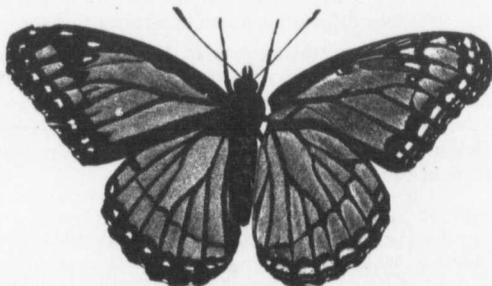


Fig. 36.

whilst but a single specimen of *Arthemis* came to view, no doubt owing to the lateness of the season. Besides these I noticed quite a number of specimens of *Feniseca tarquinius*, but could not manage to secure a single one. These interesting butterflies have a peculiar habit of flying anywhere but in the direction the collector is looking. They were all flying in close proximity to the alder bushes, on which their larvae feed upon a species of aphid.

Among the moths I took *Catocala relictata* and *concupens*, also a few other noctuids, some of which were new to me, and I noticed the wings of *Euprepia caja* lying upon the sand, the body of which some enemy had secured.

Besides the above everything was burnt any notice of any of seemed quite plentiful.

Dr. Wm. Brodie Port Sydney on severity. He stopped at a conversation with M latter part of June a One specimen of *Eup to caja* and probably enitis *Arthemis*, and I understand does not

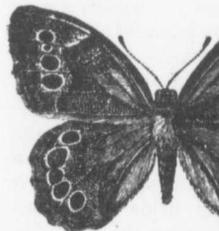


Fig. 37

ville which is about 15 Mr. Tyers has received about 25 miles north Noctuidae, which are as yet, been identified.

No doubt there a far as I know, been w

RANDOM

The aphidivorous and recorded. The st the chrysalid has also b a correct conception of a habit of the butterfly print, which is quite in as I know, is unique. in groups, is the open an open space. I hav such a branch, and fro had been sitting, then forth a number of tim traverses in this moven on which it had been perceptible rustle of th as suddenly, as if it h back again, to and fro a short rest it will repe

Besides the above, some beetles were secured with the aid of the sweep net, but as everything was burnt up with the heat, nothing much was to be done. I did not take any notice of any of the other orders, so cannot say anything about them; grasshoppers seemed quite plentiful, however.

Dr. Wm. Brodie of Toronto, the well-known entomologist, has, I believe, visited Port Sydney on several occasions and I understand has explored the neighboring vicinity. He stopped at a farm house a few miles down the Muskoka River from Port Sydney, the owner of which is an enthusiastic naturalist, his principal hobby being ornithology. In a conversation with Mr. Crew the doctor stated that during his recent visit during the latter part of June and first week or so in July he had made some interesting captures. One specimen of *Euprepia caja* was secured by him as well as another moth very similar to *caja* and probably of the same genus. Dr. Brodie spoke of the plentifulness of *Limnitis Arthemis*, and reported having taken quite a number of a *Chrysophanus*, which I understand does not occur at Toronto, and which appeared to be very common; most

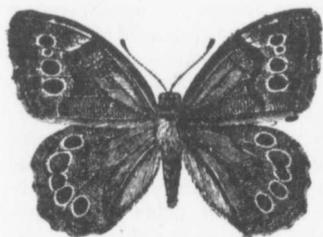


Fig. 37

of the specimens taken, however, were more or less in a damaged condition. *Debis portlandia* (Fig. 37) also appeared to be of common occurrence, the Dr. taking some 5 or 6 specimens. The habits of this butterfly are very similar to *Neonympha Eurytris*, which is our commonest representative of the "ringlets." On the whole the Doctor considered the past season to have been a poor one in the vicinity of Port Sydney, but I am satisfied that with a good season much interesting work could be accomplished there.

The country to the north of Port Sydney and Huntsville which is about 12 miles from Port Sydney, contributes some fine specimens of insects. Mr. Tyers has received quite a large number of lepidoptera from the Muskoka region—about 25 miles north of Huntsville, among which are some very nice things in the Noctuidae, which are not included in our local fauna, and the majority of which have not, as yet, been identified.

No doubt there are new species yet to be found in that country, which has not, as far as I know, been worked up to any great extent.

RANDOM RECOLLECTIONS IN NATURAL HISTORY.

BY J. ALSTON MOFFAT, LONDON, ONT.

The aphidivorous habit of the larvæ of *Feniseca Tarquinius* has been well observed and recorded. The striking portraiture of a monkey's face in the form and markings of the chrysalid has also been commented on, and even photographed, yet no one can form a correct conception of its wonderful naturalness until they have seen it. But there is a habit of the butterfly which it at all times indulges in that I have not seen noticed in print, which is quite in keeping with the peculiarities of its previous stages, and, as far as I know, is unique. A favourite situation for this butterfly to rest on, either singly, or in groups, is the open side of a wood, or the leafy branch of a tree projecting into an open space. I have seen a single individual take its position on the extreme point of such a branch, and from there it would dart a little distance to the one side of where it had been sitting, then back to about as far on the other side of it, then back and forth a number of times before it returns to rest on its perch again. The distance it traverses in this movement may be about ten feet, and at right angles to the branch on which it had been sitting. It brings up at each end with a perfect snap, and a perceptible rustle of the wings. It seems to throw itself with great violence, and stop as suddenly, as if it had struck a board; then off to the other end of its course and back again, to and fro with such rapidity that the eye can scarcely follow it; then after a short rest it will repeat its performance.

Whether it is the male or female that indulges in this sport, I cannot say, or if it may not be confined exclusively to either sex. I had the good fortune to see the performance enacted three different times, in two of which the exhibition was brought to a fatal termination, but no attention was paid to the sex of the performers. I should be inclined to surmise that it is the male and he only.

When reading some remarks upon the parasitic worms of the genus *Gordius*, more commonly called "Hair Snakes," from the belief entertained by many that they are horse hairs transformed in water into snakes; the writer animadverted upon the ignorance and superstition that still prevailed on this subject, which was considered not at all creditable to the superior education of the present day; which brought back to my recollection something of the tedious process by which my mind was relieved of its ignorance in this matter, and set me a-thinking that if the writer had been possessed of some further information it might have tended to moderate his estimate of himself and others; for there are few erroneous notions in natural history entertained by the multitude, that have such a reasonable excuse for their existence, in nature and in fact, as this one about "Hair Snakes." And seeing that a knowledge of facts is a more certain way of abolishing both ignorance and superstition than the denouncing of either; and as it seems to me that there are extenuating circumstances connected with this subject that are not as well known as they ought to be, I shall give an account of what I at one time saw.

When I was a small boy living in the country, which was at that time "Backwoods," and having no playmates of my own kind, I naturally sought for companionship with other kinds; passing my time in the woods and fields in search of something new, curious or attractive to me, and especially in observing the works and ways of living creatures, in which I found my chief enjoyment. On one hot summer day after heavy and continued rain I was amusing myself in a pasture field that had never been cultivated: and in which were numerous little hillocks with hollows on one side of them, indicating that there, in the long-by-past, trees had grown, been uprooted and decayed. The hollows were filled with pure water from the recent and frequent showers. Their bottoms were smooth and bright green, whilst their clear and crystalline waters reflected every passing cloud that floated over them in the brilliant sunlight. Whilst dreamingly watching the rapid passing of small white clouds reflected in one of these pools, my attention was aroused by an agitation of the water at one side; and upon examination I found a tuft of yellowish white hairs, which had evidently come from some cow's tail, partially in and partially out of the water. The hairs may have been between eight and ten inches in length, and there may have been fifteen or twenty of them together. There was about two-thirds of their length in the water, and the rest on dry ground. The part of them that was on land was a compact mass, as if they had been plucked out together and dropped there; whilst that part of them that was in the water had each individual hair as widely separated from its fellow as it possibly could get, whilst each and all of them were animated by an undulating eel-like movement which they kept up incessantly, as if they were making an effort to get off and could not.

I had seen *Gordius* before that, and upon inquiry had been informed that they were "Hair Snakes," from which I inferred that they were hairs turned into snakes; and here sure enough I thought I had found a bunch of them in the process of transforming; but how one portion of a hair could become a living snake, whilst the other part still remained a dead hair, was to me a perplexing and mighty mystery, and remained so for many years afterwards. In some of my promiscuous reading I at length came upon a satisfactory solution of the enigma. It seems that there is an animalcule of some kind that breeds in water, and is in the habit of attaching itself to objects floating in the water, and if these creatures are sufficiently numerous, and the object sufficiently pliable, they can by united action produce an undulating movement, and give to the object an appearance of individual life; and this is what I had seen. Not quite an ocular delusion, but a mental deception of the most convincing kind. I had noticed when looking at the hairs, that the portion in the water appeared stouter than the other, but I satisfied

myself with the thought that I had learned that an object had not been deceived which I could not accept but what I had read with them.

If that tuft of hair with motion as part of others, and would like my attention would not that "Hair Snakes" an instructive lesson, what I had seen previously obtaining the right conclusion have ocular proof of do turn into snakes."



When engaged a Sphinx (Fig. 38) to me so laid it aside for and shrivelled, and upon and brittle scale, I saw of emerging before it operate for discovering as they were disposed menced investigating freely and as clean as but upon which had moth, the matured which were about three be an unnatural po

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myself with the thought that a living thing should grow; and in after years when I learned that an object in water appeared thicker than when out of it, I wondered if I had not been deceived in that way, but there was an apparent roughness of their surface which I could not account for, as I knew that hairs did not soften and swell in water; but what I had read explained most satisfactorily everything I had seen in connection with them.

If that tuft of hairs had been wholly in the water, and their full length endowed with motion as part of it was, each hair would have been moving independently of the others, and would likely have been scattered all over the pool; then in all probability my attention would not have been particularly attracted by them, further than to think that "Hair Snakes" were unusually numerous in that pool; and so I would have missed an instructive lesson, for what I read would not have impressed me as it did, but for what I had seen previously. This is an experiment that anyone favourably situated for obtaining the right conditions could easily carry out for themselves, and then they would have ocular proof of what a reasonable excuse there does exist for the belief that "hairs do turn into snakes."

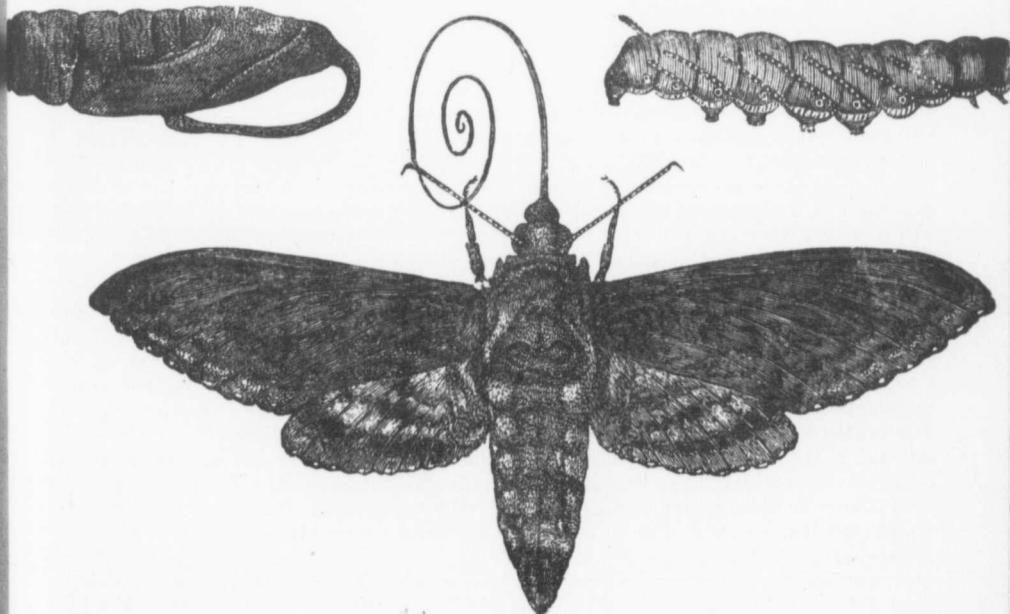


Fig. 38.

When engaged at one time in an effort to bring some chrysalids of the Tomato Sphinx (Fig. 38) to maturity, and obtain the moths, I noticed that one of them was dead, so laid it aside for a time. Upon my next handling it I found the outer skin dry and shrivelled, and upon removing a portion of it, which was an exceedingly thin and brittle scale, I saw that the moth within had been fully matured up to the point of emerging before it died, so finding that I had an excellent subject upon which to operate for discovering the position and arrangement of the various parts of the insect, as they were disposed of in the chrysalid prior to its assuming an active life, I commenced investigating. Carefully removing the outer covering, which came away as freely and as clean as if it had never been in any way attached to the corpse within, but upon which had been distinctly impressed every external feature of the coming moth, the matured pupa was disclosed scaled and coloured complete. The winglets, which were about three-quarters of an inch in length, pressed firmly—in what seems to be an unnatural position—on its breast, instead of on the sides where they are

to be afterwards; and the long legs compactly gathered together under the winglets, occupying the least space possible. The external loop on the chrysalid, in which the proboscis, or sucking tube, generally called "tongue," is partly contained, interested me the most, so I gave special attention to it.

Upon removing the outer scale of the loop—which has often been compared to the handle of a pitcher, and to which it bears a striking resemblance—I found that the proboscis within was double. It leaves the head and reaches about two-thirds the length of the chrysalid in the loop, where it touches and is united to the covering of the abdomen; here it is doubled back upon itself, not sharply, but with an open curve, which produces that knob at the lower end of the handle. It then presses closely to the under, or inner side of the descending portion till it reaches the head, where it passes inward to the body of the moth, whence it proceeds downward again, under the folded legs and winglets of the moth to its full length of four and a half or five inches, tapering gradually but perceptibly from base to apex.

If such a chrysalid was broken open when newly transformed from the caterpillar, it would be found to be an unorganized fluid mass, seemingly held together only by the outer integuments—which parted so freely from what was inside, when matured—and upon which, even at that time, is imprinted all the external outlines of the coming moth, and from which the internal organical structure of the future solid body seems to radiate, and take on form and consistency. What a wonderful transformation is herein brought about by time and favourable conditions! From an unorganized fluid, to a diversified and complicated organism, adapted to a vigorous, active life. And the sucking tube, so delicately and yet so powerfully constructed, that the creature can extend it to its full length of five inches, or roll it up into a coil at its pleasure, not the diameter of a five cent piece. And yet more wonderful if we go back to the egg from which it all came, and within which lay "the power and the potency" for producing all that was to follow. "Never deviating from its course, but always producing a being like the parent." The proboscis is constructed of two longitudinal pieces with a groove on the inner side of each, which forms the cavity through which the moth takes its nourishment. These two pieces are firmly held together side by side by means of interlacing fibres, which yet admit of elasticity to the tube and allow the cavity to expand when food is passing through it, and may be used by muscular pressure in assisting to force it into the gullet. What wonderful adaptations of means to an end are to be observed in nature for the production of organs suited to the requirements of the creatures using them. One can at times see something like the exercise of the inventive faculty in evading or overcoming obstacles in the way of reaching the end required, when these are somewhat out of the ordinary, and with admirable success; impressing the mind with the thought that there must be somewhere, intelligent direction and supervision for the accomplishing of it.

THE PREPARATION OF SPECIMENS FOR THE EXHIBITION OF LIFE-HISTORIES IN THE CABINET.

BY DWIGHT BRAINERD, MONTREAL.

My brother and I arrange our cases in a rather peculiar way, and were complimented by being asked to describe it for the "Report."

The point that bothered us, was to break the lines ordinarily found in a drawer. We have four sizes of cardboard oblongs, cut proportionately, and use them instead of the common name labels. They are placed above each species, should be about half as long again as the wing span, and contain the bleached wings, frass and eggs corresponding to the name across their left hand margin. (See Plate).



By this method, the drawers are cut up into little squares, each large enough to hold a series together with the caterpillar, ichneumons, etc. One can put a good deal of taste into the arrangement and the effect is certainly good. Outside of looks, I do not know that the system has anything to recommend it. Of course with white cards, the drawer covering must be colored: we employ a rough buff wall paper.

I am asked for some remarks on inflating and wing bleaching. Many books give instructions, but for novices it may be said that caterpillars are inflated or blown by slightly cutting the anal orifice, ventrally, squeezing everything out by the hole so made while holding them between the fingers in a soft cloth; binding a tube in this hole and drying them, inflated by a current of hot air. It is well to have a piece of blotting paper to absorb the drop or two of liquid ejected when the cut is first made, and care must be taken to clean the neck. Neglect of this makes an ugly black blotch.

Benzine is the best thing for killing, as some kinds of caterpillars seem to fatten on chloroform. The stripping and drying should be done immediately the caterpillar is dead. If not, it draws up into all sorts of knots, and if left until relaxed, is too tender. Partially dry the skin before giving it much air pressure or it will get out of shape, and stiffen up the tail end before paying much attention to the head.

I never could make much success of the straw recommended by experts, and always use a glass tube drawn to a point to furnish the air. Lap it with silk three or four times, run slightly into the caterpillar, make a turn or so in front of the last pair of legs and fasten the silk back on the tube. With very small things, this glass can afterwards be cut off by a file, and a headless pin, bent at right angles, stuck in with a drop of gum. Larger species should be slipped off by the thumb nail and pinned through the middle.

The less heat used, the better will be results. A lamp chimney fastened horizontally on a metal coat hook, makes a first class oven. And a candle is the best source of heat as by snuffing it the temperature can be regulated. The flame should be kept at least two inches below the oven, and the segments you are working held over the hottest place. Druggists sell a double bulb inflator now, which is much better than the breath for giving the empty skin its shape.

In bleaching wings, to show the veins, the only suggestion I can offer is the use of wood rather than common alcohol for washing. The oil in it increases the transparency. If bleaching has not been described in past Reports, the wings are torn or snapped off close to the body, soaked a minute in alcohol, and then, to remove the color, in Labarague solution. When clear, wash again in alcohol, dip in water and mount on a card.

THE BROWN-TAIL MOTH (*Euproctis chrysorrhœa*, L.).

BY DR. JAMES FLETCHER, OTTAWA.

The specimens of the new pest of fruit and forest trees in Massachusetts which I am able to show to-day, have been kindly supplied for this purpose by Mr. A. H. Kirkland of the Gypsy Moth Committee. They consist of the male and female moths, the egg mass, the full-grown larva and the hibernaculum in which the larvæ pass the winter.

This insect is well known in Europe and has about the same range as the Gypsy Moth. Thirty years ago, when I was a boy, it was not an uncommon species for one season at Rochester, Kent, in the south of England, but I learn that it is now rare. The first notice of its occurrence in America was when Prof. Fernald announced that he had been working on it in Massachusetts in 1897, but it had been noticed by some for four or five years before that date. It is thought to have been imported with nursery stock perhaps as early as 1885. Early last spring it was sufficiently abundant for Mr. Kirkland to

point out to me several specimens of the last mentioned pest on the railway to Malden, Massachusetts. Fernald has published descriptions of the last mentioned pest in Boston. Both Prof. Fernald and Mr. Kirkland urge that drastic measures be taken. Date, Oct. 5, 1898:

"The Brown-tail moth is a thorough work don't this was neglected. I no doubt the moths remember, flies frequently parasitised to quite larger hymenoptera and from this as a result to see this insect in rank with the Ten doubtless carried or While we know the becomes a pest at a

Kollar, the Au etc.," says of this insect. "It may justly be said that the larvæ often infest in as was the case in t

The caterpillar large and small fruit. The favourite food is the male and female moths. The life history of the caterpillars, which live on the leaves, stripping the Pear Slug, leaves of several leaves into this shelter following spring. In that time, devouring June they spin light or a month later. They are covered with golden are elongated, depre of the Gypsy Moth, golden brown hairs insect voracious feed the cause of much ar is of much the same of *Halisidota*. Prof severely as to requir the Gypsy Moth emp cover the cause and (Bull. 17, New Ser netting of the skin or the cocoons, but they are blown about by often affected when road."

point out to me several of the winter nests of the larvæ as we travelled from Boston by railway to Malden, Mass. Most of these nests seemed to be in pear trees. Prof. Fernald has published a bulletin on the subject, and also an extensive article in the proceedings of the last meeting of the Association of Economic Entomologists which was held at Boston. Both Prof. Fernald and Mr. Kirkland consider this insect as a serious pest and urge that drastic measures should be adopted to exterminate it. The latter writes under date, Oct. 5, 1898:—

“The Brown-tail Moth was not a severe pest here the past summer because of the thorough work done last winter in destroying the winter webs of the young larvæ. Where this was neglected the caterpillars proved quite a scourge and from these neglected spots no doubt the moths spread to no small degree in the flying season. The female, you will remember, flies freely. A hopeful feature is the parasite help. We found the pupæ parasitised to quite an unexpected degree by *Diglochis omnivorus*, Walker, and by a few larger hymenopterous parasites. Of course, I have only two years' experience to go by, and from this as a basis no strong predictions can be made, but I should not be surprised to see this insect spread gradually over New England and become a pest of about equal rank with the Tent Caterpillar, perhaps worse. Since the female flies so well and is doubtless carried on gales of wind, I can see no prospect of exterminating the insect. While we know that the insect breeds well on many shade and forest trees, I doubt if it becomes a pest at any great distance from orchards.”

Kollar, the Austrian entomologist, in his “Insects Injurious to Gardeners, Foresters, etc.,” says of this insect which he treats of under the name of the Yellow-tailed Moth: “It may justly be reckoned among the most destructive insects of the orchard. The larvæ often infesting fruit trees to such a degree that not a leaf or fruit remains uninjured, as was the case in the year 1828.”

The caterpillars have a very wide range of food plants including nearly all of the large and small fruits; they will also attack a great many of the common perennial plants. The favourite food seems to be the pear. Compared with the Gipsy Moth, as both the male and female moths fly easily, the Brown-tail Moth has greater powers of spreading. The life history of the species is as follows. The winter is passed by the partially grown caterpillars, which hatch in August and feed for about six weeks upon the upper surface of the leaves, stripping them of the skin and cellular tissue in the same way as is done by the Pear Slug, leaving the skeletonized leaves brown and dead. The winter shelter consists of several leaves spun together with silk, and a colony of the young caterpillars retires into this shelter in the latter part of September and remains dormant until the following spring. They revive again just as the buds are bursting and do much harm at that time, devouring the young leaves, flowers and forming fruit. When full-grown in June they spin light cocoons among the leaves, and the moths emerge about three weeks or a month later. The moths appear in July and the curious and beautiful egg masses covered with golden fur-like down may be found on the leaves during this month. They are elongated, depressed, and rounded above, more regular in outline than the egg masses of the Gipsy Moth, but like them protected by a densely felted covering consisting of the golden brown hairs from the anal tuft of the female. Not only are the caterpillars of this insect voracious feeders upon the foliage of many kinds of trees and plants; but they are also the cause of much annoyance from the stinging hairs of the larvæ and pupæ. This stinging is of much the same nature but more intense than that caused by the hairs of the species of *Halisdota*. Prof. Fernald states that many persons in the infested region suffered so severely as to require the aid of a physician and the irritation was so annoying to some of the Gipsy Moth employees that the chemist was directed to investigate the matter to discover the cause and to find out if possible an antidote. Prof. Fernald concludes his article (Bull. 17, New Series, U. S. Dep. of Agriculture, Div. of Ent.) as follows. “The nettling of the skin may be caused by contact with the caterpillars, both old and young, or the cocoons, but in the latter case contact is not necessary, as the hairs from the cocoons are blown about by the wind. An English journal mentions the fact that travellers are often affected when the wind blows strongly from infested hedges along the side of the road.”

By examining the specimens which I have here, it will be seen that the egg mass is about half an inch long by a quarter of an inch wide. The eggs cannot be seen under their furry covering, but they are round, of a golden color, and there are between 200 and 300 in a heap. The caterpillars vary in appearance during the different moults. The young caterpillars are described as of a dirty yellow color, with a black head and a black ring around the neck. They are thickly covered with hair and have four rows of black dots along the back. They are social in their habits throughout their larval life. From the first they spin a web over themselves, and as a leaf is destroyed another is attached to it by silken strands and gradually becomes part of the nest. The leaves attacked are also fastened securely to the twigs. The nest is never entirely forsaken; when the caterpillars get larger they sally out in search of food but return from time to time to their refuge. The mature larva (as exhibited) is rather a handsome creature, velvety black lined with brown and bearing on each segment tufts of golden brown bristles. Along each side is a conspicuous lateral interrupted white stripe with tufts of curious hair-like processes. On segments ten and eleven are spherical reddish yellow tubercles, one on each segment, similar to those found on the Gipsy Moth. These the caterpillars can elevate or depress at pleasure. The head is black mottled with brown, and the full-grown larva is nearly an inch and a half in length.

Kollar speaks of pupation taking place by preference upon damson trees, the caterpillars leaving apple and pear trees to pupate upon the damsons. He also speaks of the mode of pupation as follows: "After the last moult, which the caterpillars undergo either in the old nests under the new web or in the open air, they disperse over the different fruit trees in the garden. Pupation takes place in June; several again unite, roll some leaves together into a ball, make for themselves jointly a brownish web and become dark brown pupæ. There are from four to twelve in a ball."

Among remedies, this author recommends highly the collecting of these balls, which are generally found either on damson trees or, when these are not present, upon the lower branches of the trees which have been attacked. The Brown-tail Moth is a night flying insect which is very active at night, but sits quietly without movement during the day time. The four wings and thorax are of a snowy whiteness; the antennæ are golden brown, white above, and in the male widely pectinate. The abdomen is dark brown in both sexes, that of the female bearing at its posterior extremity a round mass of golden yellow hair, which entirely disappears by the time egg laying is completed, the component hairs having been deposited by the female over the mass of eggs as a covering.

The work which has been done in connection with the Brown-tail Moth is another instance of the grand service which is being rendered to the State, the Union and the cause of economic entomology by the Gipsy Moth Committee. The laws which have been enacted in Europe, and already in Massachusetts, show the necessity of attending to this enemy at once before it gets beyond control. It is well for the country that chance has introduced it within the area so well watched by the expert entomologists and officers of the Gipsy Moth Committee. The careful experiments which have been carried on by these gentlemen show that the destruction of the webs in winter and the spraying of trees when the caterpillars are active, supplemented with lantern traps, are effective means of keeping down the numbers of this insect, and, further, that if the matter is neglected we have in this new pest an enemy with great capabilities for spreading and doing harm, which should stimulate effort on the part of everyone living in the infested areas to do what is advised by the Committee promptly, so that, if still possible, so destructive an enemy may be prevented from spreading over a large area of country. The experience of some districts which were systematically worked by destroying the conspicuous winter shelters with the caterpillars inside them in 1897-8, is very instructive, for there were practically no moths in these districts last summer; but in adjacent places where no effort was made, the moths have increased to such an extent that these cleared districts will probably be re-infested and all the work will have to be done over again.

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Fig. 39.

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INJURIOUS INSECTS IN 1898.

BY DR. JAMES FLETCHER, OTTAWA.

The crops of the Province during 1898 have not suffered generally from any unusual or even locally severe outbreak of injurious insects. There have been, of course, losses in all crops from the ordinary annually-recurring pests; but the wide awake Ontario farmer now knows pretty well what to do or where to get the necessary information, when he notices an unusual abundance of an insect enemy. We may again be thankful for a season of good crops, and for the most part these were got in in good condition. The general results of the year are given concisely in the excellent Crop Reports for November, issued by the Deputy Minister of Agriculture, Prof. C. C. James. The only drawbacks of the season were exceptionally hot weather with drought in some sections in July and August and a rather wide-spread and almost unheard of frost in the month of July, which affected some tender crops. The autumn was long and fine, with no severe early frosts, thus allowing all root crops and fodder to pick up well.

CEREALS.

The cereals throughout the Province have made an excellent showing. Owing to the increase in the price of wheat last autumn, a large area was sown to this staple crop. The hot, dry period referred to, although it ripened up some oats rather prematurely, produced wheat of exceptionally fine quality. Mr. W. Scott, of the McKay Milling Co'y of Ottawa, a large buyer of grain, tells me that he has not seen for many years wheat of such high quality as he has this year received from some parts of the Ottawa Valley, some samples running as high as 64½ lbs. to the bushel, without any sign of injury by the Wheat Midge or other insect enemies.

"Poor yields were exceptional, and large yields were common. The plumpness of the grain is frequently alluded to, in many cases the weight going over the standard, and as high sometimes as 63 or 64 lbs. to the bushel. Here and there only did correspondents complain of rust, midge, or other injury to the crop. The yield is 24 bushels per acre for Fall Wheat. . . . The crop of spring wheat has been over an average in yield, and the quality is also good. The yield is 17.7 bushels per acre."—(November Crop Report, Ont. Bureau of Industries, p. 2.)

Barley yielded heavily, and the sample, for weight and color, has seldom been surpassed. I have not heard of any injury by insects.

Oats were in places light, and in some localities suffered from the attacks of the Grain Aphis, Wireworms, and Outworms. The injury by the first of these was light. As is usually the case, the parasites which invariably accompany this plant-louse, increased in enormous numbers and the plague stopped. The parasite which did best service was *Aphidius granariaphis*, Cook. *avenaphis* (Fitch)

DEVASTATING DART MOTH. A rather bad attack of the Glassy Outworm (*Hadena* ^{*Sidermia*} ~~*denastata*~~, Brace), Fig. 29, the caterpillar of the Devastating Dart Moth, occurred on the farm of Messrs. J. Yuill & Sons, at Carleton Place.



Fig. 39.

When insects attack a crop of grain it is always difficult to apply any remedy to the standing plants and the only resource is the practising of agricultural methods founded on the known life-history of the pest. Most insects feed upon closely allied plants; the wisdom, therefore, is apparent of following an infested crop belonging to the grass family with another consisting of plants belonging to a different botanical family.

Among the Cutworms, the two worst enemies of grain crops in Ontario are the species referred to above and the AMPUTATING BROCADE MOTH (*Hadena arctica*, Bois.), and although it is probable that the latter of these may feed on other plants, the favorite food plants seem to be members of the Gramineae or true grasses, upon the roots and lower stems of which they feed in a similar manner to the Glassy Cutworm.

This Cutworm is a more troublesome pest when it attacks grain crops, from the fact that the caterpillar does not become full-fed until some time later. In an attack of this kind it is, of course, necessary to examine the caterpillars to see how nearly they are full-grown. In the case referred to above the cutworms of the Devastating Dart Moth from Carleton Place were found to be full-grown by the end of the first week in June, and the owners of the field, who wished to sow their land again to oats, were advised that this could be safely done. The land was cultivated at once, and on the 8th of June was seeded down again to oats and grass. This crop was not attacked at all because the caterpillars were all in the chrysalis condition. This would not have been the case if the infesting Cutworms had been the caterpillars of the Amputating Brocade Moth.

Even less amenable to remedial treatment than the above are the various species of WIREWORMS (Fig. 40), which attack grain crops particularly on timothy sod. No satisfactory remedy for these has as yet been discovered. Sowing rye or barley on infested land has been found useful by some, and late ploughing is highly recommended; but no applications to the land or poisoning of the seed are of any avail.



Fig. 40.

An interesting discovery has been made during the past summer at Toronto, by Mr. C. W. Nash, and at Norwood, Ont., by Mr. T. W. Wilkins, of a parasitic fungus belonging to the genus *Cordyceps*, which was in both places destroying the wireworms in considerable numbers. This fungus was much more slender than the one which is frequently figured as the parasite of the White Grubs (*Cordyceps melolonthæ*, Tulasne) (Fig. 41). So far, the identity of the wireworm destroying species has not been obtained. It is probable that it is an undescribed species.

THE WHEAT MIDGE (*Diplosis tritici*, Kirby), which a few years ago worked such havoc in the wheat crop, seems almost to have disappeared from Canada; however, one district seems to have suffered severely from this pest last season. This was along the shore of Lake Ontario in the Niagara peninsula. Another pest, which did not appear at all in 1898, is the American Frit Fly (*Oscinis carbonaria*, Loew.), which in 1890 injured wheat very much in the eastern portions of the Province. For three years before that it had also been an enemy of meadow grasses.

THE WHEAT-STEM MAGGOT (*Meromyza Americana*, Fitch), although present in most localities where looked for, seems lately to have gone back to a large extent to its natural food plants, the wild native grasses.

The most important attacks upon wheat, and these were by no means extensive or severe, were by the old and well-known culprits, the Hessian Fly (*Cecidomyia destructor*, Say) and the Joint-worm (*Isosoma tritici*, Riley).



Fig. 42.

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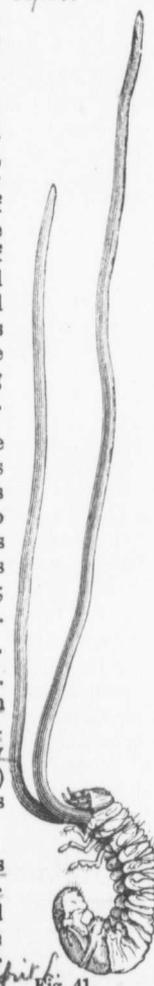


Fig. 41.

Hydropogon
 Fitch



Fig. 42.

THE HESSIAN FLY (Fig. 42—greatly magnified) is probably more prevalent than it is generally thought; but as its depredations in most places are not serious they are not observed. The injuries to fall wheat in the autumn are greater than by the more conspicuous attack on the stem during the summer by the spring brood. Occasionally the spring brood attacks the wheat plants in the succulent root shoots just as is done by the autumn brood; this would be due I think to a late spring holding back the development of the wheat plants. The eggs would be laid on the leaves, and the young maggots might attack the shoots too severely to allow of them developing into stems. It has been frequently noticed that insects are not belated to the same extent as plants by cool spring weather,

THE WHEAT JOINT-WORM (*Isosoma tritici*, Fitch). (Fig. 43—the fly highly magnified). In 1895 specimens of injured wheat straws bearing many galls in the bases of the sheathing leaves of the stems were sent from Meaford, on the Georgian Bay, by Mr. Thomas Harris; these were considered to be *Isosoma hordei*, Harris. The injury to the

infested crop amounted to 5 per cent. There was no recurrence of the attack last year at that place; but a somewhat similar attack upon wheat appeared at Verdun, Bruce Co., on the opposite side of the peninsula. Many specimens were sent to me by Mr. William Welsh, both in the autumn of 1897 and last spring. The galls were different from the Meaford specimens in that there was little swelling, and the cells of the larvæ were almost entirely in the tissues of the stem proper, short sections of which were rendered hard, woody, and brittle by the operations of the insects. From some of these stems a large number of the

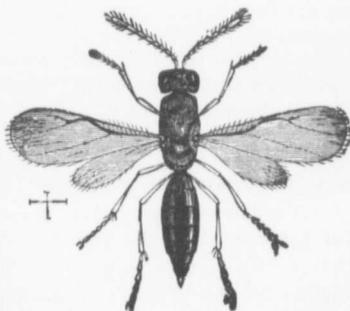


Fig. 43.

flies were reared. These have been identified by Dr. L. O. Howard and prove to be *Isosoma tritici* of Fitch. The injury was serious, attacked stems producing fewer and smaller grains than the others. From the Verdun material, in addition to the gall makers, two kinds of parasites were reared, *Homoporus chalcidiphagus*, (Walsh), and *Eupelmus epicaste*, Walsh; but these were not present in sufficient numbers to affect the outbreak to any appreciable degree. During the past summer loss from this Joint-worm was not so great as in 1897, so it is to be hoped that its natural enemies may have increased. The eggs of the joint-worms are inserted into the young green straws in June by the female flies. Wheat, oats, rye and barley are damaged. There is only one brood in the year, a few of the flies issuing in the autumn, but most of them not till the following spring. Most of the galls are situated in the first or second joints of the stem above the root, and, as the normal time of emergence is in the spring, any treatment of the stubble such as burning over or ploughing down deeply, by which the insects are destroyed or smothered, must reduce their numbers considerably. Mr. Welsh noticed that many of the hardened portions of the stems were broken from the straw in threshing and were found among the rubbish or in the grain. These pieces from half an inch to one inch in length contain from five to ten larvæ. This shows that, besides treating the stubble, these pieces of stem as well as the straw must also be attended to. The broken-off hardened pieces should be collected at threshing and cleaning and burned. Likewise straw from fields where the joint-worms have been found should be destroyed by either feeding or some other means before the time at which the flies should appear.

THE PEA WEEVIL (*Brauchis pisorum*, L.). As in previous years many inquiries have come in for the best means to kill the "pea bug" in seed pease. The life-history is

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well-known; the eggs are laid on the young green pods; the grub on hatching eats its way in and penetrates one of the forming pease. There it remains until full-grown, consuming the interior of the pea and passing through all its stages from a white fleshy grub to the chrysalis and then to the perfect beetle. A small proportion of the beetles emerge the same autumn and pass the winter under rubbish or in barns and other buildings. The larger number, however, remain in the pease and do not emerge until the next spring, so that they are frequently sown with the seed. The perfect insects fly easily and resort to the pea fields about the time the blossoms appear. They feed for some time on the flowers and leaves, and egg-laying takes place as soon as the pods are formed.

Remedies.—The best remedy for this insect is, undoubtedly, to treat the seed with bisulphide of carbon. Nearly all the large seed houses have special buildings for this purpose, and few seed pease are sold which have not been treated. Should it be found, however, when sowing pease, that they contain living weevils, it is an easy matter to treat them. Perhaps the most convenient way for farmers is to take an ordinary 45-gallon coal oil barrel. Into this 5 bushels of pease may be put at one time. According to the quantity of seed to be treated, use 1 ounce of bisulphide to every 100 pounds of pease; therefore, if the barrel is filled, put 3 ozs. of the chemical in a flat, open saucer or basin on the top, or pour it right on the pease; cover up the top quickly with a damp sack or other cloth and put some boards over that. Bisulphide of carbon is a colourless liquid which volatilizes readily at ordinary temperatures; the vapour which is quite invisible, but has a strong, unpleasant odour, is heavier than air, therefore sinks readily and permeates the contents of any closed receptacle. This liquid is very inflammable; so great care must be taken with it. The pease should be treated under a shed out of doors, and should be kept tightly closed up for 48 hours. No light of any kind must be brought near, or an explosion may occur.

The late sowing of pease is sometimes practised to avoid the weevil; but this plan is not approved of, as the crop is small and is then frequently attacked by mildew.

Seed pease may be held over without injury for two years, and this is a sure remedy against the Pea Weevil; for the beetles must emerge the first spring, and if the pease are tied up in paper or cotton bags, as they cannot eat through these materials, they will all be dead before the second spring. Weevilled pease should not be used as seed, as they produce, if they grow at all, weak, spindly plants.

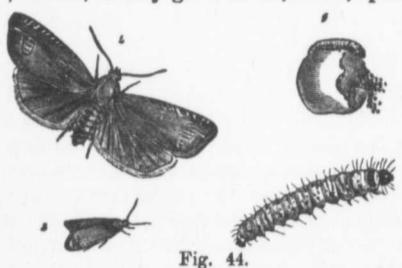


Fig. 44.

abundant enough to cause much complaint. The caterpillars are whitish and fleshy, with dark heads and some dark tubercles on the segments, from each side of which a slender bristle springs. When full-grown they are about $\frac{1}{4}$ inch in length; they then eat their way out by a small round hole through the pod and enter the ground a short distance, where they spin small oval cocoons in which they pass the winter, and the perfect moths do not appear again until nearly the middle of the following July. Dr. J. Ritzema Bos, in his *Agricultural Zoology*, says of the same or a closely allied European species: "The moths fly about in large numbers around the pea blossoms, always a short time after sunset. The females lay one, two, or at most three, eggs on a very young pod. In fourteen days the caterpillar is hatched, bores into the pod, and attacks the pease. The pease attacked are covered, while in the pod, with the coarse-grained excrement of the caterpillar and are often united, two or three together, by a web." The perfect moth is a modest-coloured but pretty species, $\frac{1}{4}$ inch long when the wings are closed, mouse-coloured, bronzed

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Remedy.—As found that early s before the moths a and last season. l and in 1898 betwe tions, and these da

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THE CLOVER-SEE good deal of harm in turning their attentio these varieties are no of feeding off or mo satisfactory by those the first brood mature complete their changes cured before that date leave the clover heads as the second crop, fro

towards the tips of the wings, silvery gray beneath. The only markings are along the front costa and at the apex of the fore-wings. The costal marks consist of 10 or 12 short, black streaks separated by similar clear white dashes; near the apex is a flask-shaped mark which bears 4 or 5 short, longitudinal, black dashes. Last year the attacks of the Pea Moth upon pease in Ontario were considerable, Mr. John McMillan, M.P. for Huron, even putting the loss at one-third of the crop in his district.

Remedy.—As a remedy, deep ploughing has been recommended. It has also been found that early sowing and the cultivation of early varieties enable the pease to mature before the moths are on the wing. The perfect insects have been reared both in 1897 and last season. In the former year all the specimens emerged between July 12 and 15, and in 1898 between July 13 and 15. These specimens were kept under natural conditions, and these dates probably agree with the time the moths appear naturally in the field.

THE BEAN WEEVIL (*Bruchus obtectus*, Say, Fig. 45). From time to time notices appear in reports of entomologists and in the newspapers in the United States of injury to seed beans by a weevil similar to the Pea Weevil, but rather smaller. This is the Bean Weevil, a small, very active beetle, at one time thought to be a native of America but now considered to be a cosmopolitan species, which has been imported into this

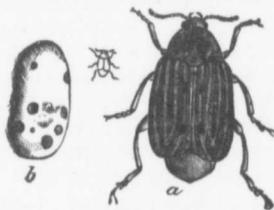


Fig. 45.

country through commerce. Authentic instances of this pest having occurred in Canada in injurious numbers have not, I believe, been recorded until this year, when it was found at Strathroy, Middlesex Co. As in the case of the Pea Weevil, the Bean Weevil occurs in the seed and is sown with it. The eggs are laid on young forming pods and the grubs eat their way inside and attack the seeds. There is, however, one important difference in the life history, namely, the bean weevils are able to propagate in the dry, stored seed, and two or three broods may come to maturity

and entirely destroy the beans, whereas in the case of the Pea Weevil the young grub can only begin life in the soft, green pease; again, there is never more than one weevil in a pea, while in the case of the Bean Weevil, ten, twelve, or more, may occur in a single bean, according to its size.

Remedy.—The remedy for this new enemy of the bean is precisely the same as for the Pea Weevil, viz., to fumigate the infested seed with bisulphide of carbon. If, however, it is found that the beans have been badly bored before the injury is detected, it is far better to destroy the whole by burning and procure new seed without going to the trouble and expense of fumigating.

FODDER CROPS AND ROOTS.

Fodder crops of most kinds have been remarkably heavy in most parts of the Province during the past season. In the Ottawa Valley such crops of clover have never before been seen, and with the exception of a little injury by the Black Army-worm, *Noctua-jennica*, Tausch. in the spring, both crops were exceptionally heavy and were saved in the best of condition. In the west one or two occurrences of the Clover weevil (*Phytonomus punctatus*, Fab.) were mentioned but no appreciable effect upon the crop was made.

THE CLOVER-SEED MIDGE (*Cecondomyia leguminicola*, (Lintner) did a good deal of harm in the seed growing districts and some farmers speak of turning their attention to the Mammoth Red Clover and Alsike, because these varieties are not injured by this troublesome insect. The remedy of feeding off or mowing the crop before the 20th June has been found satisfactory by those who have tried it, because the maggots (Fig. 46) of the first brood mature and leave the clover heads to enter the ground and complete their changes soon after the date given, and if the clover is fed or cured before that date the larvae are destroyed. If left later the maggots leave the clover heads and produce the second brood which matures just as the second crop, from which the seed is reaped, comes into flower. About the time



Fig. 46.

the seed is ripe these leave the clover and pass the winter in the ground, to emerge again the following spring just at the time the clover blossoms.

The hay crop has been little injured by grasshoppers or other pests. In old worn out meadows "Silver top," caused by leaf-hoppers and other sucking insects, has been noticed; but well worked land with a good rotation of crops suffers little from this injury.

Potatoes have been less attacked by the COLORADO POTATO-BEETLE than usual. Early in the season some correspondents thought that this pest was dying out, but the hot weather of midsummer soon brought it up to its usual abundance. The well tried remedy, Paris green, in either wet or dry applications, is now too well known to require more than a reference.

Injuries by White Grubs and Wireworms were more serious than is often the case, and unfortunately little can be done to counteract their operations.

THE CUCUMBER FLEA-BEETLE, Fig. 47, (*Cephalodera cucumeris*, Harr.) which frequently does great damage to potatoes by perforating the leaves, has been successfully treated again this year by spraying the plants with Bordeaux mixture and Paris green made with the formula 6 lbs. of copper sulphate, 4 lbs. of fresh lime and 45 gallons of water, to which $\frac{1}{2}$ lb. of Paris green is added. This remedy is now becoming well known, and on account of its usefulness widely used by our wide awake farmers to prevent the loss which is still enormous from the ravages of the Potato-rot. The first spraying should be done in Ontario not later than the 1st August, and this should be followed by two more applications on 15th August and 1st September. These sprayings also, of course, render unnecessary the treatment of the potatoes for the Colorado Potato-beetle, as those insects are killed at the same time.

A rather unusual injury to potatoes was this year reported from Carrville, York Co., by Mr. J. Lahmer. This was by the FOUR-LINED LEAF-BUG (*Pasiphysa lineatus*, Fab.), and occurred at the end of May. The attack was, however, restricted in area and did not continue late into the season. The life-history of this pest has been worked out by Prof. Slingerland, of Cornell University. The eggs are laid in the terminal twigs of currant and other bushes in the autumn and do not hatch until the following spring. The bugs attack the leaves of the currant and some other shrubs to a certain extent, but are more injurious to various herbaceous perennials. The plants most often noticed as injured by this insect are Sage, Mint, Gooseberry, Currant, Dahlias, and the Japanese Honey-suckle (*Weigelia*), Potatoes and some other plants less frequently. It is hardly likely that this insect will ever prove a serious enemy of the potato crop. The mature insect is a bright greenish yellow bug three-tenths of an inch in length, with two black spots on the thorax and four stripes of the same color down the back. It is very quick in its movements.

Remedies.—As the eggs are laid in the twigs of bushes and are comparatively conspicuous, owing to the white tips protruding, wherever the bugs have been troublesome the eggs should be looked for and destroyed during the winter. The bugs and larvæ can be killed or driven away by dusting with pyrethrum insect powder, or by spraying with kerosene emulsion or whale-oil soap solution.

THE TURNIP APHIS OR CABBAGE APHIS (*Aphis brassicae*, L.). Turnips in many sections have been badly injured by this plant-louse, which has been one of the worst enemies of root crops during the past season. Although much loss is due to this pest every year, as a rule, nothing is done by farmers to remedy the evil, many volunteering the information that nothing can be done. This, however, is not the case, for successful experiments have shown that, by spraying the plants bearing the first colonies which appear early in August, much may be done to protect a crop. At the time of thinning and hoeing turnips the colonies are small and may be easily treated by means of a knapsack sprayer with kerosene emulsion (one part to nine of water), or with whale-oil soap, one pound in eight gallons of water; or even by hoeing out the infested turnips and covering them with soil, an easy matter at that time with the hoe in hand.

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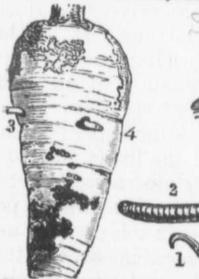


Fig. 48.—The Carrot Rust-fly and its damage to the carrot root, assuming this form. John Curtis, which and Messrs. Blackie shiny black, with yellow winter is passed eit

Remedies.—The Carrot Rust-fly found much freer from field crop it is usual ent quality may be of grown for stock are

VEGETABLES.

Vegetables in gardens suffered locally from the usual pests of the garden, Cutworms, Flea-beetles, Onion, Radish and Cabbage maggots. For cutworms, banding freshly set out plants with paper or tin collars was quite effective; and for plants grown in rows, bran poisoned with Paris green was most effectual, either slightly dampened so as to make the poison adhere and then distributed in small heaps along the rows, or with more bran added until it was almost dry and then drilled along the rows. Flea-beetles (*Phyllotreta vittata*, Fab.) on radishes, young cabbages and turnips were speedily disposed of by dusting the plants with Paris green, 1lb in 25lbs. of perfectly dry land plaster. The ROOT MAGGOTS were unusually abundant and many experiments were tried to find a good remedy. Dusting Hellebore and Insect powder well down among the plants gave perhaps the best results with radishes and onions. For the cabbage maggot Hellebore 2 oz and Kainit 2 oz. were mixed in a pailful of water; about half a teacupful poured around the root of each cabbage after pulling away some of the earth, gave considerable protection but was not a perfect remedy. Kainit used alone, dissolved in water, or applied dry close to the roots of cabbages, onions and radishes and then covered with soil, or dusted on the surface close to the roots, had the effect of protecting the plants for a time, but did not give with me results sufficiently good to allow of its being recommended in the way some American growers have done. Last season, however, was an exceptionally bad one for all of the root maggots; radishes, onions and cabbages all being attacked severely from early in the spring until right up to the hard frosts of autumn. Kainit however is a quick acting fertilizer and a decided insecticide. Further experiments have been planned, and growers of vegetables can use it with advantage in ordinary years.

THE CARROT RUST-FLY (*Psila rosea*, Fab). An attack upon carrots which has recently called for attention in Canada is by the European enemy of the carrot, called the Carrot Rust-fly. This has come under my notice occasionally during the last ten years in parts of Ontario, Quebec and New Brunswick, in all cases doing much harm in restricted localities, but as a rule disappearing after a year or two. The outbreaks, however, are, I fear, becoming gradually more numerous. During the past autumn infested carrots were sent to me from Knowlton and Beauce in Quebec Province and from Ottawa in Ontario. The attack is easily recognized. Early in the season the leaves of young carrots turn reddish and the roots will be found to be blotched with rusty patches, particularly towards the tip. These carrots when stored for winter use, although sometimes not showing much injury on the outside, may be found to be perforated in every direction by dirty brown burrows, in which are many semi-transparent yellowish maggots about $\frac{1}{4}$ of an inch long. These maggots are blunt at the tail end, but taper toward the head, where is a black hooked tip, forked at the base, by which the maggot makes its way through the roots. The puparium is reddish-brown, and the

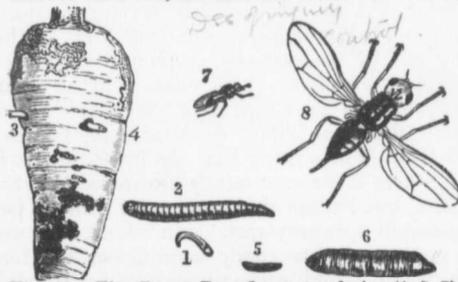


Fig. 48.—The Carrot Rust-fly—natural size (1, 5, 7), and enlarged (2, 6, 8).

assuming this form. The fly and its work are shown very well in the figure (Fig. 48) by John Curtis, which I am able to present herewith through the courtesy of Miss Ormerod and Messrs. Blackie & Sons. The mature fly is two-winged, $\frac{1}{4}$ of an inch long, bright shiny black, with yellow legs and red eyes. The wings are beautifully iridescent. The winter is passed either as a maggot or in the puparium.

Remedies.—The methods which have given the best results in preventing injury by the Carrot Rust-fly are (1). Late sowing. Carrots which have been sown late have been found much freer from attack than those sown at the ordinary time. When grown as a field crop it is usual to sow carrots as soon as possible, but for table use carrots of excellent quality may be obtained from seeding as late even as the middle of June. If field carrots grown for stock are only moderately attacked they can be fed but, of course, are not as

good as sound roots. (II.) Preventive remedies consist of applications of strong smelling substances by which the characteristic odor of the carrots is masked. For this purpose, sand tainted with coal oil or carbolic acid, has been used to good effect. Kerosene emulsion diluted 1 to 10 and sprayed along the drills by means of a knapsack sprayer, also gave comparative immunity. In localities where the fly is known to have occurred, the ordinary precaution of sowing carrots as far as possible from the infested land will occur to all growers. Where carrots have been stored away during the winter in sand or earth, this soil should be treated to destroy the pupæ, which leave the roots and enter it to pass their pupal stage. A convenient method is to put the soil into a wet manure pit, or, if this cannot be done, it might be buried in a deep hole, specially dug for the purpose, and, after covering up, the top soil should be firmly tramped down.

THE CORN-WORM (*Heliothis armigera*, Hbn.). Several correspondents have complained of the unusual abundance this autumn of the caterpillars of what Prof. Luggar calls the Sweet-Corn Moth or Tassel Worm. These are both good names, but the insect is far more generally known as the Corn-worm. It is also the same as the notorious Boll Worm of the cotton, to which crop it frequently does great damage. Unfortunately, no very good, practical remedy has been discovered for application in the cotton field. The injuries of the Corn-worm are in Canada almost confined to the fruit of tomatoes and to sweet corn, particularly the late varieties. Late in October, Mr. C. L. Stephens, the Secretary of the Orillia Horticultural Society, sent specimens of the caterpillars and injured ears of corn, with the information that the caterpillars had been very destructive, injuring as much as 95 per cent. of the ears of both sweet corn and yellow field corn. It was a new outbreak in the locality, and was the cause of considerable anxiety. Specimens were sent also from Sombra (Lambton Co., Ont.), and two rather bad occurrences came under my notice at Ottawa. The caterpillars do not appear until late in the season. In the month of October they were found of all sizes eating the young grains of corn, mostly near the tips of the ears. There were sometimes five or six caterpillars in a single ear, many of which were rendered quite unfit for the table. As the larvæ approached full growth, they would occasionally eat their way out of one ear by a neat round hole and travel to another ear. They were very variable in color, from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches in length, of a pale-greenish or dark-brown color, marked with longitudinal dark stripes and with a conspicuous stigmatal band, white mottled with pink, the body bears the ordinary tubercles, which are distinct and black, each one supporting a slender bristle. The whole upper surface is marbled with white and the whole surface velvety, by reason of numberless and very short bristles, black and white in about equal numbers. When full grown, these caterpillars eat their way out of the ears and, entering the soil, spin cocoons, within which they change to chestnut-brown pupæ. This moth is by no means a common species in Canada, and all the specimens I have seen have been taken late in the year. Prof. Luggar states that the insect does not winter in Minnesota, but that all are killed late in the fall. This, he points out, would mean that the insect has to be re-introduced every summer from the South, where it can successfully hibernate. Whether this is also the case in Canada, I am not sure, but I think that some must with us pass the winter as pupæ. The moth, like the caterpillar, is very variable in color. It is usually of a pale, dull, ochreous yellow, with variable olive or ruddy markings on the forewings. The yellowish hind wings have a broad black band and are edged with pink. These moths expand a little more than an inch and a half. The caterpillars of the Corn Worm feed, besides, upon a great many other kinds of plants than those mentioned, such as pumpkins, tobacco, beans, peas and a large number of weeds and garden plants.

Remedies.—The only remedy which can be suggested is the hand-picking of the caterpillars. The destruction of the moths by lantern traps has been also recommended: these consisting of a lamp standing in an open pan containing water and a little coal oil. These traps are placed at night in fields where the caterpillars have been abundant. When an ear of corn is attacked, the silk shows the effect of the injury going on beneath the husks by being discolored prematurely. As soon as this is noticed, the leaves of the husk should be pulled back and the marauders destroyed. Fall ploughing will, doubtless, break up the cocoons and expose many of the pupæ to various enemies.

Notwithstanding a good one, and satisfaction was abundantly made returns from all over that the supply of fruit for home consumption, in States from the west were also shipped from

Insect enemies were given this year of the interesting exhibits sprayed and unsprayed Mr. W. M. Orr, the his work during the ities. There were in interested in trying men anxious only to They would, therefore tendent had nothing until it arrived in To most convincing proof Fruit Growers' Association on the results of the under his direction published in full in the method of work and In estimating the percentage the fruit carefully examined small, being rejected stantiate them will cost spraying must, however best obtainable apparatus failure to protect crop spray, disregard as to and misdirected economic fruit growers find that Orr, however, says, "one exception,—Mr. controlled by spraying

I give the following opinions of Our Fruit-growers "Does spraying pay? In many instances spray the same as tillage and factory experiences in be killed. That spray erpillars and potato beet markets are a nuisance year." (Cornell Bulletin)

In summing up the Catharines: "It appeared to 80 p.c. of perfect fruit and when the conditions well-drained land, away

FRUIT CROPS.

Notwithstanding several adverse circumstances, the fruit crop of the Province was a good one, and satisfactory profits were realized. If the crop was short in one section it was abundantly made up somewhere else. "Notwithstanding all disadvantages, the returns from all over the Province, with the exception of a few northerly counties, show that the supply of fruit, more especially apples, was considerably more than sufficient for home consumption, very large shipments having been made to England and the United States from the western fruit growing section. Pears, peaches, plums and smaller fruits were also shipped from many localities." (*November Crop Report.*)

Insect enemies were the cause of much loss; but most convincing evidence was again given this year of the value of spraying, and undoubtedly one of the most instructive and interesting exhibits at the Toronto Industrial Fair was the display of fruit gathered from sprayed and unsprayed trees in the same orchard. These orchards were those in which Mr. W. M. Orr, the Provincial Superintendent of Spraying Experiments, had carried on his work during the summer of 1898, and were situated in twenty-four different localities. There were in all 250 plates of fruit. The owners of the orchards were in no way interested in trying to prove that spraying was or was not beneficial, but were practical men anxious only to know how to get the largest returns of money from their property. They would, therefore, be the very people to acknowledge poor results. The superintendent had nothing to do with the selection of the actual fruit shown, and did not see it until it arrived in Toronto, where he took charge of it and displayed it to good effect as a most convincing proof of the efficiency of spraying. At the last meeting of the Ontario Fruit Growers' Association at St. Catharines on December 2nd, 1898, Mr. Orr read his report on the results of the experimental spraying work carried on for the Ontario Government under his direction during the year. This is a most valuable document, and will be published in full in the Report of the Fruit Growers' Association. Mr. Orr explains his method of work and gives extracts from the letters of some of the owners of the orchards. In estimating the percentage of perfect apples, a part of the tree was picked clean and the fruit carefully examined; every specimen that had a worm or a spot, no matter how small, being rejected as imperfect. Some of the facts given and the figures which substantiate them will certainly convince many that spraying does most decidedly pay. The spraying must, however, be done properly, without stint of labour or materials, with the best obtainable apparatus and at the proper time. I am more and more convinced that failure to protect crops by spraying is due to lack of skill or carelessness in applying the spray, disregard as to the exact date when the successive applications should be made and misdirected economy as to the pump and nozzle used. Occasionally, good, careful fruit growers find that spraying does not always give the results which they expect; Mr. Orr, however, says, "The owners of every orchard in which we worked this year, with one exception,—Mr. Curwen, of Goderich—report that the Codling Moth was largely controlled by spraying."

I give the following quotation from Prof. L. H. Bailey's recent pamphlet, "Impressions of Our Fruit-growing Industries," because it bears directly on this point, he says: "Does spraying pay? The past season has given strange results in spraying; in very many instances spraying seemed to do no good. Does spraying pay, then? Certainly, the same as tillage and pruning do. We do not know why there were so many unsatisfactory experiences in 1898, but this does not lessen the fact that bugs and fungi should be killed. That spraying pays is as well demonstrated as it is that apple worms, tent caterpillars and potato blight are injurious. Markets often fail, but it does not follow that markets are a nuisance. The surest way is to make it a rule to spray everything every year." (*Cornell Bulletin 153, 1898.*)

In summing up the results of the spraying work of the season, Mr. Orr said at St. Catharines: "It appears from results obtained in experimental work that from 65 p.c. to 80 p.c. of perfect fruit can be secured when spraying is regularly and properly done, and when the conditions are favourable, such as an orchard standing high and dry on well-drained land, away from buildings or hedgerows, and the trees planted far enough

apart so that the limbs do not come within 10 or 12 feet of touching, and have an abundance of sunshine and free circulation of air. It is also important that the trees be properly trimmed, all rubbish removed, and the land properly fertilized, for it is a fact that two-thirds of the orchards in Ontario are starving. With good apples at the price they have commanded this year and last, the orchard, if properly attended to, would be the most profitable part of the farm."

If the fruit-growers of Ontario, generally, can be made to appreciate the above statement of Mr. Orr, who is a practical fruit-grower, and will follow his advice, enormous advantage must accrue to the country from the good work which the Provincial Minister of Agriculture, the Hon. John Dryden, has done by having the spraying experiments and other work on injurious insects carried out. In fact, it is hard to find in the whole Provincial expenditure anything which has given such manifest and quick returns for the small amount of money expended. The great interest which was taken in this work of spraying is shown by the fact that over 3,500 fruit-growers attended the meetings when the spraying was being done, in order to see the work, to ask questions and to learn the proper way to carry on operations for themselves. This was almost double the number that attended two years ago.

Spraying with arsenical poisons, such as Paris green, London purple, arsenate of lead, etc., was done, first of all, to lessen injury by the Codling Moth on the apple, and by the Plum Curculio on plums and cherries; but it is now used against all foliage eating insects. It has lately also become the custom to spray many plants with a combined mixture which will destroy both insect and fungous pests. For this purpose, the best mixture known is Bordeaux mixture and Paris green. The formula most widely adopted is one which is very easy to remember, as all its parts contain the figure 4. It consists of copper sulphate, 4 lbs., quick lime, 4 lbs., Paris green, 4 ozs., water 44 gallons.

Owing to the large amount of capital necessarily invested in and required to operate a fruit farm, and the permanent nature of fruit plantations, more attention has been given to those causes upon which failure and success depend than has been the case with ordinary farm crops, which change from year to year; consequently, more perhaps is known and more enquiries are received with regard to orchard pests than any other class of insects. The common enemies which occur year by year in orchards have been treated of over and over again in our annual reports, and there would be no advantage in speaking of them now at any length, but attention may be drawn to some of the more serious or unusual outbreaks.

TENT CATERPILLARS have been even more abundant than last year in almost every province of the Dominion. In the Ottawa district groves of basswoods, maples, and aspens were stripped of every vestige of foliage, as well as the underbrush, consisting of numerous kinds of shrubs. Although the Forest Tent Caterpillar was slightly more numerous, the American Tent Caterpillar (Fig. 49), it was noticed, occurred with it in almost equal numbers, and, notwithstanding that close search was made for parasites, in this

number of egg clusters were collected to see if the young caterpillars contained in the egg were in a healthy condition. These were kept in a warm office, and by the 1st of January hundreds of young caterpillars had hatched and were gathered together in a large mat-like cluster on the side of the jar.

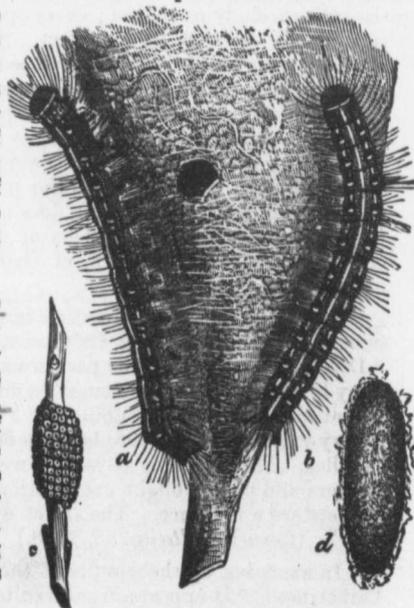


Fig. 49.

There is no indication that the trees through which the wind blows is ominous; specifically, winter and remedies which give the egg clusters of the young caterpillars the conspicuous (III.) the spraying. The sooner the apple can be controlled to a certain size.

THE APPLE and many enquiries about harm, however, with damage due to this.

THE PLUM although reported (pruni, Fab.) were

THE BLACK (in the Niagara district) contradictory; nevertheless, cherries. I kill than the green given the best result. No. 3 in six gallons excellent remedy, and the eggs of the Black spurs, by the last done by spraying the buds burst.

Another enemy did much harm, a remedy which gives one pound in 200 gallons of the arsenical poison.

THE GREEN Fruit to the family *Xylina* fruit. These caterpillars long intervals; but, reference to the foliage than that done by maple trees. At particularly the Silk almost defoliated by the end of June the birds, chiefly warblers, Niagara they were chickens which wait changes. Mr. Orr "The Green Fruit-likely to become a pest their apples and pear fruit."

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There is no indication of the presence of either egg parasites or fungous disease, and as the trees throughout this district bear enormous numbers of the egg clusters, the outlook is ominous; special effort must be put forth by fruit growers and gardeners during the present winter and next spring, or there will certainly be serious loss next season. The remedies which give the best results against these insects are (I.) the collection and burning of the egg cluster during the winter, (II.) the cutting off and burning of the nests of young caterpillars early in spring, when they may be easily detected by the conspicuous white tethers which they spin in the crotches of branches, and (III.) the spraying with Paris green of all trees liable to be invaded in an infested district. The sooner the application is made the more effective it will be, for many insects which can be controlled while young are much more difficult to poison after they have reached a certain size.

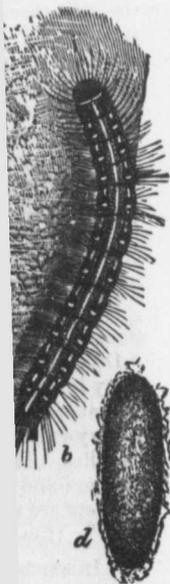
THE APPLE APHIS (*Aphis mali*, ^{Pomii} Fab.) appeared in large numbers early in spring, and many enquiries were received about it from the western part of the Province. Little harm, however, was done either in the spring or late in the autumn, when most of the damage due to this insect generally occurs.

THE PLUM APHIS (*Aphis prunifolia*, ^{Rhipidulaphis} Fitch) was less abundant by far than last year, although reported from a few places. Specimens of another plum aphid, (*Hyalopterus pruni*, Fab.) were received from one or two Ontario localities.

THE BLACK CHERRY-TREE APHIS (*Myzus cerasi*, Fab.) was certainly less wide-spread in the Niagara district last season than in 1897, and reports concerning it were very contradictory; nevertheless considerable damage was done, particularly in orchards of sweet cherries. It has been noticed that the dark coloured plant-lice are more difficult to kill than the green ones. Of several remedies which have been tried, the one which has given the best results is whale-oil soap solution, one pound of Good's Caustic Potash Soap No. 3 in six gallons of water, applied warm as a spray. Kerosene emulsion, also an excellent remedy, must be used as strong as one part to six of water for these plant-lice. The eggs of the Black Cherry-tree Aphid are laid upon the twigs, particularly on the fruit spurs, by the last autumn brood. There is no doubt, therefore, that good work could be done by spraying the trees during the winter, or better still, early in spring before the buds burst.

Another enemy of the cherry, as well as of the plum and pear, which when neglected did much harm was THE CHERRY AND PEAR SLUG (*Eriocampa cerasi*, Peck). The remedy which gives the surest relief is the prompt spraying of the trees with Paris green, one pound in 200 gallons of water, adding in all cases an equal amount of fresh lime with the arsenical poison, Paris green, to counteract its caustic effects on the foliage.

THE GREEN FRUIT-WORMS.—The caterpillars of three very similar moths belonging to the family *Xylina* did much injury to apples and pears, attacking specially the young fruit. These caterpillars are not regular pests of the orchard, but appear in numbers at long intervals; but, as they have a special taste for the green fruit, attacking it in preference to the foliage on fruit trees, the damage they do is much more important than that done by many other injurious insects. In addition to fruit trees they attack maple trees. At Niagara and at Aylmer, Que, near Ottawa, shade and forest trees, particularly the Silver Maple *Acer dasycarpum*, Ehrh.), were terribly disfigured and almost defoliated by these caterpillars over large areas. It was pleasing to see at the end of June that thousands of them were being destroyed by various insect-eating birds, chiefly warblers, but especially by the English Sparrow. In the streets of Niagara they were so vigorously assailed by the sparrows in the branches, and by chickens which waited for them below, that few could have escaped to complete their changes. Mr. Orr writes of the occurrence of this pest in the Niagara peninsula:—
"The Green Fruit-worm, a comparatively new comer, and but little known here, is likely to become a serious pest: some growers reporting from 20 to 30 per cent. of their apples and pears ruined by it. By the middle of June it had destroyed much fruit."



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Mr. N. H. Cowdry also writes of its depredations on the fruit of apples and pears at Waterford, Ont. The same complaint came from Mr. J. A. Link, of Sombra, Ontario.

Remedy.—The only remedy is early spraying, while the caterpillars are small and while they are feeding on the buds and young foliage. Luckily for the fruit grower these caterpillars are always accompanied when in large numbers by parasitic enemies.

THE ROSE BEETLE (*Macrodactylus subspinosus*, Fab.), Fig. 50.—This well-known enemy of the fruit grower, which every year does so much harm by eating the flowers of grapes, apples, pears, roses, plums, raspberries, blackberries, and in fact all plants belonging to the Rose family, as well as many other kinds of trees, did some harm this year in the hotter western sections of the Province. It occurred in



Fig. 50.

large numbers near Niagara upon the young fruit of apples, in some cases actually covering the fruit. There is only one brood of this pest, the mature beetles last for about five weeks. There is perhaps no fruit insect known more difficult to combat than this is. The ordinary insecticides have little effect on it. Covering rose bushes with netting and beating the beetles from the bushes into pans containing coal oil can be practised on a small scale. The only remedy which so far has been found at all effective on a large scale "is to spray grape vines and fruit trees with a wash made by adding three or four pecks of freshly slaked lime and a quart of crude carbolic acid to 50 gallons of water." Dr. O. M. Weed.)

THE RASPBERRY SAWFLY (*Monophadnus rubi*, Harris), was more than usually abundant in the western counties of the Province, but where promptly sprayed with Paris green and water, and later when the fruit was forming with white hellebore, was easily disposed of.

SCALE INSECTS.—The advent of the San José Scale in Ontario had a remarkable awakening effect on the fruit growers of the province, and, as a consequence, there has been during the past season far more enquiry with regard to injurious insects than has ever been the case in a single year before. The vigorous policy of the provincial Government and the excellent conscientious work done by the Inspector, Mr. George E. Fisher, and his assistants, backed up by a rigorous application by the Federal Government of the San José Scale Act has undoubtedly had a good effect not only among the thinking fruit growers of the Dominion, but upon statesmen in other countries who have made several enquiries as to what steps were being taken in Canada to stamp out this most injurious insect and prevent further importations from infested countries. Having had ample opportunity of examining the districts which were infested, I can bear testimony to the great success which has attended these efforts. The investigations in connection with the San José Scale have brought to light other scale insects where their presence was not suspected; both the Forbes Scale and the Putnam Scale have been found to be widely distributed, but in very few instances have they occurred in injurious numbers. These two scales are of particular interest owing to their very close superficial resemblance to the San José Scale; the microscopic difference of structure, however, can at once be discovered when the scale insects are taken from their scales and after proper preparation examined under the microscope. In addition, both of these species lay eggs at certain times of the year, while the San José Scale, it is alleged, never does so. The Forbes Scale (*Aspidiotus Forbesi*, Jnsn.) and the Putnam Scale (*A. ancylus*, Put.) can be successfully combated by spraying the trees with whale-oil soap, one pound in two gallons of water. The best time to make the application is early in spring before the trees are covered with foliage.

THE SCURFY BARK-LOUSE (*Chionaspis furfurus*, Fitch.), Fig. 51., wide-spread, but not very abundant nor injurious has been found in many localities in the western part of the province, and, like the very injurious Oyster-shell Bark-louse, can be destroyed with

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the whale-oil soap solution mentioned above, followed by high culture and good horticultural treatment of the trees.

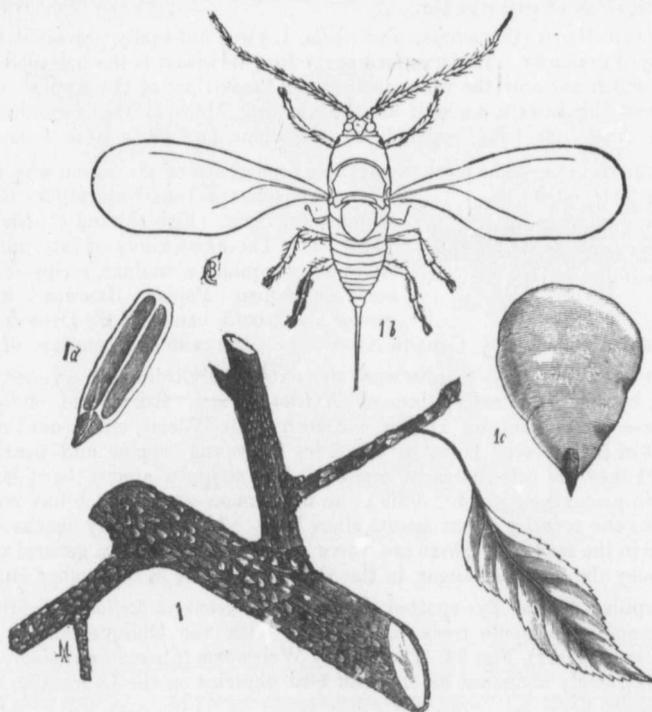


Fig. 51.

NOTES ON INSECTS OF THE YEAR. DIVISION NO. I., OTTAWA DISTRICT.

By W. HASUE, HARRINGTON, OTTAWA.

The first insect to attract attention in the spring was the larva of the little Arctician *Phragmatobia rubricosa*, Har., the fuscous little woolly bears of which may be found scurrying over the snow in day time or coiled up in some small depression where they had rested from their wanderings of the day before. On bright days in April, *Aphodius prodromus*, (Brahm) filled the air. This species has only been noticed at Ottawa for the last four or five years, but is now as common as *Aphodius inguinatus*, Hbst. *distinctus* (Mii)

CUTWORMS.—The Black Armyworm (*Naclua jennica*, Tausch.) was abundant in some localities as near Hull, Quebec, and on the Central Experimental Farm, attacking many plants, but especially clover and peas in fields, and also doing much harm in gardens as a cutworm. This is an early developing species which is full-fed about the end of May, and consequently plays great havoc in beds of young seedlings of early vegetables, sometimes cutting off as many as six or eight peas, or mowing down eight or ten inches along a row of onions or carrots in a night. Occurring with this caterpillar, as cutworms in gardens, were the larvæ of the White Cutworm (*Carnodes scandens*, Riley), uncommon at Ottawa, and our commonest cutworm, The Red-backed Cutworm (*Carnodes ochrogaster*, Gn.). These caused considerable loss in gardens among young vegetables and seedlings of flowers. This latter is also a large species when full-grown; but as the eggs laid the previous autumn do not hatch till the following spring the caterpillars do not become full-fed till much later in the season than the Black Armyworm and the White cutworm, both of which pass the winter half-grown. For some reason the White Cutworm did not revive from hibernation last year till much later than many other cutworms. Poisoning with traps made of bundles of weeds, grass, or clover dipped

Luxor

spread, but not in part of the destroyed

in a strong mixture of Paris green and water, or with poisoned bran, were very successful. Cabbages, tomatoes, and other young plants were easily protected at the time of setting out with rings of paper or tin.

THE CODLING MOTH (*Carpocapsa pomonella*, L.) was unusually prevalent and injurious in unsprayed orchards. The standard spray for this insect is the poisoned Bordeaux mixture, with which not only the fungous disease "Black Spot of the Apple" is treated, but all foliage-eating insects, as well as the Codling Moth. The formula is copper sulphate 4 lbs., fresh lime 4 lbs., water 40 to 44 gallons, and Paris green 4 ozs.

TENT CATERPILLARS.—The most remarkable occurrence of the season was of the two common species of Tent Caterpillars *Clisiocampa americana*, Harr. (Fig. 49) and *C. disstria*, Hbn. (Fig. 52). These two kinds of caterpillars which were about equally abundant, stripped bare many acres of Aspen Poplar, Basswood and Maple groves along both banks of the Ottawa River and along the Canadian Pacific and Canada Atlantic Railways in the counties of Carleton.

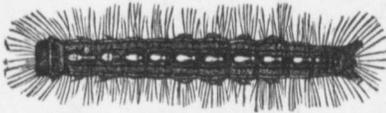


Fig. 52.

THE ASH-GRAY PINION.—Maples were also extensively injured at Aylmer, Que., and at Hull, Que., by the green caterpillars of *Xylina Groti*, Riley, and *X. antennata*, Walker. These caterpillars are known as Green Fruit Worms, on account of their destructive habit of eating large holes in the sides of young apples and pears. In the Ottawa district they did little harm in orchards, but stripped almost bare large forest trees at the two places mentioned. This is an uncommon attack which has not occurred in anything like the severity of last season since 1885. The ashy-gray moths do not appear until late in the season. There are three species very similar in general appearance. All of these may be taken at sugar in the Ottawa District in September and October.

The caterpillar of the Eye-spotted Bud-moth (*Imetocera ocellana*, Schiff), Fig. 53, was rather common on apple trees in company with the Oblique-banded Leaf-roller (*Cacæcia rosaceana*, Harr), Fig. 54. The Cherry Web-worm (*Cacæcia cerasivorana*, Fitch), Fig. 55, was extremely abundant on the wild bird cherries on the Laurentian mountains,



Fig. 53.



Fig. 54.



Fig. 55.

near Chelsea, Que., the unsightly webs attracting attention along the sides of the mountain road. Although so abundant on the wild cherries, this insect did no harm to cultivated varieties.



Fig. 56.

THE OYSTER SHELL BARK LOUSE.—(*Mytilaspis pomorum*, Bouche), Fig. 56, is very common and destructive in this district, occurring not only on apple trees but also on many other kinds of shrubs and trees in the garden and forest. It was noted as injuriously abundant on red and black currants, lilac, spruces, ash, dogwood (*Cornus*), mountain ash and hawthorne. The Forbes scale was found on the fragrant currant (*Ribes aureum*, Pursh), and the Putnam scale on the elm.

The White Cedar Lecanium (*Lecanium Fletcheri*, ckl.) and "Red Spiders" did some harm to cedar hedges.

Canker worms were noticeably less abundant than usual, but the Basswood Looper (*Hyboznia tiliaria*, Harr), Fig. 57, was very common, the delicate male moths drawing the notice of the least observant by their clumsy flight and the late season at which they appear.

THE CURRANT SAW FLY (*Nematus ribesii*, Scop), was as usual abundant and destructive where the bushes were not treated with the well-known remedies, Paris green or White hellebore.

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 THE CURRANT APHIS (*Aphis ribis*, L.) was the most destructive insect on currants and gooseberries this season, many bushes being so much injured that they dropped their leaves and the fruit was ruined.

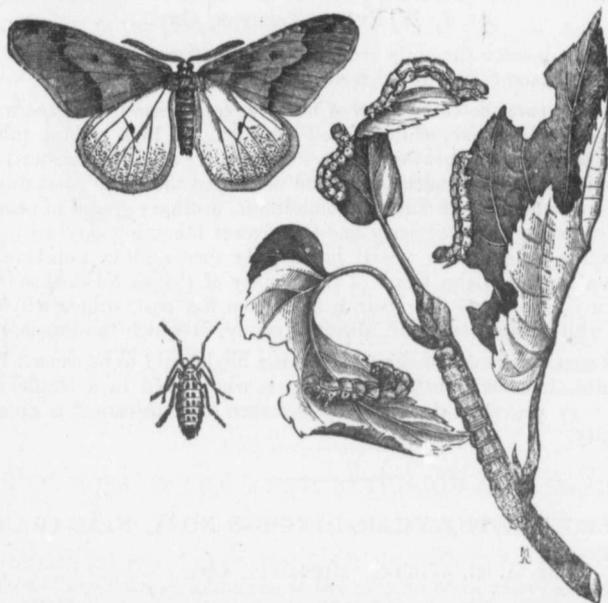


Fig. 57.

THE GRAPEVINE LEAF-HOPPERS (*Erythroneura* species) did much harm to Virginian creepers and grapevines, but particularly to the former. These insects, like the grapevine flea-beetle (*Haltica chalybea*, Illiger), seem to prefer the Virginian creeper to the grape. This is sometimes very apparent where the creeper and wild grapevine are trained together over arbours.

Two more enemies of the Virginian creeper not often referred to as such, but which both occurred in some numbers this season at Ottawa in the same arbour, were *Saperda puncticollis*, Say, a beautiful longicorn, velvety black with golden yellow stripes down the edges of the wing cases and with spots on the thorax. These emerged from the larger living stems of Virginian creeper, while from younger stems many specimens of *Psenocerus supernotatus*, Say, were reared.

The Mourning Cloak Butterfly (*Paranotia antiopa*, L.) and the Interrogation Butterfly (*Geoplia interrogationis*, Fab) were destructively abundant on elms planted as shade trees. The caterpillars of the former also stripped large branches on willow bushes.

ROOT MAGGOTS in cabbages, radishes, turnips and onions were remarkably destructive right through the season.

Two injurious insects which it was hoped had "run their course" and which for the last year or two had not been nearly so abundant as in previous years, this year again showed up in decidedly increased numbers. These were the imported Larch Saw fly (*Nematus erichsonii*, Hartig) and the Cattle Horn fly (*Hæmatobia serrata* Rob-Desv). For the Horn fly perhaps the most convenient remedy is 1 lb. of pine tar mixed with 10 lbs. lard. A small quantity of this ointment rubbed lightly along the back and sides of cattle once a week during the fly season will have the effect of keeping flies away and will also have a healing and soothing effect upon any sores due to rubbing or licking.

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NOTES ON INSECTS OF THE YEAR, DIVISION NO. 2, BAY OF QUINTE DISTRICT.

By J. D. EVANS, TRENTON, ONT.

Throughout this district the only crop which has suffered to any extent from insect foes during the past season (1898) is the seed pea crop.

For a number of years the cultivation of fancy or seed ^{peas} in this section for foreign markets has been very extensive, while a good demand and high prices ruled for such, extra precautions were taken by growers to have the weevil (*Bruchus pisorum*) killed by the seedsmen before they arrived at maturity or had destroyed the pease; but during the past three or four years, when prices have become lower, ordinary grades of pease have been grown to a greater extent than formerly and the grower becoming careless in housing and dilatory in marketing his crop, the weevil has greatly increased in numbers. This occurs not so much along the Lake front of the County of Prince Edward as in inland sections. While many farms may be entirely free from the pest, others will lose from 15 to 30 per cent., while instances occur, although rarely, in which the loss is 40 per cent.

Another destructive agency to the pea crop is a blight said to be caused by a fungous growth which oftentimes will utterly destroy a whole field in a single night. This disease has been very prevalent during the past season and has caused a great loss to the farming community.

NOTES ON INSECTS OF THE YEAR, DIVISION NO. 4, NIAGARA DISTRICT.

By A. H. KILMAN, RIDGEWAY, ONT.

The past season has not been marked by any great insect depredations, at least as far as my personal observation and inquiry have reached, in this locality—Niagara District—but variations in the occurrence of insect pests, pointing either to an increase or a decrease or in the more startling direction of the approach of new foes, is always of interest to students of Entomology and to farmers and fruit growers.

Contrary to expectation, the Northern Army-worm, *Leucania unipuncta*, was less in evidence than during 1896-7. In late August, when the imagines of this insect are nearly always to be found, none were observed. The grass-hopper, (*Caloptenus femur-rubrum*) was also conspicuously absent.

Cabbage butter-flies (*Pieris rapae*) during the drought in the earlier part of the season, were scarce but late cabbages were much injured by the larvæ of this insect. Similar observations were made in regard to the Colorado potato-beetle. Early potatoes were not materially injured and unwary gardeners, deceived by the non-appearance of the slugs, relaxed their efforts and paid the penalty by seeing the plants of the later crop "sailing under bare poles."

Raspberry canes have been seriously injured in some localities, by a cane borer, probably *Oberea bimaculata*.

An inconspicuous green worm, doubtless the Raspberry Saw Fly (*Selandria rubi*, Harris), operated in spots all over the fruit section, completely destroying some patches of red-raspberries near Niagara Falls.

Neglected vineyards on sandy soil suffered an entire loss of crop from the ravages of the Rose Beetle (*Macrodactylus subspinosus*, Fabr.)

In this locality plums failed to blossom. The Curculio (*Conotrachelus nenuphar*), attacked the later cherries with the result that the fruit was wormy and useless.

Apples, especially in neglected and unthrifty orchards, were scarred by insects and fungi and wormy by larvæ of Codling moth.

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The Tussock Moth (*Orgyia leucostigma*) is on the increase here. In the neighboring city of Buffalo, it has become a scourge, defoliating the horse-chestnut trees, and attacking other trees as well. To gather and destroy the cocoons or egg masses in winter seems to be the most feasible method of checking the ravages of this insect.

The birch trees in the parks are attacked by a new pest, an *Agrilus*. The species will be determined next summer.

Crioceris asparagi, Linn., the Asparagus Beetle, (Fig. 58) which according to Dr. A. S. Packard, is not a native but an introduced species has advanced in its attack upon asparagus plants as far north as Niagara River. Mr. Reinecke informs me that he has found the beetles in abundance on asparagus at Buffalo.

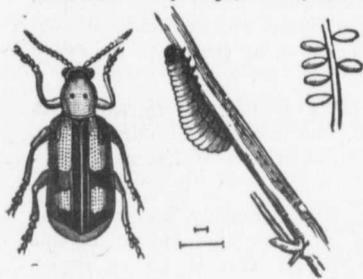


Fig. 58.

or the larvæ on a clover plant.

The Punctured Clover-leaf Weevil, *Phytonomus punctatus*, Fabr., in August last, appeared in great numbers on the side-walks and fences and on the shores of Lake Erie, but though I have repeatedly examined the clover fields for the purpose of determining the amount of injury done by this particular insect, thus far I have failed to find either the imago

NOTES ON INSECTS OF THE YEAR.—DIVISION No. 5, LONDON DISTRICT

By R. W. RENNIE, LONDON, ONT.

In submitting my report as director for Division No. 5 for 1898, I am very glad to state that there have been no additions to the number of injurious insects in this district, with two exceptions; in fact there has been a falling off in numbers of older pests that in previous years played great havoc with certain crops.

One exception is the Cottony Maple scale (*Pulvinaria innumerabilis*, Rathvon)—^{with} Fig. 59—which appeared in very large numbers this last spring; in fact, in such large numbers did they appear that on one of the finest streets in this city (London), the trees appeared to have been sprayed with white-wash.



Fig. 59.

In the fifth report of the U. S. Entomological Commission, there is an article copied from Prof. Riley's report as U. S. Entomologist for 1884, page 412, in which he states that the females, before the falling of the leaves, migrate to the branches and twigs, and there fix themselves, generally on the underside. Such has not been the case in this city. They were found occasionally on the branches and twigs, but the vast majority were noticed round the spot where a branch had been cut or broken off; indeed, so thickly that they almost overlapped each other. They have not confined their attacks to the maple, but have also been working on the grape vine.

It has apparently been quite a study to find out in what manner this spreads. Some think that it is due to planting infested trees, others by birds, insects, water, etc., but if you were to get a colony under the microscope you will soon find out how they spread.

I have a table three feet in diameter on which I use the microscope. One evening I placed a colony on a glass slip under the microscope, which was at one edge of the table, and probably examined them for ten or fifteen minutes, and there left them. Going back again in about twenty minutes, there were none on the slip, but they could be found at the extreme edge of the table. They do not seem to care what they walk over, anything and everything is the same to them. How many reached

the floor I do not know, but from the number left on the table fully two-thirds had got away. Take any insect as small as this is that will walk over three feet in the course of twenty minutes, or less. Surely there can be no doubt as to how they spread, particularly when they do not care what they walk over.

As to the means proposed for destroying this pest, they are various, such as heading in of the branches. (What is the good of this if they do not confine themselves to the branches?) Also spraying with whale oil soap this may be effective, but it is also very expensive. In my own opinion there is nothing better than kerosene emulsion, which I think is one of the best destroyers of insect life that can be used without excessive expense. There are also parasitic enemies, as there are in every other branch of animal life.

About the 24th of May last I noticed a small larva feeding on the eggs, but was unable to identify it in this stage. Mr. Balkwill, the treasurer of our Society, succeeded in rearing a few, which were identified by Mr. J. Alston Moffat as *Hyperapsis signata*. (Oliv)

The other exception is *Graptodera chalybea* (Fig. 60), commonly known as the grape vine flea beetle. This insect appeared in great numbers this spring in this

locality, although this is not a grape-growing district. This insect passes the winter in a mature state, attacks the buds of the vine as soon as they begin to grow, destroying both fruit and foliage at once. In about three or four weeks the mature insects disappear, but their place is taken by a small, insignificant looking larva, generally black in colour, which very soon makes its presence known by eating holes through the leaf, making the leaves look like sieves; not eating like some larvæ do, starting at one part and continuing until the whole leaf is devoured. They move from place to place on the leaf, apparently selecting parts in the leaf that are most acceptable to the palate of an epicure (as such they undoubtedly are.)

These larvæ attain their full growth about the end of July, pupate in the earth, and emerge in from ten days to two weeks in the mature state. The greatest injury is done in the spring by the mature insect.

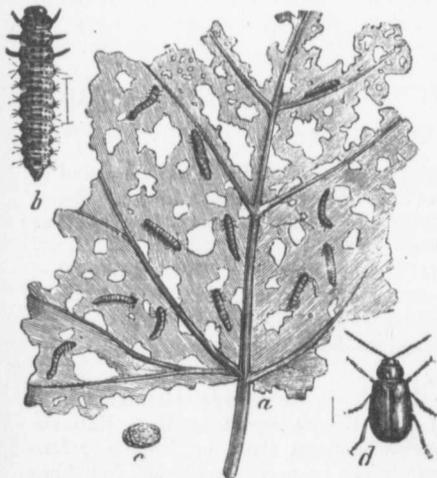


Fig. 60.

The most effective remedies for this insect are: To remove all fallen leaves in the fall, and whatever other decaying vegetable matter has accumulated around the vines, and burn it; also in early spring to syringe the vines with a weak mixture of Paris green and water. Hellebore may be used in the summer against the larvæ.

In regard to other destructive insects, as I mentioned in the first part of my report, they have been less numerous than usual.

After remarks had been made by many of those present on the abundance or rarity during the past season of many familiar insects, the following resolution was moved and unanimously adopted:—

“That a most cordial vote of thanks be tendered to the members of the Montreal Branch for the exceedingly generous reception they have given to the Entomological Society of Ontario on the occasion of their annual meeting.”

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A FEW OF THE MOST TROUBLESOME INSECTS OF THE PAST SEASON
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READ BEFORE THE COLLEGE OFFICERS' LITERARY AND SCIENTIFIC SOCIETY, BY H. L. HUTT, B.S.A., ONT. AGRICULTURAL COLLEGE, GUELPH, ONT.

As far back as I can remember, I have always taken a great deal of pleasure in studying insect life. On more than one occasion can I remember being punished and disgraced in school, for investigating the jumping capabilities of a grasshopper, or squeezing an involuntary song from a captive cicada. But that was in days gone by. Now the policy of the Educational Department is to encourage the study of such subjects as were then discouraged by hard knocks.

At this institution Entomology has probably always been a part of the regular course. When I began to study it systematically about ten years ago, under the direction of Prof. Panton, it appealed to me at once as one of the most interesting and practical subjects on the curriculum. And the first summer I spent at home after leaving the College, all the available beehives, boxes and glass-topped section cases were converted into breeding cages, where all transformations could be watched in the specimens within. My collection that year was not confined to insects alone, but it contained a variety of creatures from batrachians and lepidopterous larvæ to milksnakes and their eggs. And I might add that one of the most interesting methods of studying this most interesting subject is to watch the transformation and habits of the insects themselves, either in confinement, or as they occur in nature.

As there is no class of society that is exempt from the losses and annoyance caused by insects, a knowledge of their life history and habits is important to all, but to none is it of greater importance than to the farmer and fruit-grower.

During the past summer I received a great many letters enquiring about insects affecting a wide range of crops. To deal fully with all mentioned would necessitate writing a book, but as the subject of this paper I have taken a few of the more common ones that have been the most troublesome, and these, it will be noted, represent fairly well most of the orders into which insects are usually divided.

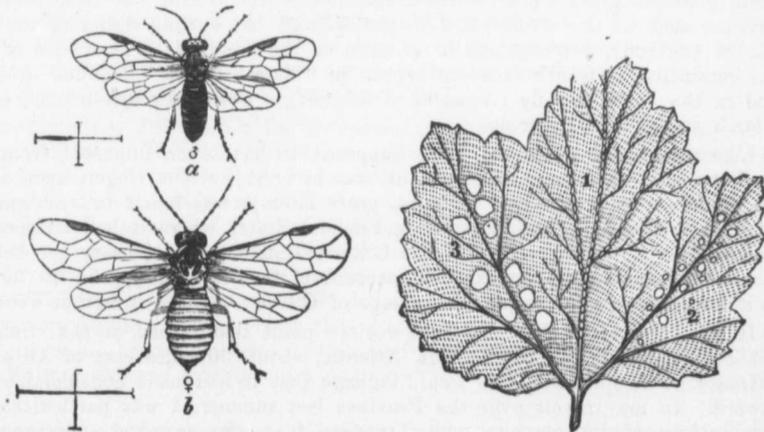


Fig. 61.

Fig. 62.

1. THE CURRANT SAW-FLY, (*Nematus ribesii*). One of the earliest insects to make its appearance was the Currant Saw-Fly (Fig. 61, *a* the male, *b* the female). This belongs to the Hymenoptera, or membrane winged insects, and is closely related to that most industrious and beneficial of all insects—the honey-bee.

It passes the winter usually in the pupa state, in a slight papery cocoon spun beneath the surface of the ground or under rubbish or leaves. From its winter quar-

ters it emerges early in the spring, about the time of the opening of the buds of the currant and gooseberry. Last spring they appeared in unusual numbers, and during the warm parts of the day might be seen in swarms about the bushes.

In appearance this saw-fly is a little smaller than the common house-fly, and has a yellow body. The male is considerably smaller than the female and is somewhat darker in color. During bright, warm days they are very active, but early in the morning or when the weather is cool and cloudy they are sluggish and may be easily captured.

Saw-flies are so called because of the saw-like ovipositors of the females. Speaking of these, Prof. Comstock says, "This is at least one instance of where the female wielding of a saw is done most skilfully, for the female saw-fly uses these nice tools in a very efficient manner, to make slits in the leaves and stems of plants in which she places her eggs." The eggs are deposited, from 20 to 40 in number, upon the back of the ribs and veins of the leaf, usually upon the lower leaves of the bushes (Fig. 62). They hatch in about ten days and the young larvæ begin to feed at once upon the tender leaves. They grow rapidly, and if unchecked will in a short time entirely strip the bushes of foliage. In the course of about three weeks, the larvæ become full grown (see Fig. 10), when they leave the bushes, spin small papery cocoons, and enter the pupa or resting state. From these the adult saw-flies emerge in a short time, and a second brood of larvæ follow, which strip the bushes again the latter part of summer.

This is probably one of the easiest insects to hold in check, as it feeds upon bushes that are easily got at, and it is readily destroyed by stomach poisons, such as Paris green or hellebore. The most important points in fighting it are to begin early, as the young larvæ are usually well at work by the time the leaves are full grown, and to force the spray up from the under side of the bushes so that it will reach the lower leaves where the caterpillars begin operations.

2. THE LARCH SAW-FLY (*Nematus Erichsonii*). On the 24th of June last, my attention was directed to the scorched appearance of the foliage on the clump of European larches in the field in front of the College. Upon going to examine them closely, I found that they had been almost entirely stripped of their needles by some kind of insect. Upon further investigation I found one or two small trees on the west side of the clump upon which a few of the larvæ were still at work. It was a smooth, glaucous green worm which I had never seen before, but from certain characteristics, such as the seven pairs of prolegs and the curling under of the last segments of the body, I recognized it at once as the larva of some species of saw-fly. Upon consulting Packard's excellent report on "Forest Insects" I found it fully described as the Larch Saw-fly (*Nematus Erichsonii*), a new and much-dreaded enemy in the larch and tamarack forests.

Like the Currant Saw-fly, it is supposed to have been imported from Europe. The first notice of it on this continent was in 1881 by Dr. Hagen upon specimens found in Massachusetts. Two or three years later it was found in vast numbers in Maine, New Hampshire and other New England States, where it had stripped all the tamarack forests. In the report of the Ontario Entomological Society for 1885, Prof. Fletcher of Ottawa gives an excellent account of its life history, and of the devastation it had made in the tamarack swamps of Quebec and the Maritime Provinces.

It was then noted that the most western point that it had at that time reached was about Casselman, on the Canada Atlantic, about 30 miles east of Ottawa. Its appearance at Guelph last June would indicate that it had made considerable progress westward. In my travels over the Province last summer, I was particular to watch for indications of its presence, and I noticed from the scorched appearance of the tree tops, that it had stripped the tamaracks in many places between here and Walkerton, and that in the large tamarack swamp south of Bradford the trees in July were as bare as if a forest fire had swept through them.

The adult insect is a handsome saw-fly, somewhat resembling the Currant Saw-fly but is a little larger and darker colored, being mostly black with an orange band around the middle of the abdomen. The female deposits her eggs in incisions made in the young

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terminal shoots. The young larvæ feed voraciously upon the tender needles and develop with wonderful rapidity. Some idea of their voraciousness, vast numbers, and rapidity of growth may be gained from the fact that the active larval state lasts but a single week, and during this short time they often strip bare vast forests of tamarack.

When mature, they drop to the ground and pass the winter in a dark brown, oval cocoon spun in the moss or grass beneath the trees.

So far as we have learned, there is but a single brood of them during the season, and this is quite enough. As it is, the defoliated trees throw out a second set of needles, and are thus enabled to survive one or two attacks, but when they are stripped of their foliage repeatedly the results cannot be otherwise than fatal. One or two natural enemies have been found preying upon the larvæ, and it is hoped that they may be able to hold them in check, because it is usually impossible to fight them by any of the modern means of insect warfare on account of the inaccessible nature of the places in which they breed. On single trees they may easily be destroyed by spraying, or even by shaking them to the ground, as they cannot crawl back upon the trees again.

3. THE TENT CATERPILLARS (*Clisiocampa americana* and *C. distria*). Among the Lepidopterous, or scale-winged insects, none attracted more attention last year than the Tent-Caterpillars. There are two species of these common to this part of the continent, one known as the Apple-Tree Tent-Caterpillar, and the other as the Forest-Tent-Caterpillar. The latter appeared last year in several parts of the province in vast armies. At one place on the W.C. & B. they were reported in the papers as having been in such vast numbers that they stopped a train. And judging from the plague of them which I saw on St. Joseph's Island, I am quite prepared to believe the reports.

A comparative study of the life histories of the two species is of interest. The adult insect in each case is a reddish brown moth measuring when the wings are expanded from one and a half to one and three-quarters inches across. In this stage they have no power of taking food and live only long enough to provide for the generation to follow. The eggs are laid about the middle of July in ring-like clusters encircling the small twigs, usually from 200 to 300 eggs in each cluster. The eggs of the *Clisiocampa Americana* may be distinguished from those of the *Clisiocampa distria* by the oval form of the clusters, those of the latter being squarely cut off at each end. In both cases the egg masses are covered with a thick coat of tough varnish which renders them waterproof, a wise provision of nature, as it is nearly nine months before the young caterpillars emerge from them. During the first warm days of spring they make their appearance, and after taking their first meal from the gummy substance which has protected them for the winter they begin to feed upon the opening buds.

The most striking difference in the two species now becomes apparent in the habits of the young caterpillar. Those of *Clisiocampa Americana* spin a tent in the nearest large fork of the branch upon which they are hatched. Into this they retire at night, during stormy weather, or when they are not feeding, in warm weather they often repose in a black mass upon the outside of it, leaving it regularly once in the forenoon and again in the afternoon to feed. Each caterpillar spins a silken web along the branch wherever it travels. Thus they never lose their way home although they may forage all over the tree. The caterpillars of the other species do not dwell in tents and are more disposed to lead a wandering life. When young they often march from place to place in single file close procession. From the time they are half grown until they reach maturity they are wonderfully active and move about as if they were in a great hurry and had no time to lose.

Both species reach maturity in about six weeks, and are then handsome hairy caterpillars, about two inches in length. *Clisiocampa distria* has a row of white spots down the centre of the back, which distinguishes it from the other species, in which the white line is unbroken.

The Forest Tent-Caterpillar is a general feeder, living on a great variety of forest trees and often doing considerable damage in orchards. The Apple-tree Tent-Caterpillar is not such a general feeder, and is more frequently found on the apple or wild cherry. For the latter it has a particular preference. In our forest plantation where

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there are 15 or 20 different species of trees, it was noticed last spring that every tree of the wild cherry had two or three nests of these caterpillars, while not another tree in the plantation was affected.

Another difference between these two insects appears in the construction of their cocoons. Those of *Clisiocampa Americana* are formed of a double web, the outer one loosely woven and filled with a powdery substance resembling sulphur. They are usually hid in some out of the way place, as under rails, boards or rubbish. Those of *Clisiocampa distria* have none of this powdery substance and are more frequently formed inside of the leaves hanging on the trees. On St. Joseph's Island last summer, I saw hundreds of maples and other forest trees upon which every leaf contained one of these cocoons, even the native spruces were so full of them that they appeared as if packed in wool.

4 CANKER-WORMS.—(*Paleacrita vernata* and *Alsophila pométaria*.)—Canker-worms have been very abundant in many parts of the country for a number of years past. There are also two species of these, but they resemble each other so closely that to the casual observer they differ only in name. One is known as the Spring Canker-Worm (*Paleacrita vernata*) (Fig. 63), and the other as the Fall Canker-Worm (*Alsophila pométaria*) (Fig. 64). One of the most noticeable differences in the two species appears in the egg stage. The eggs (Fig. 63 a and b) of the Spring Canker-Worm are oval in form and are laid in the spring in irregular patches hidden under loose bark or in expanding buds.

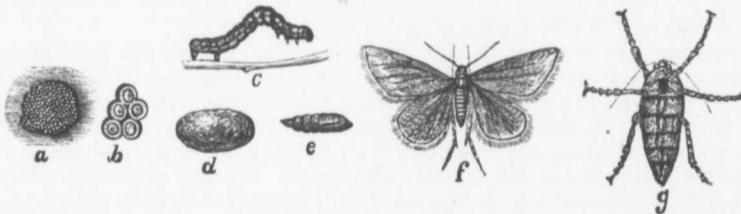


Fig. 63.

Those of the Fall species are shaped like miniature flower pots, are ranged in regular rows in masses (Fig. 65, a, b, c), and deposited in the late autumn in some prominent place on the tree. The larvæ of both species (Fig. 63 c and 65 f) make their appearance with the opening of the leaves in the spring. They reach their full size in about three weeks and are then about an inch in length. On account of their peculiar method of travelling, by alternately looping and extending their bodies, they are commonly spoken of as "measuring worms." They have another peculiar habit when disturbed of suddenly dropping from the tree and suspending themselves in mid air by a delicate silken web which is spun as they drop. Their appearance in this position is graphically described in the following letter which I received from a correspondent last June :—



Fig. 64.



Fig. 65.

BRIGHTON, June 6th, 1898.

DEAR SIR,—Last evening my husband said, "Come with us, I wish to show you a sight." We went into the orchard. "Now," says he, "see that tree over

there, the the kind y hundred w limbs he c air beneath and thoru worms' nes tell you," An answer accounts.

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s, I wish to show
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there, the leaves are all eaten up." "Worms," says I. "Yes," says he, "but not the kind you know." He took a stick and gave a limb a tap, and in an instant one hundred worms were hanging by tiny webs. He then went around hitting all the limbs he could reach, and I think there must have been a million worms suspended in the air beneath that tree. "Now, May," says he, "what am I to do? I have manured and thoroughly worked this orchard for two years, have had it trimmed, and the worms' nests all taken out of it once this spring, now just look at it." "I'll tell you," says I, "I'll write to the Agricultural College and see what they advise." An answer would be gratefully received, as the orchard is no small item in our accounts.

Yours truly;

In an orchard that is regularly sprayed they can give little or no trouble, as they are easily destroyed by Paris green, but in large shade trees, which are sometimes attacked, and where the spraying cannot easily be done, strategic measures have to be resorted to. From the fact that the female moth in both species is wingless, and after emerging from the pupa in the ground has to climb the tree to deposit her eggs, the placing of a tar band or other barrier upon the trunks of the trees at once suggests itself as a remedy.

5. THE COLORADO POTATO BEETLE.—(*Doryphora decem-lineata*.)—The potato bug or more properly, the potato beetle (Fig. 13) is with us yet, and he seems to be here to stay. Out of about ten thousand species of Coleoptera common to this country, the potato beetle stands out prominently as the one most generally troublesome. We have become so familiar with it that we seldom think of it but to kill it, yet a few facts as to its history in this country may be of interest. To the late Dr. C. V. Riley, of Washington, we are indebted for the best account of it that has anywhere been published, and I have made free use of his little book on "Potato Pests," in the preparation of these notes.

The Colorado Potato Bug, as it has been commonly called, was first described under the scientific name *Doryphora decem-lineata*, by Thomas Say, in 1824. It was then to be found only in Colorado and the North-Western States, just this side of the Rocky Mountains. Its original food plant was the Sand Bur (*Solanum rostratum*) a species of wild potato peculiar to that region.

As civilization advanced westward and potatoes began to be grown in its native home, it gradually acquired the habit of feeding upon the cultivated potato, and began its eastward march from potato patch to potato patch. In 1859 it had reached to within 100 miles of Omaha City in Nebraska. In 1861 it invaded Iowa, and gradually during the next three or four years it spread eastward over the whole State. In 1864 and 1865 it crossed the Mississippi into Illinois, at four or five different points coming on in a column about 200 miles broad from north to south. It was then travelling at the rate of fifty miles a year and it was predicted that it would reach the Atlantic Sea board in 1881. On this side of the Mississippi, however, the potato fields were more plentiful and it began to make better time, actually arriving on the Atlantic coast in 1874, seven years ahead of time, its average rate of progress being 88 miles per year. This rate, however, was not uniform, the northern columns of the army made the most rapid progress; the southern columns travelling through a country where potatoes were not so much grown, and under a broiling hot sun, lagged far behind.

The invasion of Ontario began in July of 1870, at two points on the western frontier, namely, near Point Edward and near Windsor. During 1871 they came on in increasing numbers, and it was said that during that summer the Detroit river was literally swarming with them. They were crossing on ships, chips, staves, boards, or any other floating object that presented itself. By June of that year they were common around London, and, Mr. Squirrel informs me, that later that year they had reached as far as Galt. I can well

remember the first one I ever saw; it must have been in the summer of 1872. I was then a little chap attending school on the historic battle field of Lundy's Lane, and I little knew then that I had met an enemy that would refuse to be driven from the country, for their invasion was one not only of conquest but colonization wherever they went.

A few beetles were sent to us last summer which were covered with a very interesting parasite known as *Uropoda Americana*. These are little mites about the size of a small pin-head, and of a flax seed brown colour. Each beetle was so thickly covered with them that hardly any part of its body was visible. The infested beetles were placed upon a potato plant along with some of their healthy relatives in hopes that their enemies might increase and subdue them, but after a few days the infested beetles had disappeared and the parasites with them, while the healthy beetles fed on serenely.

6. GRASSHOPPERS.—The grasshoppers belong to the Orthoptera or straight-winged insects. Of these we have a great many species, but they may all be grouped into two families—the Acridiæ or short-horned grasshoppers, and the Locustidæ or long-horned grasshoppers.

There has been much confusion of terms in the common names applied to these insects. The term locust properly applies to the first family, and not to the Locustidæ, or long horned grasshoppers. The term locust is also improperly applied to the Cicada, which belongs to another order altogether. To all but entomologists, however, the members of both families are usually known as grasshoppers, and for convenience in this paper we shall use that general term.



Fig. 66.

The most common species with us is the *Melanoplus femur-rubrum*, the red-legged grasshopper, or, more properly speaking, locust.

The females of this species deposit their eggs in holes made in the ground by means of their ovipositors. The eggs are laid in masses in the fall of the year, and hatch during the following spring or early summer. The young do not undergo complete metamorphosis, or change of form, as do the insects of the other orders we have mentioned. There is no larval stage; the young make their appearance as little grasshoppers without wings. They pass through several moults, and the wings gradually develop. With the last moult they become full fledged, and their destructiveness is then increased by their increased powers of locomotion.

Grasshoppers are more or less troublesome every year in all parts of the country, but they are usually particularly plentiful in localities where there is much waste land or poor farming. Two years ago I wheeled through the country from Walkerton to Clarksburg, a distance of about fifty miles. There was then in many places through which I passed almost another plague of locusts or grasshoppers. In conversation with a farmer whom I met I learned there were in some sections of that country quite a number of abandoned farms, where grasshoppers had been breeding year after year unmolested. Upon these farms they ate everything bare and then spread to adjoining farms. Good farming with clean cultivation and short rotation of crops is one of the best means of avoiding a grasshopper plague. On the College farm here Mr. Rennie tells me that since the fences have been removed, the permanent pastures broken up, and a short rotation of crops adopted, hardly a grasshopper could be found, whereas the old fence bottoms and permanent pastures were formerly alive with them.

7. APHIDS, OR PLANT-LICE.—Probably the most widely distributed and generally injurious insects during the past two years have been the Aphids, or plant-lice. They are members of the family Aphididæ, belonging to the section Homoptera, in the order Hemiptera. This section or sub-order Homoptera includes not only the Aphids but all of the bark lice, scale insects, mealy bugs, and leaf hoppers, some of the most injurious insects, and at the same time some of the most difficult to fight.

They are characterized, in common with all the other insects of this order, by a suctorial mouth, with which they take all their food in a liquid form, sucking it as juice

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7. HOUSE-FLY annoy the household standing this life history of the summer season

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from the plants upon which they feed. They are further remarkable for their insignificant size and the wonderful rapidity with which they breed. There are a great many species of plant-lice, and they infest in one form or another a great variety of trees and plants. The tendency has been to name these according to the tree or plant upon which they feed. One of the most destructive species in this and many others sections last year was the *Aphis brassicae*, or cabbage aphid, which affects cabbage, turnips, rape, and other brassicaceous plants. Another was the *Aphis mali*, or apple aphid. On the cherry there was a very troublesome black species known as *Mysus cerasi*, or the cherry-tree aphid. These are only a few of them, but they are all alike very troublesome in sucking the sap and reducing the vigor of the plants upon which they feed.

Many species like those on the cherry, apple and plum, excrete a sticky liquid substance known as "honey dew," upon which ants, bees, and flies regale themselves. The presence of ants running up and down the trees is almost a sure indication that aphids are at work upon the leaves. Other species, like those infesting the cabbage and turnip, excrete a white powdery substance which covers their bodies. In the woolly aphid infesting the roots of apple trees, this excretion is so fluffy that the insects appear to be covered with wool.

The life history of plant lice is peculiar. The various species differ considerably in the details of the transformations, but the following may be given as applying to most of them. The eggs which are shiny black are very large for the size of the insect, are laid in the fall upon the food plant. From these hatch in the spring wingless females, which without the intervention of the males soon begin to bring forth living young. In five days or six days these young aphids begin to reproduce in the same way. This process of agamic reproduction and compound multiplication goes on so rapidly that in a short time the progeny of the original "stem mother" mounts up into the millions. If this production of wingless forms continued long, it would mean the starvation of all, by the destruction of the plants upon which they were feeding, but Nature provides for this by the development after a time of winged forms which "hie away to fresh fields and pastures new," and in this way they spread. Often in the fall the air is so full of these flying aphids that a person riding or driving quickly becomes covered them. As the cold weather approaches and vegetation ceases, sexual forms, male and female are developed, the females being wingless. Eggs are again produced to carry the species over to another year.

From the fact that Aphids and other insects of this order insert their beaks and suck their food from the interior of the leaves or stems, it is evident that the application of stomach poisons such as Paris green can be of no avail in destroying them. The material supplied must be something that will kill by coming in contact with their soft bodies. The kerosene emulsion, so generally recommended, has been found to be more or less satisfactory, because of the frequent injury it does to the foliage upon which it is applied. Another remedy much more satisfactory, is a strong decoction of tobacco, made by boiling a pound of tobacco waste in five gallons of water, and this is made doubly effective by dissolving in it a quarter of a pound of whale-oil soap. This should be applied as soon as the aphids appear, as after a time it becomes difficult to reach them because of the curling over them of the leaves upon which they are feeding.

Nature's most active agents in holding plant lice in check are the Lady Birds. Last summer these and their larvæ could be found actively at work devouring the lice upon almost every tree and plant infested.

7. HOUSE-FLIES.—(*Musca domestica*, et al.) Of all the insects that bother and annoy the house keeper none are more common than the house flies. And notwithstanding this fact the woman, or man either, who can give a full account of the life history of these flies is as rare as the one whose house is free from them during the summer season.

All true flies belong to the order Diptera or two-winged insects. There are several species commonly found in houses, although but one of these should properly be

called the house-fly. This is the *Musca domestica*, a medium sized grayish fly too well known to need description.

The life history of this species, which is fairly typical of the majority of them, may be briefly outlined as follows: It passes the winter in the house or some other building, hiding in sheltered spots anywhere between the cellar and the garret. A few specimens in the warmed rooms occasionally hum about in the winter, reminding us that they have seen better days. In the early spring the few sole survivors of the swarms of the preceeding year make their appearance. These are mostly females ready at once to become mothers and by the end of the season their children and great great grand children extend to the tenth and twelfth generations. Each female lays on an average about 120 eggs at a time, which are deposited in irregular masses usually in horse manure. The eggs hatch in about twenty-four hours and the larvae coming from them are white footless maggots about half an inch in length. In this stage of its existence the fly is beneficial as a scavenger. In from five to seven days the larvae attain their full size, and enter the pupa or resting state. In its outward appearance the pupa is a smooth brown oval shell about a quarter of an inch in length and less than half of that in diameter. In manure heaps these may often be gathered by the shovel-full. In some investigations conducted at Washington last summer, as many as 1,200 larvae and puparia were counted in one pound of horse manure. The pupa stage also lasts only from five to seven days. So that to produce a full fledged fly from the laying of the egg requires only about ten days or two weeks.

To trace the development of the fly through all of these stages is very easy, but to ascertain the length of life of the adult fly is more difficult, and as yet I have seen no data on the subject. The Washington experimenters declared that this was a bit of information almost impossible to obtain correctly, because of the inability of the fly to live in close confinement. Here then is a point in the life history of one of our commonest insects about which we are yet more or less in the dark.

A few of the other species of flies commonly found in houses may be mentioned. The one most closely resembling the house fly in appearance is the *Stomoxys calcitrans*, or stable fly, so troublesome upon horses and cattle. The most important difference in this species is that the mouth parts are formed for piercing the skin. A bite from one of these is just as painful as the sting from a bee, but it has not the same poisonous after-effects.

One of the largest species found in houses is the *Calliphora vomitoria*, or "blue-bottle fly," that big, blue, buzzing, bummy, beggar that goes tearing through the house from room to room as though he owned the premises. He is capable in a few minutes of arousing more fight in a woman than all the other flies combined. A favorite place for this species to lay its eggs, is in meat that has been exposed for a short time. As with most other flies, the time required for development is short, and the rate of increase is so rapid that it has given rise to the saying that a pair of these flies will devour an ox more rapidly than a lion,

One of the smallest species seen in houses, the *Homalomya canicularis*, is sometimes called the small house-fly. This species is largely responsible for the prevalent but erroneous idea that little flies become big ones.

In closing this paper we should like to enter a plea for a more general study of this most interesting branch of natural history. In none do we find a greater range for observation and research, and in none can practical investigation be turned to more profitable account.

NOTES OF THE SEASON OF 1898.

By J. ALSTON MOFFAT, LONDON, ONT.

One of the most noticeable peculiarities of the Entomological year about London, was the scarcity of diurnals; many of the more common forms being to all appearance entirely absent. There were some noticeable exceptions to the rule, *Pieris rapae* for instance. From the early part of May to the end of the month, it was in unusual abundance for the spring brood. More like what one is accustomed to see in the autumn about cab-

bage and turnip, its faithful at *turnus*, appears rarely seen. London until were noticeable the meditative absence.

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bage and turnip fields; indeed it was more plentiful in the spring than at any other time of the year, something unusual in its history, and starting the inquiry, what had become of its faithful attendant parasite *Pteromalus puparum*? The yellow swallow-tail *Papilio turnus*, appeared in moderate numbers, also *Limenitis ursula*, whilst that nearly ubiquitous butterfly *Colias philodice* that helps to give life and animation to every rural scene was rarely seen. I am not certain that I saw a Milkweed butterfly, *Danais Archippus* about London until the middle of September. The larger silver-spotted fritillary *Argynnis* were noticeably scarce; and so on through the entire list of common forms; which made the meditative contemplation of a landscape dull and uninteresting by reason of their absence.

Collecting at electric light commenced early and continued good up to the end of June, many interesting and attractive specimens being obtainable by that method. The early geometers and some species of the noctuids were in abundance, whilst hibernated specimens of *Scopelosoma* and *Lithophane* were plentiful, and many of them were in excellent condition. *L. antennata* must be a very hardy insect, and capable of enduring extremes of cold; Mr. Bice having found specimens of it about the lights during the months of January, February and March; the least indication of mildness in the weather was sure to bring it out. July and August were characterized by more their usual unprofitableness to the collector, giving him plenty of hunting but little collecting. There were no reports of any serious injury having been done in this locality to crops or fruits from insect pests. Many of the ornamental bushes and shade trees of the city were rendered unsightly by the presence in great numbers upon their branches of the Cottony Scale, *Pulvinaria innumerabilis*, but the attack passed off without any apparent injury resulting.

On the 2nd of June I received from J. D. B. Mackenzie, Esq., of Chatham, N. B., a letter, stating that he had sent to me for identification, some insects that had appeared upon his cherry trees and literally stripped them of their foliage in two or three days. The insect proved to be *Ademonia rufosanguinea*, Say, of the Chrysomelid family; an innocent enough looking little beetle that would not be suspected as being capable of working such destruction. It must surely be a rather unusual occurrence? Their numbers must have been great. He also wished for information as to where he could get a description of its life history? That I could not give him.

On the 27th of July I received from Clinton, Ont., a box six inches long by four wide and one and a half deep, filled with the remains of Web-worm moths, *Clisiocampa Americana* and *disstria* mostly; said to have been the result of one night's capture in one street lamp—kind of lamp not stated, electric probably. I had read in the newspapers earlier in the season, accounts of the running of railway trains being interfered with in some localities, by reason of the swarms of caterpillars on the track; that may have been one of the localities. At all events, that boxful gave evidence of great negligence on the part of those interested, in their dealings with their tent caterpillars.

On July the 22nd, I took a trip to Lake Erie Shore. I had heard a good deal about 'Rondeau,' the Government reserve and the public park there, and that it was easily reached by rail from Chatham, Ont., so I thought it might be a profitable place to spend a day or two. In anticipation I was going to a place well wooded and wild; but instead, I was landed far out upon a sand-bar almost entirely destitute of vegetation. This sand-bar is what separates Rondeau (round water, admirably descriptive) from Lake Erie, whilst the Government reserve is on the opposite side of the bay, nine miles or so away in a straight line and no convenient means of reaching it; and as my time was limited I made no effort to do so. The sand-bar is being utilized for summer residences with its excellent boating and bathing privileges, and is locally known as 'Erieau,' a euphonious combination but lacking in correct significance. In such conditions there was but little opportunity for me to indulge in my favorite pursuit; yet even there I came upon two insects which I had never met with alive before. One was that highly ornamented little dragon fly, *Celithemes Eliza*, Hagen, which was quite plentiful amongst the straggling milk-weeds and wild rice growing along the bay side of the shore, and was in fine condition as if recently emerged. The abdomen of one sex is ornamented with bright red, the other

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 about London, was all appearance en-
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with yellow, but their brilliance disappears in drying. In company with it, but in greatly inferior numbers was *Celithemes Eponina*, Drury, which used to be plentiful in one locality at Hamilton. The other find was that attractive Hemipteron *Lygaeus fasciatus*, Fab. Although milk-weeds were to be found for hundreds of yards along the bay shore, there was but one spot where I saw it, and that was a small clump situated between two cottages, and from which by frequent visits I secured seven of them. There I observed on the wing as the first of the season, a few fine fresh specimens of the milk-weed butterfly, *D. Archippus*, Fab.



Fig. 67.

In July, Dr. W. J. Stevenson brought to me a fresh maple tree borer, *Plagianotus Speciosus*, (Say) (Fig. 67) the first living specimen of it I have seen taken at London. I could obtain it at Hamilton by the dozen where the shade trees are nearly all hard maple, whilst in London they are as nearly all soft maple; and to that as a cause I have always attributed its absence here.

During the autumn there was the usual appearance in abundance of two or three species of the Cut-worm moths at light, whilst amongst them was to be obtained an occasional rare and desirable specimen of other kinds. About the end of September Mr. Bice secured a number of that attractive Pyralid, *Eudiotis hyalinata*, Linn. It was on the 29th day of September, 1881, that I saw at Hamilton my first specimen of it on the wing, and so far as is known, very few have been taken in Ontario since, and not more than a single specimen in a season. This disclosure of such a marked increase in numbers is of considerable importance to the community, as indicating the possibility of its becoming here, such as it has proved itself to be in the Western and Southern States a first class pest to the cultivators of that delicious fruit, the musk melon. In the Eleventh Report of the New York State Entomologist for the year 1895, after giving an account of the total destruction of some melon patches in the south, which had been cultivated for the market, at page 138 it is stated: "It would appear from the limited literature accessible, that *Eudiotis hyalinata* is more especially a southern insect. I have examples in my collection from Texas. It has also been taken in Michigan, is not uncommon in New Jersey, and has been taken in Canada. I have no knowledge of its occurrence in the State of New York." That it had not been reported from New York State was to me rather a surprise, and I started the question whence came it to us? It would seem as if it must have reached Ontario by way of the west, having found the conditions most favorable for its spreading in that direction. It is the habit in some quarters to speak disparagingly of "mere collectors." But an occurrence of this nature brings forcibly to view the great loss, that even now, our department of science is suffering from the want of more collectors; for it is upon their labors and observations that we are largely depending for our knowledge of the introduction and spread of injurious species. A knowledge of the flora and fauna of any particular district is of great general interest and advantage to all students of nature, whether the individual disclosing it has any time, inclination or ability to devote to the technicalities of the subject or not, and is well deserving of the grateful acknowledgements of all.

Almost the same time as the preceding, Mr. Bice took several specimens of another Pyralid, *Pilocrosis ramentalis*, Led. This species was represented in the Society's collection by a single specimen taken by me at Hamilton, and named for me by Mr. Grote, then of Buffalo, who had much of interest to tell me of the peculiarities of this insect, one noticeable thing about it is the long scales covering the costal margin at base of the front wings of the females, which can be raised so as to disclose the membrane. Mr. J. Johnston of Hamilton informed me that these two species are represented in his collection by a single specimen of each, taken by him there many years ago. Recently I have seen a specimen of *E. hyalinata* amongst some material sent to me for determination by Mr. C. E. Grant, of Orillia. In September the Tomato Sphinx, *S. quinquemaculata*, Hub, was quite plentiful, which suggests some interesting queries concerning the life history of this species. It is considered to be single brooded in this latitude; but it is known to mature occasionally in confinement the same season as produced. Were these

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September specimens from eggs of an early brood, or were they from belated chrysalids of the previous summer's production? It has been observed that there is a great difference in the time of their appearance in nature, some showing themselves in early June, whilst fresh specimens may be obtained at the end of July; the location of the winter quarters of the pupæ influencing the time of maturing to some extent most likely. Again, if these late comers produced ova could they pass the winter safely? If not, then it would help materially to reduce the numbers for the following season. Of *Sphingidae* less frequently met with in this locality, Mr. Bice took specimens of *Ampelophaga versicolor* 55/0 Harr. The Tobacco Sphinx, *S. Carolina*, Linn., and *S. Cingulata*, Fab., or *Convolvuli* of Linn. One thing secured by him, and determined by Dr. J. B. Smith, which is new to the Society's collection, is a single specimen of *Hydroecia limpida*, Guen., whilst several other Noctuids of the season's capture are not yet identified.

THE FREEZING OF INSECTS.

BY HENRY H. LYMAN, MONTREAL.

In the 22nd Report of the Entomological Society of Ontario, being that for 1891, there appeared a paper from my pen under the title, "Can Insects Survive Freezing?"

I have recently come across further records of observations upon this subject, and deem them of sufficient interest to be republished.

In looking over an interesting book of travels, entitled "A journey from Prince of Wales's Fort in Hudson's Bay to the Northern Ocean, undertaken by order of the Hudson's Bay Company for the discovery of copper mines, a North West passage, etc., in the years 1769, 1770, 1771, and 1772, by Samuel Hearne," published in 1796, I came across the following interesting notes on page 397. :—

"FROGS, GRUBS, AND OTHER INSECTS."

"Frogs of various colours are numerous in those parts as far north as the latitude 61°. They always frequent the margins of lakes, ponds, rivers, and swamps; and as the winter approaches they burrow under the moss at a considerable distance from the water, where they remain in a frozen state till the spring. I have frequently seen them dug up with the moss (when pitching tents in winter) frozen as hard as ice; in which state the legs are as easily broken off as a pipe stem, without giving the least sensation to the animal; but by wrapping them up in warm skins, and exposing them to a slow fire, they soon recover life, and the mutilated animal gains its usual activity; but if they are permitted to freeze again they are past all recovery, and are never more known to come to life. The same may be said of the various species of Spiders, and all the Grub kind, which are very numerous in those parts. I have seen thousands of them dug up with the moss, when we were pitching our tents in the winter; all of which were invariably enclosed in a thick web, which Nature teaches them to spin on these occasions; yet they were apparently all frozen as hard as ice. The spiders, if let fall from any height on a hard substance, would rebound like a grey pea; and all the Grub kind are so hard frozen as to be as easily broken as a piece of ice of the same size; yet when exposed to a slow heat, even in the depth of winter, they will soon come to life, and in a short time recover their usual motions."

In Dr. H. Guard Knaggs' *Lepidopterist's Guide*, on page 44 of the 1871 edition, under the heading of "Ailments of Larvæ," I find the following :—

"Frost Bite.—It is well known that larvæ, which have been so stiffly frozen that they might have been easily broken, have afterwards recovered. The chief thing to be remembered in the treatment of such cases, is that the thawing should be effected very gradually, rapid thawing being dangerous."

ODOUR OF THE SAN JOSE SCALE, *Aspidiotus perniciosus*

By F. M. WEBSTER, WOOSTER, OHIO.

In the many accounts of this insect I do not recall that attention has been called to the odour that is associated with this insect and which in cases of excessive abundance, can be detected at a considerably distance away. Where the air is quiet it is often possible to detect the presence of a badly infested tree a yard away, and I presume that with more acute olfactories, such as insects are supposed by many to possess, even the presence of a more limited number of the scale might be detected at a much greater distance. As ants do not appear to be at all partial to this Coccid, at least in this country, it is not easy to understand what influence this odour can have in the economy of the species. It is possible that, in its native home, this odour might attract other insects and thus afford a means of diffusion, not at present so available to the scale in this country.

THE ODOUR OF COCCIDÆ.—Prof. Webster's interesting note leads me to offer a few remarks. The species of the subgenus of *Toumeyella* of *Lecanium* have quite a strong musky odour; but ordinarily I have been unable to detect any marked odour in species of Coccidæ. I suppose, however, that all possess some odour, and that its purpose is to attract the males to the females. This seems the more probable when we remember that in many species the male puparia are not on the same part of the plant as the females. Here at Mesilla Park, also, I have lately seen a male of *Margarodes hiemalis*, Ckll. ined, run over the ground until it detected a spot where a female was buried, and then dig down to the female. It must certainly have detected its mate by the sense of smell

T. D. A. COCKERELL.

LIFE HISTORY OF THE SHEEP SCAB-MITE, *Psoroptes communis*.

By O. P. GILLETTE, FORT COLLINS, COLORADO.

I am not aware that the full life-history of this insect has been published, though I shall not be surprised to learn that such is the case.

In order to know how long a time should intervene between the first and second dippings for the cure of scab, we must know the period of incubation and also the entire time elapsing from the deposition of the egg up to the time that the mite from that egg, if a female, may be itself depositing eggs. These points were determined in a series of experiments conducted by the writer one year ago and were reported in a local paper, the "Fort Collins Courier," last spring. I took seventy-five eggs from a lock of wool drawn from the back of a badly infested lamb and, after dividing them in two nearly equal lots, placed them at once on the skin of the backs of two lambs that were not infested with the mites at the time. In order to irritate the surface a little and better prepare it for the little mites that would begin at once to hatch, a lock of wool was drawn in each case from the particular spot where the eggs were placed.

Mr. Ball, assistant in my department, made a special examination of these "cultures" once a day until the mites from the eggs were fully grown and themselves laying eggs.

At the first examination a few young mites were found, which was to be expected as a few eggs among so many would be about ready to hatch. At the end of the fourth day all the eggs had hatched. At the end of the ninth day a few individuals were found in copula, and on the eleventh day eggs were found. As it required four days for the newly deposited eggs to hatch, the entire time elapsing from egg to egg would be fourteen or fifteen days.

As there would be eggs in all stages of incubation upon a sheep when the latter is dipped for the cure of scab, I have set the limit of time for the second dipping at not sooner than five days and not later than ten days after the first dipping. If the second dipping comes at a time outside this limit, there will probably be eggs upon the sheep again.

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OBITUARY.

PROFESSOR J. HOYES PANTON, M.A., F.G.S.

It is our sad duty to record the death of Professor Panton, which took place at Guelph, on the 3rd of February, 1898, after a long and very painful illness, which he bore with the utmost patience and resignation. He was born at Cupar, in Fifeshire, Scotland, and was brought out to Canada when a child; his father settled in Toronto at first, and removed, after some years, to Oshawa. He was educated at the Whitby High School and Toronto University, where he graduated with honors in Natural Science in 1877. The following year he was appointed Professor of Chemistry in the Ontario Agricultural College, but after a few years resigned the position and removed to Winnipeg, where he became principal of the Collegiate Institute. In 1885 he accepted the invitation of the Ontario Government and returned to Guelph, where he filled the position of Professor of Natural History and Geology in the Agricultural College till the time of his death. His work there had special relation to economic entomology and botany, on which subjects he issued many useful bulletins to farmers and fruit growers. He also published two small works on Economic Geology and "Insect Foes," which are valuable manuals of an elementary character. In 1896 Professor Panton attended for the first time the annual meeting of the Entomological Society of Ontario, though he had long been a member, and on that occasion read very interesting and useful papers on "Entomology for Rural Schools" and "Two Insect Pests of 1896—the Army Worm and the Tussock Moth." At the annual meeting in October, 1897, he was elected vice-president of the Society, but was unable to attend owing to the illness which had already seized upon him. The following resolution of condolence was adopted at a meeting of the Council held in March: "The members of the Council of the Entomological Society of Ontario have heard with profound regret of the death of their highly respected colleague and vice-president, J. Hoyes Panton, M.A., F.G.S., Professor of Biology and Geology in the Ontario Agricultural College, Guelph. They desire to place on record their admiration for his talents and attainments in natural science, and their deep sense of the loss which economic entomology in this Province sustained by his removal in the maturity of his powers and at an age when he was capable of performing much useful work. They beg to offer to Mrs. Panton and family their respectful sympathy in the great bereavement which has befallen them."

On the 18th of February, 1898, Mr. JOHNSON PETTIT died at Buffalo, N. Y., and was buried a few days later at Grimsby, Ont. For many years Mr. Pettit was a most diligent and successful collector of Coleoptera in the neighborhood of Grimsby, and was well known amongst entomologists both in this country and the United States. After forming a very complete collection of the beetles of Ontario so far as known at that time, he gave up the pursuit and turned his attention to geology. Subsequently he sold his cabinet of insects to the Entomological Society of Ontario at a nominal price, in order that it might be kept in a place of safety and preserved from destruction. His work was characterized by remarkable neatness and painstaking accuracy.

PROFESSOR DAVID SIMONS KELLICOTT was born at Hastings Centre, Oswego County, N. Y., January 28, 1842, and died at his home in Columbus, Ohio, April 13, 1898. In his boyhood his frail constitution and delicate health required him to spend much of his time out of doors, and it is to this, no doubt, that in part at least his love for nature may be traced. He graduated from Syracuse University with the degree of B. Sc., while the institution was yet known as Genesee College, teaching one year in Southern Ohio prior to his graduation. After graduating, he taught one year in Kingston Normal School, Pennsylvania, after which he was connected for seventeen years with the State University, at Buffalo, N. Y., being Dean of the College of Pharmacy, and also Professor of Botany and Microscopy. He came to the Ohio State University in 1888, where, for ten years, he has occupied the chair of zoology and entomology. At the time of his death he

was General Secretary of the American Association for the Advancement of Science, President of the American Microscopical Society, and Treasurer of the Ohio Academy of Science. He had served as President of the Buffalo, N. Y., Academy of Science, and the Ohio Academy of Science.

Animal parasites of fishes, and the rotifera, from time to time claimed a considerable portion of Professor Kellicott's attention, but his entomological work won for him the admiration of the entomologists of America. Patient, conscientious and utterly devoid of selfishness, he was one of the most kind and lovable men the writer has ever met. Faithful and just with his colleagues and the idol of his pupils, seeking patiently and industriously after the truth, he won esteem while living, and in his death he has left numberless friends to mourn his loss. If there was ever a man who deserved the reward: "Well done, thou good and faithful servant," that man was David S. Kellicott; and the fruits of his labors will stand as an enduring monument to his faithfulness among his fellow men. He began to contribute to the Canadian Entomologist in 1878, his last article appearing in 1896.

F. M. WEBSTER.

DR. JOSEPH ALBERT LINTNER.

By the death of Dr. J. A. Lintner, which occurred at Florence, Italy, on May 6th economic entomology has lost one of its oldest, ablest, and most distinguished devotees. He was of German parentage, and was born at Schoharie, N. Y., February 8, 1822. He graduated from the Schoharie Academy at the age of fifteen, and for the next thirty years was actively engaged in mercantile pursuits in New York City, Schoharie and Utica. The study of natural history became a fascination for him early in life, and in 1853, he turned his attention especially to insects and rendered valuable aid to Dr. Fitch, who was then making an entomological survey of the State of New York.

Dr. Lintner's first paper upon insects was published in 1862, and six years later he became zoological assistant in the New York State Museum of Natural History. He continued in the service of the State until his death, working as assistant in the Museum for twelve years, and in 1880 receiving the appointment of State Entomologist. This thirty years of continuous, active service in an official capacity, in a useful and limited scientific field, and in a single State, is certainly a remarkable record, and one which speaks volumes of praise for Dr. Lintner.

He richly deserved the honour of the degree of Ph. D. conferred upon him in 1884 by the University of the State of New York. He was also honoured with the presidency of several scientific associations, and his name is enrolled among the members of many entomological and other scientific societies, both in America and in Europe. The publications of Dr. Lintner merit the highest praise and deservedly entitle him to the foremost rank among the economic entomologists of the world. He published more than a thousand miscellaneous articles upon injurious insects, besides his four important "Entomological Contributions" and his twelve reports as State Entomologist; probably the thirteenth report, for 1897, is in the printer's hands.

These reports are justly entitled to the highest rank among the scientific publications of the great Empire State. They represent the highest ideal or model of what such reports should be, both from a scientific and a practical standpoint. For typographical neatness and scientific accuracy, for the simple, yet elegant and dignified, way in which dry, scientific facts are made interesting and adapted to the understanding of the agriculturist, Dr. Lintner's reports have not been excelled in the world's entomological literature; such indexes as his reports contain are rare in any literature. One is still more impressed with the scientific and literary attainments of Dr. Lintner, when one understands that, practically, he never had any of the modern facilities, such as are found at many of our experiment stations, for studying the habits of insects; his office was his literary sanctum, laboratory, museum, library and insectary combined.

Dr. Lintner was a man of quiet and dignified manners, always courteous and pleasant to meet in social intercourse. He was ever ready to impart from his vast fund

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of knowledge; and being an expressive speaker, he always commanded the attention of scientific bodies which he was called upon to address. His frequent addresses before horticultural and agricultural societies in his own and in other States, and farmer's meetings of all kinds, were always full of information.

He had recently been granted a well-earned six month's leave of absence, and was spending it in sunny Italy when the death summons came. In Dr. Lintner the agriculturists of New York found one of their best and most helpful friends, and entomologists the world over, a true and sympathetic co-worker. His name well deserves a place in that list of names enshrined in the hearts of every American economic entomologist—Harris, Fitch, Walsh, Le Baron, Riley—and Lintner.

M. V. SLINGERLAND.

BOOK NOTICES.

TWENTY-FIRST REPORT OF OBSERVATIONS ON INJURIOUS INSECTS and Common Farm Pests during the year 1897, with Methods of Prevention and Remedy. By Eleanor A. Ormerod, London: Simpkin, Marshall, Hamilton, Kent & Co., 1898 (1s. 6d., pp. 160.)

We beg to offer our hearty congratulations to Miss Ormerod on the publication of the twenty first of her Annual Reports. Twenty-one years is a long period for anyone to carry on a laborious work, but this talented and indefatigable lady has not only accomplished a most valuable and important work, she has done so without any assistance except that of her late lamented sister, and entirely at her own expense. On this side of the Atlantic, Reports of this character are published by the Government of the Province or State to which they belong, but in England no official recognition has been shown, and though the country has undoubtedly been saved hundreds of thousands of pounds by the instructions given in these Reports to the farmers and gardeners of Great Britain, whereby they have been able to intelligently cope with their insect foes and employ the best methods of prevention of their attacks, yet no aid has been afforded her from the public purse—no recognition of the immense value of her work has been vouchsafed by the powers that be. But while officially ignored, Miss Ormerod's name and work are held in the highest honour throughout Great Britain and treated by the press in every department with the utmost respect; and in many British colonies and several foreign countries her name is widely known and her talents fully recognized.

A single observer, however able and industrious, could not possibly pay attention to all the manifestations of insect injury throughout the British Isles, but Miss Ormerod has by degrees gathered together a corps of observers in every county and district throughout the United Kingdom; and is kept closely informed of all that causes injury or loss to crops or fruit, and to live stock as well. During the past year she received about 3,000 letters on Entomological subjects, and with the aid of a secretary was enabled to attend to them all. She thus conducts at her own charges what ought to be a Division of Entomology in the Department of Agriculture at London.

In the Report before us thirty-six species of insects are dealt with and figured, their ravages described, and methods of prevention and remedy fully given. Several of them are familiar to us on this side of the Atlantic, e. g. Apple Codlin Moth, Cockroaches, *Xyleborus Xylographus*, Mediterranean Flour-Moth (*Ephestia Kuhnii*), etc.

From the care and accuracy which characterize her descriptions and figures, Miss Ormerod's work is of permanent value to economic Entomologists everywhere, and her reports are always received with welcome and gratitude by those who have the good fortune to obtain them. That she may long be spared to carry on her admirable work is the earnest aspiration of her many friends.

C. J. S. B.

OUT DOOR STUDIES: a Reading Book of Nature Study, by James G. Needham; 1 vol. pp. 90. New York, Cincinnati, Chicago: American Book Company.

These are a series of stories of animal life, written in a charmingly interesting way, and designed to lead on a youthful reader to observe for himself the wonders of nature that are everywhere open to his view. It begins with an account of the common wild Snout-Dragon or "butter and eggs," and tells how the peculiar structure of the flower is designed for the visits of the bumble-bees who come for the nectar and carry off the pollen as well. The next chapters are on Chipmunks; Galls and their makers; the Golden-rod and its visitors and tenants; Crows and their Doings; Dragon-Flies which, as our readers may remember, have been special objects of the author's studies; Eye-spotted insects which aid in the protection of their owners; and Ant-lions. Any boy or girl, who takes up the book and dives a little way into its pages, will surely read on with delight and when the little volume is closed, be anxious to sally forth and see if he (or she) cannot find some similar marvels of nature and learn their meaning, while admiring their beauty.

The book is one of a series designed for the use of school-children who are about to enter the High Schools. It is beautifully illustrated with about ninety wood-cuts, the work of Mrs. Needham, the author's wife, and is provided with an index, and a list of the scientific names of the animals and plants referred to in the text.

C. J. S. B.

THE PTEROPHORIDÆ OF NORTH AMERICA, by C. H. Fernald, A.M., Ph.D., Revised Edition. July 30th, 1898. Boston: Wright & Potter Printing Co., 18 Post Office Square, 1 vol., 8vo, 84 pp., 9 plates.

Any one who has a copy of Professor Fernald's manual of the Crambidae of North America will hardly need to be told that this later work is exactly what every student or collector of the Micro-depidoptera wants, and that the way is now made easy for him when he wishes to identify his Plume-moths and learn all that is thus far known about the North American species. It is characterized by its author's well-known accuracy and conciseness of statement, and is a complete monograph of the family as far as this continent is concerned. It begins with an historical account of the family in the writings of European Entomologists and the more recent publications in America. This is followed by short chapters on the structure, habits, early stages and systematic position of the Plume-moths. The body of the work is taken up with descriptions of the genera and species, including very useful synopses in each case. Three of the plates illustrate the external anatomy and the structure of the wings, the remainder depict the genitalia of the species. We miss, however, the exquisite coloured plates that so beautifully illustrated the Crambidae. We need not say more than that this is a full and entirely satisfactory work on the Pterophoridae and that it maintains the high standard of excellence that we now expect in the author's scientific productions.

C. J. S. B.

AGRICULTURE, by C. C. James, 200 pp., George N. Morang, publisher, Toronto, 1898.

It has been the lot of few authors to accomplish satisfactorily what in their preface they state to have been their object as Prof. James has in preparing the 200 page Manual of Agriculture which has lately been given to the farmers of Canada. The author has had special opportunities, which he has made the most of, of learning not only what was needed by the intelligent farmers of the Dominion, but what was the best way of presenting this information to them. Both as Professor of Chemistry at the Ontario Agricultural College and as Deputy Minister of Agriculture, Prof. James has been brought into close contact with the leading and rising farmers of Ontario. The new Manual will fill a decided want, which is none the less from the fact that this want may not have been noticed by some until their attention was drawn to it by seeing how well it has been filled.

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The purpose of the book is "to aid the reader in acquiring a knowledge of the *science* of agriculture, as distinct from the *art* of agriculture, that is, a knowledge of the 'why,' rather than a knowledge of the 'how.' The science of agriculture may be said to consist of a mingling of chemistry, geology, botany, entomology, physiology, bacteriology, and other sciences, in as far as they have a bearing upon agriculture. The aim has been to include but the first principles of these various sciences and to show their application to the art of agriculture. . . . An intelligent understanding of the science underlying the art of agriculture will add much interest to what is otherwise hard work, and as a natural consequence, the pleasure of such work may be greatly increased."

Every day the fact is being recognized more and more that the elements of those sciences which underlie all progress in every branch of agriculture *must* be taught in the Public and High Schools of the country. Already simple nature studies and the first steps in chemistry and geology are taught in the schools of Manitoba and Ontario, and these studies have proved to be not only of use and attractive to the students, but a ready means of creating a bond of sympathy between the teacher and his pupils; more especially has this been the case with those energetic and restless souls too often now called "bad boys" more, perhaps, from lack of understanding or skill in management on the part of the teacher than from a superabundance of real badness on the part of the taught. Boys play truant because they find more to interest them outside the school than at their desks. If therefore the things which appertain to out-of-doors can be brought inside the schoolroom without robbing them of too much of their outside flavor, they will be a sure bait to catch the attention of all bright healthy boys and girls. Their study will arouse interest at once and the habits of concentration, power to observe and compare, and the necessary development of the faculties of exact thought and accurate description will be available for all other branches of study with which the pupil is engaged.

This book may be used as a text-book in High Schools and Public Schools. It would be well indeed for Canada if its use were made compulsory in every school in the land. The great truths laid before the reader are presented in a simple straightforward manner intelligible to all. The subjects are so skilfully arranged and concisely stated that a surprising amount of accurate information is given in this small octavo of 200 pages. The value of this simple knowledge to practical men is not, I believe, overstated when I aver that if all the farmers in Canada would read this little work, as they most certainly should, its appearance would mark an epoch in the history of the Dominion, which would be made manifest to all by an enormous increase in the crops and wealth of the whole country.

The scope of work is shown by the following brief epitome of subjects: Part I. treats of the Plant, its development, structure, food and functions; Part II., Soil, its nature and treatment; Part III., Crops of the Field; Part IV., The Garden, Orchard and Vineyard; Part V., Live Stock and Dairying; Part VI., Bees, Birds, Forests, Roads and the Home.

In these different sections the insect and fungous enemies of crops are treated at some length. This little volume is bound in cloth and well got up; although some of the illustrations are rather roughly executed, it is on the whole most excellent and for the price, 25 cents is a marvel of cheapness.—J. F.

THE WINTER FOOD OF THE CHICKADEE, Bulletin 54, New Hampshire College of Agriculture, by Clarence M. Weed—There is something particularly charming about those confiding little feathered denizens of the woods which brave our cold northern winters and stay to cheer us at a time of the year when there is so little animated life. The Chickadee or Black capped Tit-mouse (*Parus atricapillus*) is at once one of the most cheerful as well as one of the most useful of our common native winter birds. What a bright, busy, happy sight is presented by a flock of these little friends; for they are all friends these little balls of black satin and grey down, they are far too busy and well employed to waste time in fighting. Satan has a hard time of it in "some mischief finding" for these little fellows to do, for their hands are never idle, as they hurry

through the woods, running up or around the trunks of trees or hanging head downwards from a slender twig, never still for more than an instant, as they peer into every tuft of moss, every crack or cranny in the bark, along the twigs, under the bud scales of deciduous trees or among the leaves of evergreens, talking cheerfully to themselves and each other all the time as they carry out their useful mission in clearing the trees and shrubs of countless insect enemies; woe to the luckless caterpillar, chrysalis, spider, or beetle which comes within the range of their sharp black eyes. Nothing comes amiss to these insatiable hunters, from the minute, shining black eggs of an aphid to the fat chrysalis of a *Cecropia* Emperor Moth; with deft blows the hard sharp beak soon penetrates the thick silken cocoon and in a very short time the marauder is away looking for another victim. Dr. Clarence Weed publishes in this interesting bulletin the results of some careful investigations which he has carried out as to the winter food of the chickadee. He shows that more than one half of the food of this bird during the winter months consists of insects, a large portion being in the form of eggs. Vegetation of various sorts made up a little less than a quarter of the food, and two-thirds of this quarter consisted of the buds or bud scales which were believed to have been accidentally eaten along with the eggs of plant-lice. These eggs made up more than one-fifth of the entire food and formed the most remarkable element of the bill of fare. This destruction of myriads of eggs of the plant-lice which infest fruit, shade and forest trees is probably the most important service which the chickadee renders during his winter residence. More than 450 of these eggs are sometimes eaten by one bird in a single day as well as the eggs of many other kinds of our most important insect enemies of the forest, garden and orchard. Dr. Weed figures in his bulletin some twigs of various trees upon which the eggs of insects have been deposited. Among these are represented the egg masses of the tent caterpillars and the Fall Canker-worm, both of which are favourite foods of these useful little birds. In addition to eggs or insects, many caterpillars and other stages in the development of insects are destroyed. One interesting figure shows the winter cases of a small caterpillar, closely hidden behind apple buds; these are, in all probability, those of the Eye-spotted Bud-moth, sometimes one of the most troublesome and destructive enemies of the fruit-grower. This bulletin shows much careful work in a field which has been, to a large extent, neglected by entomologists, and Dr. Weed should receive the thanks of all lovers of birds for the proofs which he furnishes of the real benefits we receive from these little favorites. It was pleasing for some people to know and most people to think that these birds were useful, but it is now possible to prove it to all who are willing to learn.—J. F.

SCUDDER'S REVISION OF THE MELANOPLI.

One of the most important works on Entomology which has been issued by an American author in recent years is that entitled a "Revision of the Orthopteran Group Melanopli (Acridiidae) with Special Reference to North American Forms" by Samuel Hubbard Scudder.* It is more important because it deals with a representative North American group of insects whose members, between April and November, leap from our pathway in profusion whether we stroll through open woodland, sunny meadow, or along the roadside, and yet of whose classification and nomenclature the greatest confusion has heretofore existed. It was only another example showing the truth of the old saying: "that the common things around us are those of which we are most densely ignorant."

True, of one of the members of the group, the "Rocky Mountain Locust," *Melanoplus spretus* (Thos.), more has, perhaps, been written than of any other insect on earth, yet it is but one of 207 of its kind which are described at length by Mr. Scudder. The others are scattered far and wide over the continent of North America and the descriptions of the ninety-two species hitherto rightfully known to science were distributed through an almost equal range of literature. No better evidence of the need of the "Revision" is necessary than to know that after a careful examination of nearly 8,000 specimens, 7,000

*Proc. U.S. Nat. Mus., XX., 1897, No. 1124, pp. 1-421. Plates I.-XXVI.

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of which belonged to the single genus *Melanoplus*, the author has in it reduced forty-seven supposed species to synonyms and has established eighteen new genera and described for the first time 115 species.

With a group whose members are so closely kin as those of the *Melanopli* it has heretofore been almost an impossibility for the specialist—let alone the tyro—to satisfy his conscience as to the status of a specimen which he might have in hand. The available literature was so scattered and the different authors had seized upon so many different characters as representing what appeared to them the most striking structural features, that the whole mess was worse than a Chinese puzzle. By seizing upon the variations of the abdominal appendages of the male as the most salient features showing specific rank, and by publishing actual drawings of two different views of the male abdomen of each of the 207 species, Mr. Scudder has done much to render possible the ready identification of each species—a task which otherwise would have been very difficult, owing to the size of the group and the close similarity of many of its members. Analytical keys to genera, and to species where the genus is not monotypic are also given, and add much to the value of the work; as does also the full list of localities from which each species has heretofore been taken.

Taking into consideration its size and importance, the defects of the "Revision" are very few. The one thing which the tyro will find most lacking is a glossary of the technical terms. In a work of the kind these are necessarily numerous, and though they may be plain to the author and to specialists, to the beginner they are often extremely confusing. Even a figure of a typical locust with all the parts named would have been a great aid. A tendency to multiply species can here and there be noted, as on p. 138, where *M. bivittatus* is separated from *M. femoratus* only by the color of the hind tibiae, which is an exceedingly variable character.

More might have been added along ecological lines, but this is a work for the future which the student of the group can now take up with renewed energy. For before one can write of a species he must have a name to handle it by; something which in the case of many of the members of this group has heretofore been lacking. Now, by using a little care and accustoming himself to the technical terms, the student can, by the aid of the "Revision," soon bring order out of chaos and label his *Melanopli* with correctness and despatch. In conclusion, it may be said that any one who will use the work will soon conclude that the aim of the author, "to enlarge and systematize our knowledge of this important group as a basis for future studies," has been well and successfully accomplished.

W. S. B.

A TEXT-BOOK OF ENTOMOLOGY, including the Anatomy, Physiology, Embryology and Metamorphoses of Insects, for use in agricultural and technical schools and colleges, as well as by the working entomologist. By Alpheus S. Packard, M.D., Ph.D. New York: The Macmillan Company, 66 Fifth avenue. 1898. (Price \$4.50.)

The book is primarily divided into three parts. Part I. being devoted to morphology and physiology, Part II. to embryology, and Part III. to metamorphoses. Under these divisions Dr. Packard treats his subject as follows: Position of insects in the animal kingdom. Relation of insects to other arthropoda. Insects (hexapoda). The head and its appendages. The thorax and its appendages. The abdomen and its appendages. The armature of insects. The colors of insects. Muscular system, Nervous system. Sensory organs. Digestive canal and its appendages. Glandular and excretory appendages of the digestive canal. Defensive or repugnatorial scent glands. Alluring or scent glands. Organs of circulation. Blood tissue. Respiratory organs. Organs of reproduction. Development of the egg, larva, pupa and imago. Hypermetamorphism. Summary of the facts and suggestions as to the causes of metamorphism.

The volume contains 729 pages, including a carefully prepared index, 654 figures and numerous valuable bibliographical lists. We certainly have nothing in the way of entomological literature, in this country, that will cover the field of development of insects as will this last work of Dr. Packard. Not only the teacher and student, but the educated men and women of the world at large who may desire to know more of the anatomy,

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physiology and metamorphoses of insects, will find in this work the very aid that is most desired. With this work and some other like Comstock's Manual, any student of ordinary ability can begin at the very foundation of entomology and work his way upward, fully as easily as has heretofore been possible in zoology. The advent of this work certainly marks the trend of entomological studies in America. In future, except in some particular groups, we are to have less species-making and more studies of the development and transformations of those already well known in the adult stage, as well as of their inter-relations with each other and with other organisms about them. We shall not study dried corpses, alone, but life in connection therewith, and the possession of pinned specimens of the adults in our cabinets will only increase our desire to know more of the problems of their existence

F. M. W.

HANDBOOK OF INSECTS INJURIOUS TO ORCHARD AND BUSH FRUIT. By Eleanor A. Ormerod. London: Simpkin, Marshall & Co., Sept., 1898. 8 vo., 286 pp.

The excellent work which has been done for economic entomology by Miss Ormerod, particularly in England, but also in many other parts of the world, is well known to every one. Her valuable annual reports are eagerly looked for every year by all interested in the practical application of the study of insects for the prevention of their injuries to crops. We have just received from this talented authoress another evidence of her unselfish labours for the good of her countrymen. The above named volume is in reality a compendium of the original observations made during the last twenty-one years by Miss Ormerod and her correspondents, together with the latest results and the most approved remedies for the various pests of large and small fruits.

As in all former publications bearing Miss Ormerod's name, the arrangement of the subjects, for convenience of reference, the presswork and the general get-up of the volume, bear the stamp of a most careful and tasteful masterhand. The different fruit crops treated of are: Apple, cherry, currant, gooseberry, medlar, nut, pear, plum, quince, raspberry and strawberry. At the end is a list of the fruit crops infested by insects with the names of the insect infestations; the subjects are arranged alphabetically; and after the name of each tree or crop mentioned in the work the names of each of the infestations to which it is liable in England are classified under subordinate headings as Bark, Blossoms, Fruit, Leaves, Shoots, Wood according to the nature of the attack. The insects are given with their scientific and popular name and so far as possible are arranged together as to kinds, as Aphides, Beetles, Moths, etc., with the number of the page of the detailed observation in the volume. In four instances where the pests are causes of much mischief to several kinds of crops, the infestation appears under its own name. These exceptions are Earwig, Red Spider, Root-knot Eelworm and Wasps.

Particular mention must be made of the excellence of the illustrations which seem to be perfect types of what such illustrations should be in works on insects for the use of practical fruitgrowers.

J. F.

THE BUTTERFLY BOOK, a popular guide to a knowledge of the Butterflies of North America, By W. J. Holland, D. D., Chancellor of the Western University of Pennsylvania, etc., Pittsburg, Pa. One vol. 4to., pp. 382. [Price \$3.00 postage prepaid. Copies may be procured from the Author, or William Briggs, 29-33 Richmond Street, West, Toronto.]

It is with great pleasure that we announce the publication of this beautiful popular book on the Butterflies of North America. Hitherto the vast number of young people who begin collecting insects have had their enthusiasm sorely chilled by their inability to find names for their specimens and have soon given up the pursuit in despair. Now, there need be no difficulty as far as the butterflies are concerned. In the handsome volume before us there are no less than forty-eight beautiful colored plates, produced by a new process from photographic representations of specimens from the Author's cabinets and on them are depicted over a thousand butterflies, belonging to 527 species. The colors are remarkably true to nature and a child should have no difficulty in identifying any specimen that he may capture from the plates alone. In the letter press brief de

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scriptions are given first of the characteristics of the genus, in all its stages, with a wood cut shewing the neuration, and then of each species, setting forth the colours and markings, size, &c., of the butterfly, the early stages where known and the geographical distribution; references are also given to the works of Edwards, Scudder and other authors, where fuller information can be obtained. As an introduction to the work illustrated chapters describe in a popular and interesting manner, the life-history and anatomy of butterflies, how to capture, prepare and preserve specimens, their classification and the principal books that have been published upon them in North America. Interspersed through the volume are short papers for the most part of an amusing character in which the author varies the monotony of descriptive matter by telling some of his experiences or relating some interesting facts regarding these beautiful creatures. We heartily commend the work to our readers and earnestly hope that it may become widely distributed amongst all lovers of nature throughout North America. C. J. S. B.

WILLIAM HAGUE HARRINGTON, F.R.S.C.

One of the excellent portraits prefixed to this volume is that of Mr. William Hague Harrington, one of the ablest entomologists in Canada. He was born at Sydney, Cape Breton, on the 19th of April, 1852, and received his early education first at a private school and subsequently at the Sydney Academy, where he distinguished himself by close application in all the lines of study, and particularly in mathematics. In 1870 he removed to Ottawa and on the 30th of November of that year was appointed to a clerkship in the Post Office Department, where he has remained ever since, gradually rising until now he is chief clerk in the money order branch. Mr. Harrington has always been an enthusiastic naturalist and in 1879 he joined with his friend, Dr. James Fletcher, in the formation of the Ottawa Field Naturalists' Club, and has continued to take an active interest in it ever since. During the same year he was elected for the first time a member of the Council of the Entomological Society of Ontario, and has continued to hold some office in it ever since; in 1884, 5 and 6 and again in 1892 he was its delegate to the Royal Society of Canada; in 1891 Vice-President and from 1893 to 1895 President of the Society; for some years past he has also been one of the Editing Committee of the *Canadian Entomologist*.

Beginning with the year 1879, he has been a regular contributor to these Annual Reports. Among his more important and valuable papers may be mentioned those on Elateridae (1879), Rhynchophora—Weevils (1880), Some Fungi-Eaters (1881), Long-stings, House-flies, Chrysomelidae (1882), Insects affecting Hickory (1883), Saw-flies (1884), Ants, Wasps and Bees (1885), Insects infesting Maple-trees (1886), The nuptials of *Thalessa* (1887), Insects affecting willows (1889), Hymenoptera Parasitica (1890), Notes on Japanese insects (1891), Uroceridae (1893), Notes on Canadian Coleoptera (1894), Winter insects from Swamp-moss (1895) Beetles on Beech (1896), and his Presidential Addresses in 1893 and 4. During all these twenty years he has continually furnished papers of a more technical and scientific character to the pages of the *Canadian Entomologist*, and has described a considerable number of new species of Hymenoptera. His work is so thorough and accurate that it has been awarded the highest praise by those competent to judge.

In 1894 Mr. Harrington was elected a Fellow of the Royal Society of Canada. He is now in the full maturity of his powers, and, if his life be spared, we may feel sure that the coming years will continue to bear fruit and that Entomological Science will be enriched by the outpouring of his accumulated stores of learning, experience and observation.

JOHN DEARNESS.

The other portrait at the beginning of this volume is an excellent likeness of Mr. John Dearness, Inspector of Schools for East Middlesex, President of the Ontario Educational Association, member of the Educational Council for the Province, and from 1895 to 1897 President of the Entomological Society of Ontario. Mr. Dearness was born at Hamilton, Ontario, in 1852, his parents having come to Canada from the Orkney Islands. His early years were spent on a farm near St. Marys, where no doubt he imbibed in his youthful days the love of natural history which he has cherished ever since. His primary education was obtained at the local schools, from which he proceeded to the Provincial Normal School; there he greatly distinguished himself throughout the course and left with the highest honors and certificates. He at once began his professional work as the teacher of a cross-roads log schoolhouse in the country, but was soon promoted to be principal of a village school and then of a town school; after a brief period in a high school he was appointed to the important position of inspector in 1874, having gone through all these gradations of scholastic work in the marvellously short space of three years. He has now been performing the duties of an inspector for nearly quarter of a century, and is also Lecturer on Botany and Zoology in the Western University of Ontario at London. He was one of the editors of the series of "Royal Canadian Readers," and in 1896 was appointed a member of the first Educational Council of this Province.

Though his life has been so fully devoted to educational work, Mr. Dearness has yet found time for the practical study of natural science, especially of mycology, and has applied his leisure hours to the formation of a collection of fungi, which is unsurpassed in Canada, containing as it does a very large number of species new to science. For many years he has taken a warm interest in the Entomological Society of Ontario and since 1892 has held an official position upon its Council as Director, Vice-President and President. His addresses when filling the presidential chair have been published in these Annual Reports and must be familiar to our readers; they treat to a large extent, as might naturally be expected, of the educational value of natural history and the methods by which the study of insects can be successfully introduced into country schools. His scientific writings, however, have consisted for the most part of papers read before the Microscopical and Botanical Sections of the Society and have treated of toadstools and mushrooms rather than of bugs and butterflies. Being of the same age as Mr. Harrington and full of health and vigor, we may form similar expectations of his future work in his chosen fields of both science and education.

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AN ACT TO FURTHER IMPROVE THE SAN JOSE SCALE ACT.

Assented to April 1st, 1899.

Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

1. This Act may be cited as *The San Jose Scale Amendment Act*.

Short title.

2. Section 7 of *The San Jose Scale Act, 1898*, is hereby amended by adding the following sub-section:

61 V. c. 33, s. 7 amended.

(a) If, in the case of an orchard or collection of plants, the inspector finds scale on plants located in several different parts of the orchard or collection, and decides that it is advisable in the public interest to destroy all the plants in such orchard or in any part or parts thereof and so reports to the Minister, the Minister may direct that an examination or inspection shall be made by an additional inspector, and upon their advice in writing he may direct that all the plants in such orchard or such collection of plants or in such part or parts thereof shall be destroyed without requiring that every plant in the said orchard or collection shall be first examined.

Destruction of diseased plants.

3. The owner or proprietor of any nursery shall not send out or permit any plant to be removed from his nursery without the same being first fumigated by hydrocyanic acid gas in accordance with regulations prescribed by order of the Lieutenant-Governor-in-Council.

Plants to be fumigated before leaving nursery.

4. No person shall sell or dispose of or offer for sale any plant obtained, taken, or sent out from a nursery unless the said plant has previously been fumigated in accordance with these regulations.

Sale of plants before fumigation prohibited.

5. In case the inspector finds scale in any nursery and so reports to the Minister, the Minister may thereupon inform, by writing, the owner or proprietor or manager of said nursery of the existence of scale in his nursery, and the owner or proprietor or manager of said nursery shall not thereafter permit any plant or plants to be removed from the said nursery until he is notified in writing from the Minister that the inspector has reported to the Minister that it is safe in the public interest to permit the said nursery stock to be removed after fumigation.

Scale in a nursery—stock not to be removed without leave of Minister.

6. This Act and *The San Jose Scale Act, 1898*, shall be read and construed as one Act.

Act incorporated with 61 V. c. 33

(For the San Jose Scale Act, 1898, see Report of 1897)

REGULATIONS FOR THE FUMIGATION OF NURSERY STOCK.

Toronto, April 7th, 1899.

The following regulations have been prescribed by Order of the Lieutenant-Governor in Council in accordance with the provisions of the San Jose Scale Amendment Act, passed April 1st, 1899 :

1. Fumigation must be carried on in a box, room, compartment, or house suitable for the purpose, which must be air-tight and capable of rapid ventilation. The owner or proprietor will notify the Minister as soon as preparation for fumigation is complete. The Minister will thereupon order an inspection of the fumigation appliances. No fumigation under the Act is to be carried on until such inspection has been made and a satisfactory report sent to the Minister.

2. The Inspector, after examining and measuring the box or house, or other compartment in which fumigation is to be carried on, will prescribe the amounts of material to be used for every fumigation, and the instructions as to the same must be carefully followed out. The Inspector may, if thought advisable, supply the material for each fumigation in weighed packages.

3. The fumigation house (which shall include all apparatus or appliances used in the fumigation, such as generators, etc.) is to be subject to the orders of the Minister on the recommendation of the Inspector. Subject to the approval of the Inspector the fumigation house may be on other lots than those on which the nursery stock are growing.

4. The fumigation is to be by hydrocyanic acid gas produced according to the instructions of the Inspector and from such formulas as he prescribes for the purpose.

5. The fumigation is to be continued for a period of not less than forty-five minutes. After the expiration of this time or longer, and when fumigation is complete, the house is to be thoroughly ventilated for fifteen minutes at least.

6. No person is to be allowed to enter the fumigating house until after the ventilation period has expired. Entering before may prove injurious, if not fatal, as the gas is a deadly poison.

7. The fumigation of buds and scions may be done in fumigation boxes of not less than thirty cubic feet capacity, the same to be subject to inspection and approval.

8. Immediately after inspection of the fumigation house, the Inspector will report to the Minister, and the Minister or the Inspector will thereupon give permission in writing for the owner or proprietor to begin fumigation.

9. The owner or proprietor of every nursery will attach to every box and to every package of nursery stock a certificate as follows, and he will furnish every purchaser who so desires a copy of the same.

CERTIFICATE OF FUMIGATION.

This is to certify that this package of nursery stock consisting of.....
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