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SEVENTEENTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO.

1886

Printed by Order of the Legislative Assembly.



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PRINTED BY WARWICK & SONS, 26 & 28 FRONT STREET WEST.

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 Agrotis C-nigrum
 Alaus oculus . . .
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 " cognata
 Amphion nessus . . .
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 Anisota rubicunda.
 Annual Address of
 " Meeting of
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 Annual Report of
 " Statement
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 Ant Lions
 Apatela Americana
 Aphides, Unusual
 Aphis aceris
 " mali
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 Apple-tree borers .
 " plant lous
 Army worm

 Bacon beetle
 Bark lice
 Basket-worms
 Bean maggot
 " weevil
 Bed-bug
 Beginning an acqu
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 Bellamira scalaris .
 Bethune, Rev. C. J.
 Blissus leucopterus
 Book notices

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To the Honourable

SIR,—I have the
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10th, 1886, when th
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ANNUAL MEET

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London, Ontario, on

The Vice-Presid

Present: Mr. J

W. Fyles, South Que

Dr. J. R. White, To

Dr. Woolverton, M

Mitchell, of London,

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SEVENTEENTH ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY.

To the Honourable the Commissioner of Agriculture :

SIR,—I have the honour to submit herewith for your consideration the Seventeenth Annual Report of the Entomological Society of Ontario, prepared in accordance with the provisions of our Act of Incorporation.

The Society held its annual meeting in the City of London on Wednesday, October 10th, 1886, when the officers for the ensuing year were elected, and the ordinary business of the Society transacted.

I also submit herewith the minutes of the annual meeting and the audited annual financial statement of the Society.

The publication of the *Canadian Entomologist*, now in its nineteenth year, is regularly maintained.

I have the honour to be, Sir,

Your obedient servant,

EDMUND BAYNES REED,
Secretary-Treasurer.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The annual meeting of the Society was held pursuant to notice in the Society's rooms, London, Ontario, on Wednesday, October 20th, 1886, at 8 o'clock.

The Vice-President, Rev. C. J. S. Bethune, M.A., D.C.L., of Port Hope, in the chair.

Present : Mr. James Fletcher, Ottawa ; Mr. J. Alston Moffatt, Hamilton ; Rev. Thos. W. Fyles, South Quebec ; Mr. A. W. Hanham, Hamilton ; Capt. Gamble Geddes, Toronto ; Dr. J. R. White, Toronto ; Mr. J. M. Denton, Mr. J. Bowman, Dr. Burgess, Dr. Arnott, Dr. Woolverton, Mr. H. P. Bock, Mr. Laurence Reed, Mr. Werner, Dr. Wishart, Dr. Mitchell, of London, and the Secretary-Treasurer, Mr. E. Baynes Reed.

The minutes of the previous meeting having been printed and circulated among the members, their reading was dispensed with, and they were duly confirmed.

The Secretary read a letter from the President, Professor Saunders, regretting his inability to be present at the meeting, and stating that he would be unable to continue in active participation in the work of the Society, or to act as Editor of the *Canadian Entomologist*, inasmuch as he had accepted the Government appointment of Director of the Experimental Farm Stations, and consequently the whole of his time would necessarily be fully occupied.

The report of the Council, the audited financial statement of the Secretary-Treasurer, the report of the Librarian, the report of the Delegate to the Royal Society of Canada, and the report of the Delegates to the American Association for the Advancement of Science, were laid before the meeting, and on motion duly received, discussed and adopted.

The report of the Montreal Branch was read by the Secretary and ordered to be printed in the Annual Report.

REPORT OF THE COUNCIL FOR 1886.

The Council are able to report progress in the work which has been so long and successfully carried on by the Society.

The *Canadian Entomologist* has been issued as usual, and the high character of its articles fully maintained.

As stated at the last annual meeting the Society, in compliance with the request of the Dominion Government and with the cordial approval of the Provincial Government, prepared and sent to England their whole collection of Canadian insects, to form part of the Indian and Colonial Exhibition.

The collection contained some ten thousand insects representing the various orders.

They reached their destination in safety and have been well taken care of.

The Council desire to express their thanks to those members of the Society who gave so much time and assistance in preparing and arranging the collection, especially mentioning Mr. J. Alston Moffat, of Hamilton, Mr. W. H. Harrington, of Ottawa, and Mr. F. B. Caulfield, of Montreal.

A number of electrotypes of insects not hitherto figured have been procured for the illustration of the annual reports. These have been drawn and engraved from specimens in the Society's collection.

During the spring of this year a Farmers' Institute was organized in the County of Middlesex, and the Council thought it proper that the Society should be represented thereat, and accordingly Messrs. Denton and Reed attended the meeting and gave information on entomological matters of interest.

It is with deep regret that your Council has to announce that their esteemed President and Editor is compelled to withdraw from active participation in the work of the Society, owing to his having accepted the onerous duties of the Director of the Experimental Farm Stations.

The Council, while congratulating Professor Saunders upon this recognition of his abilities and zeal in the public service, would desire that the Society should place on record their appreciation of the valuable services which, for a period now extending over a quarter of a century, he has rendered to the cause of scientific and economic entomology, and they would suggest the propriety of making Professor Saunders a life member of the Society.

The Council further suggest that all ex-presidents be members *ex-officio* of the Council of the Entomological Society.

The report of the Montreal Branch will be submitted in due course.

The Society was duly represented at the meeting of the American Association for the Advancement of Science at Buffalo, and a report of the delegation will be presented.

The report of the Secretary-Treasurer is submitted herewith.

Presented on behalf of the Council,

E. BAYNES REED,
Secretary-Treasurer.

LONDON, Ont.,
October 20th, 1886.

ANNUAL STATEMENT ENTOMOLOGICAL SOCIETY

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London, Ont., Oct. 1

REPORT OF THE

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ANNUAL STATEMENT OF THE SECRETARY-TREASURER OF THE
ENTOMOLOGICAL SOCIETY OF ONTARIO FOR THE
YEAR ENDING OCTOBER 18th, 1886.

Receipts.

Balance from previous year	\$ 265 35
Members' fees, sale of <i>Entomologist</i> , etc	199 37
Provincial grant, 1886	1,000 00
Collectors' material—pins, cork, etc	44 13
Interest on Savings' Bank account	7 28
Dominion grant for Colonial and Indian Exhibition.....	300 00
	\$1,816 13

Disbursements.

<i>Canadian Entomologist</i> , printing, paper, stationery, etc	\$423 12
Library account	250 61
Expenses of report for 1885, including engraving, electrotyping and wood-cuts	189 35
Annual vote to Editor and Secretary	175 00
Rent	80 00
Caretaker	10 00
Collectors' material—pins, cork, etc	115 20
Insurance	41 25
Expenses preparing collection for Colonial and Indian Exhibi- tion, Insurance, etc.....	353 00
Sundries, postage, telegrams, fuel, etc	41 33
Expenses of delegation to A. A. S., Buffalo.....	36 70
Balance	100 57
	\$1,816 13

We certify that we have examined the above account with books and vouchers, and found the same to be correct. Balance in hand and in bank, one hundred dollars and fifty-seven cents.

H. P. BOCK,
W. E. SAUNDERS, } Auditors.

London, Ont., Oct. 18th, 1886.

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

As delegate from the Entomological Society of Ontario, I have much pleasure in announcing that the Society which I have the honour to represent, continues its labours with undiminished energy and success. Its membership is large, and it is everywhere recognized as one of the most important scientific institutions of the country.

Its monthly publication, the *Entomologist*, continues to receive the support of, and to be welcomed by Entomologists of all places, and Vol. XVII. for 1885 is a most valuable addition to the recorded knowledge of American insects. The contributors to this volume, forty in number, include the leading Canadian workers, and many of the best known entomologists of the United States. A complete set of the *Entomologist* and of the Annual Reports will be found to contain a vast store of information in regard to the structure, classification, distribution and habits of our insect foes and friends.

Saunders, regretting his
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Editor of the *Canadian*
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YNES REED,
Secretary-Treasurer.

The title "Entomological Society of Ontario," might lead many to suppose that its work was limited to this Province, but in reality it is carried on by members in all parts of the Dominion, from Prince Edward Island to British Columbia. The fauna of the latter province, and of the North-West Territories, has been investigated during recent years by several experienced collectors, and large additions have been made to Canadian lists, and many new species discovered in the several orders of insects.

Through the contributions of members, the collection maintained by the Society has rapidly increased in size and value. By special request of the Dominion Government this collection has been sent to the Colonial Exhibition just opened in London. It was first carefully re-arranged by members having special knowledge of the various orders, and was much improved by having a large proportion of the old specimens replaced by fresh material, and by having a large amount of new material incorporated. The collection, as thus arranged and enlarged, fills over one hundred large cases, and will undoubtedly favourably impress all beholders with the great number and variety of our insects.

The Society has learned with pleasure that a competent Entomologist is proposed to be employed in connection with the Experimental Farm to be started for the investigation of scientific agriculture. Such an officer is a decided essential, and his duties will be, to quote from Prof. Saunders' Report to the Department of Agriculture, "to investigate the habits of insects destructive to farm and garden crops, fruit, etc., as well as those affecting animals, with a view of testing such remedies as may be available for their destruction. He should also prepare such collections for the museum at the Central Station as would illustrate the insects injurious and beneficial to vegetation, and duplicate collections of a similar character as early as practicable for each of the sub-stations."

In this connection it may be stated that Mr. Fletcher, who is at present acting as Honorary Entomologist to the Department of Agriculture, has, under exceptionally unfavourable conditions, and without being able to devote his time to the work, or to employ needed assistance, published a Report containing a large amount of information about the insects which were found to be most injurious during the past year. The Report is based upon his personal observations in different sections and upon voluminous correspondence from all parts of the Dominion. It is an earnest of what might be accomplished by an Entomologist having the necessary equipment and assistance to prosecute and record investigations.

Fortunately neither from Mr. Fletcher's Report, nor from that of the Entomological Society, do we find that any especially destructive new pests were met with during the past year. Nor were some of the old ones so abundant and devastating as formerly. The ravages of the Larch saw-fly (*Nematus Erichsonii*), and of the Spruce bud-moth (*Tortrix fumiferana*) shows signs of decrease. The Clover-seed midge (*Cecidomyia leguminicola*), continued to do serious injury over extended areas, but if farmers will act upon the suggestions which have been made in our reports regarding the cultivation of this crop, they can harvest a good yield of seed.

Two of the most destructive insects in Canada for many years past have been the Codling-moth (*Carpocapsa pomonella*), and the Plum-curculio (*Conotrachelus nenuphar*), the former destroying or injuring probably one-fifth of our apple crops, and the latter, often causing a total failure of the crop of plums. Numerous remedies have been proposed and employed against these pests, but the labour required was in each instance considerable, and the results were scarcely ever entirely satisfactory. Experiments made during recent years by our members have, however, proved that Paris Green is an efficient and practicable remedy, when mixed with water and sprayed upon the trees as soon as the flowers have been fully fertilized.

These facts are mentioned by me in order that a knowledge of them may be distributed by the Fellows of your Honourable Society and by the Delegates attending this meeting.

The loss to the country occasioned by the ravages of insects upon crops of all kinds, is so enormous that it becomes the duty of every Society interested in Natural History or the Economic Sciences to do what may be in its power to enable agriculturists to combat their small but numerous foes, and thus add to the prosperity of the country.

May, 1886.

W. HAGUE HARRINGTON,
Delegate.

MONTREAL

The thirteen
G. J. Bowles, Esq.

The President

The Council
Seven meetings

been read:—

1. Insects of
2. On *Physc*
3. *Euchaetes*
4. On the l
5. Notes on

F. B. Caulfield.

6. The *Cato*
7. Notes for
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Orthopter
Diptera .
Neuropte
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MONTREAL BRANCH—ENTOMOLOGICAL SOCIETY OF ONTARIO.

The thirteenth annual meeting of this Branch was held at the residence of the President, G. J. Bowles, Esq., on Tuesday, May 25th, 1886, at 8 o'clock p.m.

The President read the following report of the Council for the year:—

The Council beg to submit the Thirteenth Annual Report of the Branch.

Seven meetings have been held during the year, at which the following papers have been read:—

1. Insects of Canada and Norway.—G. J. Bowles.
2. On *Physonota unipuncta*, Say, and its supposed varieties.—F. B. Caulfield.
3. *Euchaetes egle* and its white variety.—G. J. Bowles.
4. On the hibernation of *Formica herculeana*.—G. J. Bowles.
5. Notes on some species of *Silphidae* occurring in the vicinity of Montreal.—F. B. Caulfield.
6. The *Catocalas*.—G. J. Bowles.
7. Notes for 1885 on injurious and other insects.—J. G. Jack.
8. Notes on *Ceresa bubalus*, the Buffalo Tree-hopper.—J. G. Jack.
9. Notes on the *Zyganidae*.—G. J. Bowles.
10. On some collecting grounds in the neighbourhood of Montreal.—F. B. Caulfield.
11. List of *Orthoptera* taken in the vicinity of Montreal.—F. B. Caulfield.

Of these papers, Nos. 1, 3, 4, 6 and 7 have been published in the *Canadian Entomologist*, and No. 5 in the Society's Annual Report for 1885.

Your Council have much pleasure in stating that the meetings have been well sustained, and that a number of species have been added to our local list.

The *Hemiptera* have been taken up by Mr. Bowles, and a number of species identified, and the *Orthoptera*, through Mr. Caulfield's exertions, have been increased from six species to thirty.

The number of species added to the Montreal lists during the year is as follows:—

Lepidoptera.....	81
Coleoptera.....	142
Hymenoptera.....	5
Orthoptera.....	24
Diptera.....	15
Neuroptera.....	10
Hemiptera.....	15
Total.....	292

Which, added to the list of last year, makes the total number on the Montreal list 1,395, divided as follows:—

Lepidoptera.....	565
Coleoptera.....	581
Hymenoptera.....	104
Orthoptera.....	30
Diptera.....	74
Neuroptera.....	22
Hemiptera.....	19
Total species.....	1,395

While congratulating the Society upon the work accomplished during the year, your Council would remind the members that much still remains to be done, even in the favourite orders *Lepidoptera* and *Coleoptera*. In the former, the *Micros* have been almost entirely neglected, and special attention should be given to these and to the early stages of all the families. In *Coleoptera* the number of *Dytiscidae* and the smaller *Carabidae* might,

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ned by the Society has inion Government this London. It was first various orders, and was ens replaced by fresh ed. The collection, as and will undoubtedly of our insects.

nologist is proposed to d for the investigation his duties will be, to re, "to investigate the well as those affecting for their destruction. tral Station as would icate collections of a

is at present acting as , under exceptionally ie to the work, or to amount of information past year. The Report on voluminous corres- might be accomplished nce to prosecute and

of the Entomological met with during the ing as formerly. The ce bud-moth (*Tortrix lomyia leguminicola*), rs will act upon the ultivation of this crop,

s past have been the otrachelus nenuphar), s, and the latter, often ve been proposed and instance considerable, s made during recent ficient and practicable a as the flowers have

sm may be distributed tending this meeting. on crops of all kinds, in Natural History or riculturists to combat country.

HARRINGTON,
Delegate.

with a little work, be largely increased, and the food habits of our wood-boring beetles would well repay investigation. In the remaining orders a beginning only has been made, and there is a vast and almost unworked field before us.

Your Council would therefore urge upon the members the necessity of continued zeal and energy in carrying out the pleasant task of working up the insect fauna of our district.

The whole respectfully submitted,

GEORGE JOHN BOWLES,
President.

The report having been adopted, the election of officers took place, with the following result:—

G. J. Bowles, President; H. H. Lyman, Vice-President; F. B. Caulfield, Secretary-Treasurer; J. G. Jack, W. H. Smith, W. D. Shaw, J. F. Hausen, Council.

The President read a paper on the "Cotton moth" (*Aletia argillacea*), giving its history up to date, with a record of its occurrence north of the cotton belt.

Mr. Lyman showed some rare *Lepidoptera* taken at Hudson's Bay by Dr. Robert Bell.

The President showed a number of Canadian *Lepidoptera* and *Coleoptera*, after which the meeting adjourned.

F. B. CAULFIELD,
Secretary.

In the absence of the President, his Annual Address was read by the Secretary.

ANNUAL ADDRESS OF THE PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

GENTLEMEN,—It is seldom that a season passes in Canada with so little to record in reference to the injuries caused by destructive insects. Not only have we been favoured by a kind Providence with a bountiful harvest, but our farmers have in great measure been free from the losses which usually occur from insect pests.

The Colorado potato beetle, *Doryphora decemlineata*, has proved destructive to potato vines in a few localities, and where the application of the usual remedies has been neglected or too long delayed, they have destroyed the foliage to such an extent as to injure the crop; but where the use of Paris green has been promptly resorted to no difficulty has been experienced in keeping this pernicious insect within due limits.

The Plum Curculio, *Conotrachelus nenuphar*, has been far less prevalent than usual, so that in many instances good crops of plums have been secured, even where no efforts have been made to keep the insect in subjection. The plum crop generally has been a good one and plum culture has consequently received a considerable impetus.

The worm of the Cabbage butterfly, *Pieris rapæ*, although still plentiful, is no longer the terror to cabbage growers it formerly was, its natural enemies having multiplied to a degree sufficient to keep it within some reasonable degree of subjection. The general immunity which has of late prevailed regarding the pea-weevil, *Bruchus pisi*, still continues and pea culture has become more general. Even the codling-worm, that perennial plague to the apple grower, has been less injurious than usual, so that our apple and pear crops have been freer than common from this obnoxious insect. Indeed there seems to have been a general scarcity of insect life during the past season, of which collectors in this department of natural history in Canada generally complain.

Our large and important crops of cereals have been almost entirely free from insect pests, but this experience has not by any means been universal. In the mother country much consternation has been caused of late by the sudden appearance of the Hessian fly in the wheat fields in considerable force, so that very serious injury has occurred in many quarters. When first noticed specimens of the infested grain were submitted to Miss Eleanor A. Ormerod, Consulting Entomologist to the Royal Agricultural Society, who at once divined the cause, found the linseed-like chrysalis in the wheatstalks and promptly

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suggested the usual remedies for this trouble; advice which, if persistently followed will, no doubt, soon reduce the numbers of the insects to about their normal proportion. Mr. Whitehead also has been actively engaged in investigating this important subject and in disseminating information among farmers.

Having been absent in Europe during the spring and early summer months, I have been unable to give the usual attention to Entomological subjects. While in England I had the privilege of seeing several fine collections of insects, but none gave me more pleasure in inspecting than that of the immortal Linnæus, the results of whose painstaking work is carefully preserved in the library of the Linnean Society. Through the kindness of Dr. James Murie, the librarian, I was permitted to inspect this interesting cabinet, where every specimen bears evidence of having been mounted and named by this great master in natural history. One could not help dwelling in thought on the marvellous progress which has attended the study of natural science, since the master mind of this wonderful genius was brought to bear on the simplification of its nomenclature.

Every facility was also afforded me for examining the marvellously complete collections of insects in the natural history department of the British Museum in Kensington, under the kind guidance of Messrs. Butler and Kirby. Both these gentlemen did all in their power to make my visits to that institution both pleasant and profitable, and showed me many kindnesses which will never be forgotten. The collections of butterflies here are especially wonderful in their completeness. Take for instance the species composing the genera *Pieris* and *Colias*, and beginning with the plain ground colour of white or yellow, one can trace the black bordering of the wings through all the different gradations from the faintest marginal outline to the heaviest and widest bands, and the transition is so gradual that it is extremely difficult to say where one species ends and another begins.

While passing through the extensive grape-growing regions in the south of France, a sharp eye was kept on the vineyards with the view of detecting evidences of *Phylloxera*. I am pleased to report that I saw but few indications of its presence, and from enquiries made, the conclusion was reached that this insect pest which, a short time ago, was so exceedingly destructive to the vine-growing interests, is now doing comparatively little harm. It was the occasion of much regret that the limited time at my disposal would not permit me to visit any of the noted collections of insects to be found in most of the large cities in Europe.

While in London an opportunity was afforded me, which I gladly availed myself of, that of visiting the South Kensington Museum, in company with Miss Ormerod, and of inspecting the work of that talented lady as displayed in the cases of insects mounted, and the preparations made by her to illustrate the life history of injurious insects and depict their ravages, forming a most interesting and complete series of object lessons in this important economic department of entomological science. I was also present at one of the monthly meetings of the Entomological Society of London, where I had the good fortune to meet many entomologists of note, including the venerable Professor Westwood, H. T. Stainton, Esq., Mr. McLachlan, and others. All treated the stranger with the greatest possible courtesy and kindness, and at the same time manifested the warmest interest in everything relating to the progress of entomology in Canada.

During the past year there have appeared several important works on economic entomology, prominent among which may be mentioned the reports from the Entomological Bureau of the Department of Agriculture at Washington, under the direction of Professor C. V. Riley, and the report of Professor J. A. Lintner, State Entomologist of New York. In both these publications are recorded a number of useful observations and many new facts relating to the life history and habits of the species treated of. Among other important works on entomology may be mentioned the continuance of that magnificent work on the "Butterflies of North America," by W. H. Edwards, and a volume on the "Butterflies of the Eastern States," by G. H. French, of Carbondale, Illinois.

At the recent meeting of the Entomological Club of the American Association for the Advancement of Science, held in Buffalo, N. Y., our Society was represented by the President, Vice-President, Secretary, and Mr. J. Alston Moffat. Our Society was honoured in the election of our Secretary, Mr. E. Baynes Reed, to be Secretary of the Club. The local members did all in their power to make the gathering a pleasant one, and in addition to

the ordinary meetings, special entomological excursions took place which were much enjoyed by all. The collections of the several members residing in Buffalo, and the fine library belonging to the Society of Natural Sciences, were freely opened to the visiting members.

The entomological collections in the American National Museum at Washington are being rapidly augmented under the energetic direction of the Curator, Mr. John B. Smith. The valuable private collections which have been acquired, added to the large amount of material constantly accumulating and being rapidly arranged, have already made it a most valuable collection of reference.

In accordance with a request made by the Minister of Agriculture for the Dominion, the valuable collection of our Society was specially prepared for exhibition during last winter, and forwarded early in the spring to the Colonial and Indian Exhibition in London, where it has been an attractive object to visitors throughout the summer. In the work of preparation most valuable aid was rendered by one of our esteemed fellow members, Mr. J. Alston Moffat, who devoted many weeks of consecutive labour to this end. Mention should also be made of the valuable aid rendered by our esteemed Secretary-Treasurer, Mr. E. Baynes Reed, and of his son Lawrence, also of a member of our Council, Mr. J. M. Denton, for it is to the combined efforts of these several individuals that our great success has been mainly due.

In bringing these brief remarks to a close, I desire to refer to the pleasure it has given me during many years past to fill to the best of my ability the post of honour in which, year after year, you have been pleased to place me. Public duties of an important character, which I have recently undertaken, will, from this time forward, necessarily engross all my time, and in case my name should be mentioned again in connection with the position of President, I beg to state frankly that I shall be no longer able to serve you in this capacity. I regret also that I shall be compelled to relinquish the work of editing the *Canadian Entomologist*, a position which I have long filled with much pleasure to myself and, I trust, with some acceptance to the Society. In taking leave of the many kind friends who have rendered so much assistance to our journal by their valued contributions, I would, while sincerely thanking them for past favours, bespeak for my successor a continuance of their kind services.

With many thanks for all past favours,

I have the honour to be,

Your obedient servant,

WM. SAUNDERS.

Moved by Mr. Fletcher, seconded by Rev. Thos. W. Fyles,

That the society learns with regret that their esteemed friend, Prof. Saunders, has found it necessary to withdraw from the Presidency of their body, and also from the Editorship of their organ, *The Canadian Entomologist*; but recognizing the importance of the work Prof. Saunders has been called upon to superintend, and the wisdom of the choice made in him by the Government, it congratulates the Professor upon this recognition of his abilities and zeal in the public service, and respectfully tenders to him a Life Membership in the society.

The resolution was carried unanimously by a standing vote.

ELECTION OF OFFICERS.

The following named gentlemen were duly elected as officers of the Society for the ensuing year:

President.—James Fletcher, Ottawa, Ont.

Vice-President.—Rev. C. J. S. Bethune, M.A., D. C. L., Port Hope, Ont.

Sec.-Treas. and Librarian.—E. Baynes Reed, London, Ont.

Council.—V. Moffat, Hamilton

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Council.—W. H. Harrington, Ottawa; Rev. T. W. Fyles, Quebec; J. Alston Moffat, Hamilton, Ont.; G. J. Bowles, Montreal; J. M. Denton, London, Ont.

Editor "Canadian Entomologist."—Rev. C. J. S. Bethune, Port Hope.

Editing Committee.—Wm. Saunders, Ottawa; J. M. Denton, E. Baynes Reed, London, Ont.; Capt. Gamble Geddes and Dr. White, Toronto.

Auditors.—W. E. Saunders, H. P. Bock, London.

Delegate to Royal Society.—W. H. Harrington, Ottawa.

On motion of Mr. E. B. Reed, seconded by Mr. A. W. Hanham, the Society resolved that all ex-Presidents of the Society be ex-officio members of the Council.

Rev. Mr. Bethune, and the Sec.-Treas., gave a report of the meeting of the Entomological Club of the A. A. A. S., at Buffalo, which they had attended.

Dr. White introduced the question as to whether the interests of the Society would be better served by making its headquarters at Toronto, where possibly a larger work might be carried on than in London; his idea being that by lectures on economic entomology in the different educational institutions the science might be brought forward more prominently, and thus attract greater attention from students.

Capt. Geddes, also of Toronto, while agreeing in the main with the previous speaker, suggested that Toronto should first form a branch society, and thus manifest an interest in entomology, which would bring its claims more prominently before the people and scientific gentlemen.

Mr. Fyles thought, without drawing any comparison between the two cities, Toronto and London, that London, as the centre of one of the most important farming sections of the Province, was a more appropriate locality for the headquarters of the Society than Toronto.

Mr. Reed was glad when any subject was discussed that would tend to widen the usefulness of the Society. The main object of the formation of the Society was to promote the knowledge of practical entomology among the farming community, while at the same time the Society was gradually doing good work in the prosecution of the more scientific portion of the study. He thought the above-named object was better served by keeping the Society in its present condition than it would be by any alteration in its scheme of working in a more purely dry scientific direction.

Rev. C. J. S. Bethune felt that the right nail was struck on the head by Capt. Geddes in proposing that a branch be formed in Toronto. He suggested that Capt. Geddes and Dr. White endeavour to form a branch there. He thought the removal hardly practicable, and the Society would never consent to be merged into any other society. He understood that many gentlemen in Toronto were willing to help on the scheme of lectures, which should, he thought, aim rather at interesting the outside public than at the instruction of advanced students. The matter might be left in the hands of the Editing Committee and the Council to make an effort to start them.

Mr. E. B. Reed thought that the Government might be induced to give a grant in addition to the one already received to assist these lectures.

Dr. White was in favour of getting the study introduced in the educational system of the Province.

Dr. Wolverton spoke in favour of keeping the headquarters in London until Toronto had as large or a larger society. While Toronto was the seat of learning there were too many other institutions there, and amongst them the Entomological Society would dwindle down to almost nothing.

Mr. J. M. Denton reminded the meeting that the London people had made the collection, and the library, such as it was, and so far this city was the leading centre in this respect.

On motion of Mr. Denton, seconded by Dr. Wolverton, Dr. White and Capt. Geddes were requested to obtain all necessary information respecting public lectures on entomology under the auspices of the society, and to report to the Editing Committee at their earliest convenience.

Mr. E. B. Reed read a letter from Miss E. A. Ormerod, Consulting Entomologist to the Royal Agricultural Society of England, thanking the Society for a copy of their sixteenth annual Report, and referring to the discovery of the Hessian fly in England.

Rev. T. W. Fyles read a short paper on a saw-fly larva, *Hylotoma dulciaria*, which he found attacking the foliage of the white birch in Quebec.

At 11.30 p.m. the meeting adjourned to the following morning.

The meeting re-assembled Thursday at 10 a.m.

Mr. A. W. Hanham read a paper "on the Stridulation of *Geotrupes Blackburnii*."

Capt. G. Geddes read a paper "Notes on the Genus *Colias* in the *imago* or perfect state."

Mr. Fletcher thought it possible that *C. Hagenii* is a tetramorphic form of *C. Eurytheme*, and made further remarks on Capt. Geddes's paper.

Capt. Geddes asked if *Argynnis chariclea* and *Argynnis Boisduvallii* had been taken east of the Rocky Mountains in Canada.

Mr. Fletcher said that *A. chariclea* had been taken at Neepigon and Hudson's Bay.

THE HOME OF CHIONOBAS JUTTA.

BY THE REV. T. W. FYLES, SOUTH QUEBEC.

Rev. T. W. Fyles read the following paper on "The Home of *Chionobas Jutta*."

To the north-west of Bergerville, in the vicinity of Quebec, lies a tract of country known as the Gomin Swamp. It derives its name from a French physician and botanist, who, 200 years ago, took up his residence in that locality, to study its flora, which is remarkably rich. I was informed, some time since, by the President of the Montreal Branch of our Society, that the Gomin Swamp was the only known place, in the immediate neighbourhood of Quebec, in which *Chionobas Jutta* could be found. He furnished me with a pen-and-ink map of the approaches to the swamp, and, very accurately, named the time of the appearance of the insect as that from the first to the fifteenth of June. The weather being particularly favourable, on the 31st of May, of the present year, I set out on an exploring expedition, accompanied by a gentleman from England who was visiting me. Following the directions given me we found the place. It is skirted by a thick and tangled growth of scrub, through which a few cattle-tracks lead into the swamp itself. Which of these tracks to choose we did not know, for time and changes had made some confusion in the land-marks. We asked a "canny Scot," who happened by, to tell us what to do; but he would not venture an opinion. Indeed, he seemed to think it *infra dig.* to be questioned on such a trivial matter. We then applied for information to two children of the Emerald Isle—father and son—who, with the ready kindness of their race, were profuse in their directions. Unfortunately they differed in opinion—the council was divided. In questions of locality, it is always wise to take the opinion of the bird's-nesting, hare-and-hounds part of the community, so we chose the route pointed out by the son. But what a route! I began to despair for my English friend's immaculate broadcloth at the very outset; and, the further we went, the worse we found it, until we were—I was going to say *landed*—but, until we were *fairly swamped* in the swamp itself. Did you ever experience the pleasant sensation of sinking deep in sphagnum, and feeling the cold marsh water ooze over the tops of your boots, and churn and gurgle between your toes? Gloomy thoughts oppressed my mind, as I looked at my friend, of the traveller in Ireland, who found a hat on the surface of the bog he was crossing, and, lifting it, found a head beneath, at which he tugged by the hair, until he brought up a man, who coolly asked him to bear a hand for his horse was below. My first thought was to place my companion in a position of safety. I looked round, and noticed in the

distance a growth we had to reach and their appearance we reached our goal owners of the larvae proceeded to refrain with the swamp. *C. Jutta*. Reliefs. What was the rosy flowers

The clustered plants botanist, Dr. Salisbury's slipper, *C. brown* object and noticed the motto "I have it," captured another insect—ac King Bird, *Tyrone* and twisting, captured men rewarded in good fortune to the footing that ever that day. I rejected possessed by the Captain George Mr. W. H. Edwards

Mr. Lawrence

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distance a growth of young birches, which seemed to indicate a dryer spot. What work we had to reach it! How exhaustively we studied, with reference to our surroundings and their appearances, the degrees of comparison of the adjective *treacherous*. At length we reached our goal. We found it to be a ridge thrown up, for drainage purposes, by the owners of the land beyond. We took off our boots, and emptied them of water, and then proceeded to refresh the inner man. After a while, I left my friend to make acquaintance with the swamp mosquitos (who were disposed to be quite familiar), and went in search of *C. Jutta*. Relieved from fraternal cares, I now could give my attention to the surroundings. What wonderful prospects did these present! The whole marsh was aglow with the rosy flowers of *Rhodora Canadensis*, that charming plant whose

“Beauty is its own excuse for being.”

The clustered pitchers of the *Sarracenia purpurea* (a plant named after another French botanist, Dr. Sarassin) tufted the surface of the moss; and, all around, the stemless lady's slipper, *Cypripedium acaule*, displayed its elegant blossoms. Suddenly a fluttering brown object arose before me, made a short flight, and then settled a few yards away. I noticed the mottling of the underwings, brought down my net, and, shouting to my friend “I have it,” captured my first specimen of *C. Jutta*. Soon a second specimen arose; but another insect-admirer was in the field who was more agile than I. A specimen of the King Bird, *Tyrannus Carolinensis*, gave chase to the butterfly, and, after much doubling and twisting, caught it, and disposed of it effectually. It was long before another specimen rewarded my search; but at length a third did make its appearance, and I had the good fortune to secure it. By this time my muscles were so strained by the uncertain footing that every movement gave me pain, and I was obliged to abandon the hunt for that day. I rejoined my companion and set out for home, very wet, and very tired, but possessed by the proud consciousness that I had captured *Chionobas Jutta*.

Captain Geddes said that his only captured specimen of this insect was identified by Mr. W. H. Edwards, and was taken in the Rocky Mountains at a great altitude.

NOTES ON LARVÆ OF *MALLOTA POSTICATA*.

Mr. Lawrence Reed read some notes on “Larvæ of *Mallota posticata*,” as follows:—

During the recent heavy gale of October 15th a large limb of a maple tree, standing in our boulevard, was blown down.

While removing it the next day I noticed that the centre of the limb, from the fork where it was attached to the tree was much decayed, for about one foot from the top.

Thinking this had been caused by some of our wood-boring beetles, I examined the black casting which seemed to fill up the hole, and discovered some twelve or thirteen larvæ embedded rather firmly in the pithy substance. These are, I think, the maggots of some dipterous insect, and from their rat-tailed appearance they belong to some species of *Heliophilus*. Upon placing some of the larvæ in water, the tails were observed to come to the surface of the water, as it is said, for breathing purposes. We find a *Heliophilus* mentioned in Edwards, Plate 7, figure 28. Harris also gives an account of the larvæ, saying:—“The larvæ of a few are aquatic, and are provided with very long, tubular tails, through which they breathe, and have been called rat-tailed maggots. Some of the largest and most beautiful of these flies live, in the maggot state, in rotten wood.”

Professor Lintner has given a full description of the insect in his First Annual Report of the New York State Entomologist, 1882, page 211, and named it as above.

THE DESTRUCTION OF INSECT LIFE BY THE ELECTRIC LAMPS.

BY PROFESSOR CLAYPOLE, AKRON, OHIO.

The following paper was also read for Professor Claypole "on the destruction of insects by electric light."

In the early part of the year 1885, an installation of about one hundred electric lamps was established in the city of Akron, O.* It soon became evident that these lamps would prove a fine field for entomological work. Several members of our Scientific club accordingly watched them through the summer with great success. One point that came under my own observation seems deserving of notice as showing the enormous destruction of insect life by this new mode of illumination.

It was by no means an unusual occurrence to find in the morning the glass globes from a quarter to half full of various kinds of insects. Most of these were more or less burnt, but from the charred mass good specimens were frequently obtained, and many in a state sufficient for identification.

A single instance will illustrate my purpose now. On different days I took from every lamp examined more than one hundred specimens of the little grass moth (*Crambus mutabilis*, Clem). This gives a total from 110 lamps of more than a million individuals destroyed during the three months, or 100 days, of their occurrence. This large number must be largely increased by those, probably as many, which were totally consumed, and left no trace behind.

Other insects were also destroyed in numbers nearly as great, especially several species of the Tiger Moths.

It would most naturally be expected that so wholesale a slaughter of insects, the greater part of which had probably not laid any eggs, would be followed by a diminution of their number. Accordingly this season has somewhat disappointed our expectations from this source. The swarms around the lamps have been much smaller than in 1885.

It is also worthy of notice, that it has become a matter of common observation that the number of insects coming into the houses during the summer evenings has been very much reduced by, or since the introduction of the electric lamps.

It may therefore follow that one result unexpected, and uncalculated, may follow the change in the mode of illumination. We may largely reduce the number of our insect plagues in towns. Of course, this can only apply to those that are attracted to the light—a large number—but not the most annoying. The mosquito, for example, has no special love for the lamps.

ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Club met at Buffalo, N.Y., on August 17th, 1886, at the rooms of the Buffalo Society of Natural History, fourteen members being present.

The session continued at intervals during the meeting of the A.A.A.S. The following persons were in attendance during the meeting:—J. A. Lintner, Albany, N.Y.; J. H. Comstock, Ithaca, N.Y.; S. A. Forbes, Champaign, Ill.; L. M. Underwood, Syracuse, N.Y.; T. B. Stowell, Courtland, Ill.; Rev. R. Benjamin, Cincinnati, O.; E. W. Claypole, Akron, O.; Dr. J. B. Tweedale, St. Thomas, Ont.; D. S. Kellieott, E. M. Chamot, O. Reinecke, C. D. Zimmerman, Ph. Fischer, E. P. Van Duzee, Buffalo.

The Entomological Society of Ontario was duly represented by Mr. Wm. Saunders, Rev. C. J. S. Bethune, Mr. J. Alston Moffat, and Mr. E. Baynes Reed.

The President, Professor J. A. Lintner, took the chair, and Mr. E. B. Reed acted as Secretary in the absence of Mr. J. B. Smith, of Washington.

* See report of the Entomological Society of Ontario for 1885, page 19.

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The President gave his annual address, which was a very able review of the progress of entomology, as shown in publications which have appeared since the last meeting.

Professor Lintner also alluded to the absence of some who were usually attendant at the Club meetings, referring especially to Professor C. V. Riley, who was then in Europe for the benefit of his health.

Dr. D. S. Kellicott, on behalf of the Buffalo Society of Natural History, placed the rooms at the disposal of the members of the Club.

The President paid a high compliment to the contributions to entomology that had emanated from the rooms where they were meeting.

Professor Comstock explained a new method of arranging collections by which loss of time is avoided in transferring specimens so as to make room for additional species, or making necessary changes in their arrangement. The main feature in this plan consists in having moveable blocks on which the insects are pinned, but made in sections to fit the cases.

The following officers were elected for the ensuing year:—

President.—Professor J. H. Comstock, Ithaca, N. Y.

Vice-President.—Professor S. A. Forbes, Champaign, Ill.

Secretary.—Mr. E. Baynes Reed, London, Ont.

The following is a summary of papers read before the meeting during the session:—

Professor S. A. Forbes—Notes of the Past Year's Work: The Hessian Fly, *Cecidomyia destructor* has been found to hibernate in Southern Illinois as a naked white grub, not forming puparium until May following, and emerging before harvest; these are probably the offspring of a mid-summer brood, which develop in volunteer wheat. The Clover Seed Midge, *C. leguminicola*, was observed first in 1879 in Illinois. A new Chalcid parasite, *Tetrastichus*, has been reported, but its worst enemy so far observed was *Triphleps insidiosus*. The young of this species are often so abundant on the clover heads as to be mistaken for the injurious midge, but a little observation will show their beneficial character. The Wheat-stem Maggot, *Meromyza Americana*, is shown to have three broods instead of two only. Eggs and half-grown larvæ were found in abundance, August 4th. Two species of *Melanotus*, *communis* and *cribulosus*, were bred to maturity, and a third Elaterid not yet determined, of which figures and precise descriptions have been prepared. Larvæ of these, and of *Agriotes mancus*, and of a *Cardiophorus*, were reported as injurious to Indian corn, the peculiar larvæ of the last boring the roots in all directions in sandy soil. *M. cribulosus* pupates in July and forms imago in September. The Corn-root Worm, *Diabrotica longicornis*, is reported as seriously affecting crops in Southern Illinois. The common pale Flea Beetle, *Systema blanda*, was bred from larvæ feeding on kernels of sprouting corn in the earth. *Epicærus imbricator* taken feeding on leaves of pear; eggs laid in single layer on leaves, concealed by the insect fastening together the opposed surfaces of the leaves. Larvæ of *Sphenophorus parvulus* found to infest the roots of meadow grass (timothy). The midge sucks the sap from stems of wheat and corn. The Corn-plant Louse, *Aphis maidis*, was very injurious; observation shows that they are strictly dependent on the ant, *Lasius alienus*, which mines along the principal roots, collects the plant lice and conveys them into these burrows and there watches over and protects them. The ants have nothing to do with the hibernation of the lice, their winter nests never containing them in any form, either in corn-fields or other situations; the facts indicate that the lice hibernate as wingless females on the earth of fields previously infested. The Currant Worm, *Nematus ventricosus*, was mentioned as a case of retarded development. Mr. Bethune had noticed a similar case in *Attacus promethea*. The Root Web-worm, *Crambus zeellus*, was very destructive to corn in Illinois. A detailed description was given of its earth nest and the method and character of injury done to corn by this species. It hibernates as a larva, pupates in a tubular nest in June, emerging June and July.

A paper was read from H. Garman: Contribution to Life History of *Aphis maidis*.

Paper read from W. L. Deveraux: A Dangerless Insecticide for Collecting Bottles. The best vegetable container of prussic acid is the bark of the wild cherry, *Prunus serotina*, to be used for the Serotina bottle for young collectors, like the Laurel bottle of European entomologists.

In the discussion that took place, Professor Forbes stated that the attacks of *myrmis* had considerably lessened the number of grasshoppers in Illinois.

The President called attention to the unusual number of Aphides in New York State. They had been found on apple, black currant, tomato, and on potato in the Eastern States. The hop crop was almost destroyed by them in New York.

Mr. Bethune had also found them very numerous on the north shore of Lake Ontario.

In reply to a question, Professor Lintner stated that European entomologists had come to the conclusion that the Aphis of the wild cherry and the hop were identical.

Mr. Fischer called attention to the probable identity of *Spilosoma fuliginosa* and *rubricosa*. He also exhibited a specimen of *Catocala obscura*, just taken by him for the first time in Buffalo.

The President called attention to the fact of the earth worm being the host of a parasite, and therefore dangerous to fowls and poultry.

An excursion of members of the Club took place to Ebenezer, where a very pleasant afternoon was spent, and some interesting captures were made, among the most interesting being *Cicindela ancocisconensis*.

The Club adjourned to the call of the President at the next meeting of the Association.

POP

THE OAK-PRUIT

In last year's *villosum*, Fabr. I *parallelum*, Newm. that it is always, bearing on this subject also to *Phymatod*

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Upon reading "some of the worms following spring. found in one, a pupa Newm., very early the imago of *E.* metamorphoses were circumstances the It is my opinion that the following species Perhaps favourable than usual, produced winter and emerged will lay their eggs

POPULAR PAPERS ON ENTOMOLOGY.

THE OAK-PRUNERS: ELAPHIDION PARALLELUM, NEWM., AND PHYMATODES VARIABILIS, FAB.

BY C. H. T. TOWNSEND, CONSTANTINE, MICH.

In last year's Report I noticed with interest the article by Mr. Clarkson on *Elaphidion villosum*, Fabr. I have reason to believe that the same is partly the case also with *E. parallelum*, Newm., which I find to be the common oak-pruner here. But I do not agree that it is always, or even in the majority of instances, the case with either species. As bearing on this subject I give the following extract from my notes for 1885, which relates also to *Phymatodes variabilis*, Fab. :—

"Last fall (Sept.) I laid in a large supply of red, white and black oak and hickory twigs, containing larvæ of oak-pruners. The majority were red oak and hickory, but all were kept in separate boxes. Also a large box full of sawed hickory wood which contained wood-boring larvæ. These were all kept regularly moistened. During May and June, as I was absent from home at the time, another person, a lady, collected and saved for me a bottle full of beetles from the vicinity of these boxes (all taken from and around the large box of hickory wood, she says). These I afterward examined, and found the bottle to contain 145 *Phymatodes variabilis*, Fab., and 18 *Elaphidion parallelum*, Newm., besides two *Tenebrionide* of uncertain origin. As to which the two species proceeded from, the twigs or the hickory wood, the lady, who examined the twigs from time to time without being able to discover a single specimen among them, is almost certain that they all came from the large box of sawed hickory, on the underside of the papers covering which she was able to pick them off in large numbers, as well as all over and around the box and on the wood inside. Upon examining a good number of the twigs of each kind later in the season, I found not an insect in them (with the exception of one which contained a dried and shrivelled larva that had not transformed), but they showed every sign of the insects having emerged as perfect beetles. The *E. parallelum*, Newm., must have come from the twigs, while the *P. variabilis*, Fab., all proceeded from the sawed hickory wood. Packard gives the latter species as living only in white oak, but I am confident that these came from hickory, though I cannot conceive what became of the other numerous *Elaphidions* which must have emerged from the twigs."

In my notes for 1884, under date of 18th September, I extract also the following :—
"Found an oak-pruner in the pupa state, inclosed in its silken white cocoon, inside a red oak twig. The end of the twig was not closed up, as is usually the case, but the passage was open, and a couple of inches up from the end the larva had changed to the pupa state, leaving its cast off skin below it in the passage."

Upon reading the account by Dr. Fitch, of *E. villosum*, Fabr., I find he says that "some of the worms enter their pupal state the last of autumn, and others not till the following spring. Hence, in examining the fallen limbs in the winter, a larva may be found in one, a pupa in another." Now, though I have found the pupa of *E. parallelum*, Newm., very early in the fall (18th Sept., as stated above), and Mr. Clarkson has found the imago of *E. villosum*, Fabr., in November, I am inclined to think that these early metamorphoses were from eggs deposited earlier than others, or that by some favourable circumstances these individuals developed more rapidly and thus metamorphosed earlier. It is my opinion that both these species may assume the imago state either in the fall or the following spring, some, more forward than others, attaining this state in the fall. Perhaps favourable years, when some of the eggs may be deposited earlier in the summer than usual, produce the autumn imagos, which then remain within the twigs during the winter and emerge early in the spring. These in turn, if the season is at all favourable, will lay their eggs earlier than the others, and thus continue the early metamorphosis.

Toward the conclusion of his account Dr. Fitch says that "in at least three-fourths of the fallen limbs no worm is to be found," it having been devoured by birds either at the time the branch fell or afterward. The ground under oak and hickory trees here I have known some years (1884) to be covered with the twigs early in September, blown down by heavy winds, and at such times nearly all of the larvæ are destroyed by insectivorous birds, which extract them from their burrows, if they have not already been dislodged. This explains why so few of the beetles were obtained from the twigs I had saved—only 18 beetles from a large supply of the twigs, every one of which had certainly fallen that season, and been occupied at the time—the birds had destroyed all the others, and that very soon after their fall! But I cannot concur in the view taken by Dr. Fitch, that the larva severs the branch that it may fall to the ground, thus to aid its transformation. It is very probable that the larva cuts the twig to stop the flow of sap, the dead wood being necessary to mature its growth, and is conscious of none of that "consummate skill and seemingly super-terrestrial intelligence" which the worthy Doctor so enthusiastically attributed to it.

NOTES OF 1885 ON SOME INJURIOUS AND OTHER COMMON INSECTS.

BY JOHN G. JACK, CHATEAUGUAY, QUEBEC.

Read before the Montreal Branch Entomological Society of Ontario, 9th February, 1886.

The past season was remarkable, in our locality, for the general scarcity of diurnal Lepidoptera, and also of many of the Coleoptera, especially among the Scarabeide, Cerambycide and Buprestide. Many species of these, usually plentiful, seemed rare this year, and even *Lachnosterna fusca* was not nearly so abundant or injurious as it is generally. Perhaps, with the exception of *Colias philodice*, the most common butterfly was *D. archippus*, which I have never seen so common. I do not think I saw a single specimen of *P. cardui*, although it was very abundant last year. *Pieris rapæ* was less numerous and appears to be decreasing in numbers every year, largely owing, no doubt, to the attacks of the parasite *Pteromalus puparum*. The birds also, especially the Fly-catchers, do not get full credit for the good work they do. Insects of all other orders seemed to be about as abundant as usual, and several species proved to be more than usually numerous and destructive.

The Buffalo Tree-hopper (*Ceresa bubalus*, Say) was again very abundant, doing very much injury to apple and pear trees in young orchards. On July 5th I found some larch trees (*Larix Americana*) with the foliage very much destroyed by saw-fly larvæ, and on examining the trees in the woods and surrounding country, I found that they were all attacked. At this time most of the larvæ seemed to be a little more than half grown, and they continued to feed until about July 15th, when some of them made cocoons. Many of the trees were now entirely defoliated, and the branches and twigs literally covered with the larvæ, many of which were dropping to the ground, and with the falling "frass" made a sound like that of fast falling rain drops. Three days later (July 18) very few of the larvæ were to be found, most of them having formed cocoons among the old leaves and debris, or in the loose surface soil at the base of the trees or in the vicinity. When collecting some of these cocoons on July 19th, I found that very large numbers had already been collected and the larvæ taken out by some small animals, probably mice and moles, as there was a perfect network of small burrows under the old leaves and grass. The empty cocoons were collected into little heaps, and a very large handful could often be gathered at a single grasp.

Having been kept in a moderately warm room, some of the imagines emerged from the cocoons on December 22nd, and continued to do so almost daily until January 17th of

this year. The *Erichsonii* (Horn) for 1883.

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On July 1st (Noctuidæ). This is so well figured for 1883.

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On December green beech lo, *Saperda calcar*

this year. The larvæ, cocoons and imagines agreed exactly with the figures of *Nematus Erichsonii* (Hortig), in Professor Riley's report to the U. S. Department of Agriculture for 1883.

I had noticed these larvæ on the larch trees in former years, but they were not so generally abundant, and I had not the opportunity to study them.

My father has told me that about thirty years ago the tamarack woods were entirely defoliated, and looked as though scorched by fire, and he thinks that the saw-fly larvæ were probably the cause. It was more noticeable at that time, as there were large tracts of land covered with tamarack forest that have now entirely disappeared.

Another insect has proved to be peculiarly injurious this season to young growing beans. It is a small dipterous fly, and specimens sent to Professor Riley were determined by him as *Anthomyia angustifrons*, Mirgen (= *A. calopteni*, Riley), the larvæ of which have been hitherto known to feed upon the eggs of *Caloptenus*. During the past summer the larvæ attacked a field of golden wax-beans that were planted about June 15th, and on that part of the field that was most seriously injured, at least nine-tenths of the crop was destroyed. About ten days after planting, as very few of the beans had grown to the surface of the ground, an examination was made for the cause, and it was found that nearly every bean was infected by from 1 or 2 to 20 or 25 small, long, white maggots. Some of the beans attacked had hardly sprouted, while most of them had grown from one to two inches, but being planted deeply, they had scarcely reached the surface. Both the stems and seed-leaves were attacked. These larvæ were first noticed on June 25th; by the 28th many of them had pupated, and hardly a maggot could be found after July 2nd. The flies emerged about July 10th. If this bean-feeding habit of the insect should become general, it might prove very annoying.

Grasshoppers of several species were very abundant and injurious, hundreds of bushels of grain having been destroyed by them, while pasture and grasses were much injured, and many young fruit trees were defoliated. Some farmers reported in early September that their buckwheat had been so devoured by grasshoppers that only the stumps of the stalks remained.

Cicada canicularis Harr. was not so common this season as it has been some years.

Females of the fall canker-worm moth (*Anisopteryx pomataria*) were taken depositing eggs on apple trees, Nov. 21-24. This insect is not common in our part of the country, and is not noticeably injurious.

Larvæ of the pear-tree slug (*Selandria cerasi*) were found as late as October 30th, or later. They are not abundant and give us no trouble.

The fall web-worm, *Hyphantria textor*, has become more abundant and troublesome during the past three or four years. Young larvæ were first noticed July 10th, and new lots continued to hatch until about the middle of August.

A fresh specimen of the cotton moth (*Aletia xyliana*, Say) was taken September 19th.

On July 12th, a large number of small parasitic flies emerged from a dead cut-worm (Noctuidæ). These parasites are evidently the *Copidosoma truncatelluru* Dalman, which is so well figured by Professor Riley in his Report to the U. S. Department of Agriculture for 1883.

Early in December I took a living specimen of *Cyrtophorus verrucosus* Oliv. in the wood of the wild red cherry (*P. pennsylvanica* Linn.), and also found a large number of larvæ which I think were of the same species, as they occupied similar cavities to that of the beetle. The larva of a Lepidopterous insect (probably *Ægerian*) was found under the bark of the same tree.

On December 8th, a living pupa of *Tremex columba* was taken from the heart of a green beech log, the log being over ten inches in diameter. At the same time larvæ of *Saperda calcarata* were taken from the heart of *Populus tremuloides*.

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NOTES ON CERESA BUBALUS, SAY.

BY JOHN G. JACK, CHATEAUGUAY BASIN, QUE., CAN.

Read before the Montreal Branch Entomological Society of Ontario, 9th February, 1886.

During the past two years, but more especially this season, we have been very much troubled and annoyed by the attacks of the Buffalo Tree-hopper (*C. bubalus* Say) on the young trees in the orchard. Most of the trees have been seriously injured by having the bark cut up by the ovipositors of these insects, when depositing their eggs. These incisions and the eggs in them were so numerous that in many cases it was impossible to raise the bark for the purpose of "budding" the trees.

The incisions and eggs are usually most abundant on the south and upper side of the limbs, comparatively few being found on the shady or under sides. The first imagines were noticed in the orchard on July 16th, and a few days later they became quite abundant. On the young tender twigs of the apple trees, especially those nearest to the ground, large numbers of the insects were found busily extracting the juices with their tender beaks. Upon close examination the twigs plainly showed the traces of their punctures. They were also very abundant on beans, potatoes and several kinds of weeds, in many cases completely covering the stems, and all engaged in feeding upon the juices of the plants. Bean-stalks that were attacked in this way were considerably injured, as numerous dark knotty formations occurred at the places that were much punctured, so that the growth of the plant was decidedly checked.

The insect was first noticed depositing eggs about August 12th, and a few incisions were then to be found on the branches. This depositing of eggs continued until October 8th, when a severe frost killed a great many of the tree-hoppers, although a few escaped and continued the work until October 26th. After that date they were not noted.

Some of the eggs of the season of 1884 were collected last spring and kept in a very tight box. They were hatched during the first week in June, and with them were a number of small Dipterous flies, evidently parasites upon the eggs of *Ceresa*. I watched for these parasites in the summer and autumn, and first found them August 31st, on limbs where the tree-hoppers were depositing eggs. The parasites were found in larger numbers a little later, and I had the satisfaction of distinctly seeing a number of them insert the abdomen and sometimes almost the entire body deeply into the gaping slits made by the ovipositors of the tree-hoppers. Professor Riley thinks that the parasite may be an undescribed species.

As I did not know the best conditions or food for the young larvæ of *Ceresa*, I placed them in a glass jar and gave them the tender twigs and leaves of apple trees. From these they seemed to extract the juices, and they could be seen in rows on the ribs of the leaves, with extended beaks, while little particles of a clear gummy substance were often found at the places where the insects had been sucking the juices. I afterwards added bits of grasses, etc., to their food, but after some time they ceased feeding, and finally they all died, none of them being more than half grown. This was about July 5th, and about this time I found a number of the larvæ about some raspberry canes in a shady place, and on July 13th I took more of them among low juicy grasses and thistles, growing thickly in a cool, moist place, several rods from any trees of any kind. On July 17th, nearly all these larvæ changed to the adult form.

The larva becomes much elongated as it begins to cast the last envelope, and one of them, noticed when just beginning the operation, took three hours to complete it.

The full grown larva is about 8 m.m. in length, and light green in colour, somewhat lighter than the mature insect. The young larvæ appeared to be of a darker green than they were at a later period of their growth. The general shape is triangular, like that of the mature insect, but the broad horn-like projections are not seen in the larva. The eyes are prominent. On the front of the elevated thorax, and behind each eye, are two short, strong spines, one above the other, armed with several lateral prongs or forks; higher up, near the apex of the triangular shaped thorax, are two more, somewhat larger armed spines,

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The spines directly abdomen is covered with spines.

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and the last two visible thoracic segments are each provided with a pair of these branching spines that are still longer. There is also a pair of these spines, each armed with about 6 or 7 barbs, on each of the abdominal segments next to the terminal. These are graduated in length, the shortest being on the last segments, and the longest hardly more than a millimeter in length. The thoracic spines project forwards, while those on the abdominal segments are drawn forward at the base and then curve back, strongly suggesting the dorsal fin of a fish. On the last segment, which is long and tapering, there are two short armed spines directly above the anal opening, which is terminal. The ventral surface of the abdomen is scatteringly covered with short, strong bristles or hairs. The legs are also covered with stiff hairs.

The eggs, in batches of from five or six to a dozen (rarely more), are deposited obliquely in the bark, and often the incision continues into the wood, if the bark is thin. In this way the bark and wood become fastened together, and will not separate at any season, and the dark spots in the wood and the rough knotty bark bear evidences of the injuries for many years.

The eggs are of a dirty transparent white, about 1.5 m.m. in length, smooth, slightly tapering, and sharply rounded towards the interior end, but tapering much more gradually at the exterior end. Although normally round, the sides are generally found to be more or less flattened by pressure from the tissues of the wood and bark of the tree. So numerous were these eggs on some trees that a careful estimate shows that there must be at least from six to eight hundred eggs in a section of the branches not more than an inch long and half an inch in diameter.

I have not been able to find a remedy, and perhaps the best is to destroy as many of the egg-bearing limbs as possible. It is to be hoped that the little parasitic flies will increase, and this seems probable. On September 17th I found five or six tree-hoppers ovipositing on a piece of branch about four inches long, and on the same section were twelve or fifteen of the parasitic flies.

NOTES ON ANT LIONS.

BY J. ALSTON MOFFAT, HAMILTON, ONT.

As my former notes on the Ant Lions were of interest to some of our readers, perhaps a few additional particulars on the same subject may not be objectionable to them. Having had another opportunity of observing their habits, I made the best use I could of it. The abdomen of the nymph is somewhat heart-shaped, flat beneath and very much rounded above, thickest near the thorax, and sloping off suddenly to the sides and tail, which is an acute point. The thorax is long, and with the head is narrow and flat above, a form no doubt well adapted to its requirements. Its mode of travelling is backwards, always "advancing to the rear," one side contracted, which produces a circular movement, so that when one was placed in the centre of the palm of the hand, it made two rounds before it dropped over the side. As soon as it touched the sand it put itself instantly out of sight under the surface, where it lay for a short time perfectly quiet. When it began the formation of its pit, which I watched to its completion, it commenced by a jerk of the head and thorax, which threw the sand off and exposed them to view. It lowered them at once, made a sudden start back, when the sand covered them; then another jerk and another backward move rapidly executed, always throwing the sand to the outside. In its first round it described a circle of about an inch in diameter, reducing the circle with each round. A mound was formed in the centre and the sand ran into the trench from both sides, and thus it worked away without a halt until the mound was all thrown out, and the pit had assumed the funnel shape, when it took a rest, after which it began throwing out the sand from the centre at its leisure, deepening and widening the pit very much. The time occupied in the first part of the operation may have been about half an hour.

One that I was watching, after it had made nearly a round in commencing a pit, seemed to be dissatisfied with the location, and started off on a prospecting tour to find one

more to its liking. Its course was quite discernible by the disturbance of the surface sand, although it never appeared in view. In its travels it met an obstruction, a piece of broken pine limb about four inches long and an inch and a-half in diameter, imbedded about an inch in the sand. Against this it struggled until it raised it out of its bed, moving one end along an inch and a half, when it was sufficiently elevated to permit the nymph to pass on without going below its ordinary depth. It had travelled hither and thither over a space of twelve or fourteen inches without stopping, before I left it. It is most amusing to place one on its back and watch it get on its feet again. Although I am afraid the operation is quite indescribable by me, I can tell what it does not do; it does not spring up like like an Elater; it does not stretch out its legs as beetles generally do, they being very short, it could not nearly reach with its feet the surface on which it is lying; it does not seem merely to roll over, for when it has got on its feet, it is in the identical spot it was when on its back. But while one is watching it attentively, it suddenly assumes that hazy, indefinite appearance that anything will when in rapid vibration, and when again distinctly seen it is resting quietly on its feet, but what it did more than vigorously shake itself, or how it accomplished the "presto change," I cannot say. I watched it again and again but could make nothing more of it.

The species to which these nymphs belonged would be either *abdominalis* or *obsoletus*, and they must have been nearing maturity, as some were out on the wing at the time. I took two *abdominalis*, one of them with a most unseemly length of abdomen, extending full three-fourths of an inch beyond the wings, which I take to be a female.

OCCURRENCE OF THE CHINCH-BUG (*BLISSUS LEUCOPTERUS*, SAY) AT BUFFALO, N. Y.

BY E. P. VAN DUZEE.

This pernicious insect has been very abundant here for many years. As early as 1874 I found it in considerable numbers among moss on dry, grassy hill-sides at Lancaster, N. Y. This season (1886) it was remarkably abundant in a dry upland hay field near the same locality. I have also taken it at Ridgeway, Ont. Ordinarily the short winged form predominates, but in hot, dry summers, such as those of 1881 and 1886, they mostly acquire fully developed membranes. I find on comparison with a lot of perhaps one hundred fully developed examples from Kansas, that ours are quite uniformly larger and more robust, with longer hairs on the pronotum.

Professor J. A. Lintner says (Second Annual Report N. Y. State Ent., page 150) that, previous to its appearance in St. Lawrence county in 1882, the only recorded occurrence of this insect in New York State is that mentioned by Dr. Fitch (Second Report, 1856, p. 287). From this it appears that it has not been recorded, if indeed it occurs generally in this State. Its early introduction at this locality is only natural, considering the immense grain traffic which yearly passes through this city direct from the infested States of the West, on its way to the seaboard; yet it does seem strange that its first appearance in sufficient numbers to attract general attention should have been in Northern New York, quite aside from any of the main lines of transportation, unless, as Professor Riley suggests (Science, vol. ii., p. 621), it be a native species, which, through an unusual series of favouring circumstances, has increased enormously in certain localities. That it has not been reported as an injurious insect in this locality seems to me no proof that it has not been injurious. To be sure, it has not appeared in such overwhelming numbers as to force itself upon public notice as in other places, but from my own observations I think that no inconsiderable part of the injury to hay fields charged to the dry weather is in reality the work of this insect, or rather the combined effect of the two. For example, the hay field at Lancaster mentioned above, which last year yielded an abundant crop, is literally ruined and will have to be plowed under in the spring, while other fields less protected, where the bug was not found in numbers, escaped injury; and I know of several other fields near this city apparently affected in the same manner.

I have always occasionally among grain fields of any cultivated cereals it has been introduced. It would be high from main railroads.

The Butterflies of

This book is a complete and satisfactory group of living of nature. The of it?" If the object easily and satisfactorily shown his good judgment in his book. He has done before him. which commonly call it science. He to display himself thanks. The volumes familiar, are still there were more, every species mentioned meritorious in every

Catalogue of Canadian F.R.S.C., Montreal

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By the publication of scientific world. acquired. Posses he has had the ad native habitats in Canada. Moreover secured the hearty the "Catalogue of which extends over the work of all our flora of the Dominion

I have always found this insect in hay fields, generally in timothy or clover, occasionally among wild grasses. I do not recollect ever having taken a specimen in a grain field of any kind. If it has so thoroughly acquired the habit of subsisting upon the cultivated cereals in the West why should it not affect the same plants here, especially if it has been introduced from that section of the country through commercial transportation? It would be highly interesting to learn of its occurrence in this State at localities distant from main railroad lines.

BOOK NOTICES.

The Butterflies of the Eastern United States: by G. H. French, A.M.

This book is indicative of the progress made in Zoology, and particularly in Entomology, in that such work is possible, and that it is appreciated. In a plain, simple, and still complete and thorough way, it presents the facts known about a large and distinct group of living objects, which attract the interested attention of every lover and student of nature. The first question which a student asks of a newly found object is, "what is it?" If the object comes within the scope of this volume, this question will be answered easily and satisfactorily. The work has been done carefully and well. The writer has shown his good judgment quite as much in what he has left out, as in what he has put in his book. He has wisely accepted the work which the great body of Entomologists has done before him. He has not felt that a woe rested upon him if he failed to revise, which commonly means to ignore all such work. He has not tried to create a chaos and call it science. He has evidently preferred to present the facts of this subject, rather than to display himself. For what he has done, and for what he has omitted to do, he deserves thanks. The volume is well printed, and its many illustrations, though in many cases familiar, are still the best extant. While we recognize their abundance, we still wish there were more, and hope that it will at some time be possible to figure in such a book every species mentioned. We trust that this work will be followed by others equally meritorious in every division of the wide Entomological field.

Catalogue of Canadian Plants. Part III.; Apetalæ: by John Macoun, M.A., F.L.S., F.R.S.C., Montreal. 1886.

The last publication issued by the Geological and Natural History Survey forms the third part of Professor Macoun's Catalogue of Canadian Plants. Part I., Polypetalæ, and Part II., Gamopetalæ, have already been noticed in these pages. Part III., Apetalæ, carries the work on to the end of the Exogens and completes Volume I.

The value of this important work, which is quite indispensable to every student of Canadian botany, is much enhanced by the Addendum and comprehensive index of the whole volume, contained in the present part. In the former we find corrections and additions to the information recorded under each species in Parts I. and II., so as to bring our knowledge of the whole of the plants mentioned down to date, and in the latter not only are the orders, genera and species given, but every synonym also appears.

By the publication of this work Professor Macoun confers a lasting benefit upon the scientific world. No living botanist has the knowledge of Canadian plants which he has acquired. Possessed of a keen faculty of observation which almost amounts to an instinct, he has had the advantage of travelling extensively and of collecting and studying in their native habitats most of the plants which have been found growing spontaneously in Canada. Moreover, by generously assisting all who apply to him for information, he has secured the hearty co-operation in his work of all the active Botanists in Canada, so that the "Catalogue of Canadian Plants" is not only a record of his own vast experience which extends over a period of more than thirty years of constant study, but also includes the work of all other collectors and Botanists who have investigated or written upon the flora of the Dominion.

So closely are the studies of Botany and Entomology associated together that some knowledge of Botany is actually a necessity to the Entomologist; particularly is this the case in the interesting work of investigating the life-history of insects. It frequently happens that a very slight knowledge of the affinities of a given plant may save from starvation valuable larvæ which have been transmitted to a distance from the place where their proper food plant occurs. Most larvæ will subsist upon plants of the same genus or others closely allied to them.

A good instance of this is presented in the numerous *Coliades*, all of which will flourish upon the common white clover (*Trifolium repens*), although in a state of nature they may, according to the species, feed upon plants belonging to a dozen different genera, all of which, however, will be found to be of the same natural order as the clover (*Leguminosæ*). The *Argynnides*, again, will all feed upon our common blue violet (*V. cucullata*), as will the *Pierides* upon common and easily procured cruciferous plants.

On the other hand, for a right understanding of the shapes and positions of flowers, and for a full appreciation of the beautiful methods by which fertilization of the ovules is secured, a knowledge of the structure and habits of insects is of inestimable value.

There is, too, an economic aspect of this case, for if insects will survive upon plants which are only and perhaps distantly allied to their natural food, it is obviously necessary that the cultivator should take this into consideration when engaged in the constant strife which he has to wage against injurious insects, and we even find that some species will actually flourish better upon such cultivated plants, when grown in large numbers; the Colorado potato beetle may be instanced in this connection, which thrives so luxuriantly upon the cultivated potato, but which, when confined to its natural food, the *Solanum rostratum*, eked out but a precarious existence. Otherwise it is useless to abstain from the cultivation of any crop which has been badly attacked, as a means of starving out its insect enemies, in a locality where there are numerous wild plants or weeds which are allied to the plant which it is desired to grow. This must be borne in mind with regard to the many pests affecting cereals which are able to find ample temporary lodgment in the various wild grasses.

OBITUARY.

We deeply regret to announce the death of Mr. William D. Shaw, of Montreal, on the 29th of June, 1886, at the early age of nineteen years. The deceased was well known for his early application to science, he having been the leading spirit in founding the Montreal Chapter of the Agassiz Association. Of this Chapter Mr. Shaw was Secretary and Treasurer, and in 1885 was appointed General Secretary for Canada. Mr. Shaw was also a member of the Council of the Montreal Branch of the Entomological Society of Ontario, a member of the Natural History Society of Montreal, and a member of the Astro-Meteorological Association. A devoted student of science, his loss will be deeply felt by his fellow workers. Unassuming, guileless and upright, his memory will ever be held in loving remembrance by those who had the privilege of knowing him.

INSECTS INFESTING MAPLE TREES.

BY W. HAGUE HARRINGTON, OTTAWA.

Of recent years increasing attention has been paid in Canada to the subject of Forestry, especially in the Province of Ontario. As yet, however, our magnificent forests have not been entirely destroyed, despite the reckless and short-sighted manner in which they have been invaded by lumberman and settler, and the time has hardly come for planting, although it cannot be far distant in some districts. It cannot be wasted labour, nevertheless, to endeavour to find out what is known of the diseases and enemies of each tree, in order that when required the knowledge may be available. For ornamental

purposes many of our trees are being beautified by the habit of setting them out in the shade. This is undoubtedly one of the most hardy and vigorous species. Its fine silences. As a shade tree for growth making it is one of the chief as profit) to its poss

I have thought that the maples may be of a great value if they are not so badly injured. The following list was published in the Report for 1872, Mr. E. B. Forster, pp. 9, 10, 12, 15, 16, 18, and appeared since from

In 1881 the U. S. Department of Agriculture has published an exceedingly valuable report on the trees. In that report I am able in the present issue to do justice to the subject that many more spe

Of insects included in this list, we do not find mentioned by name. 1—(1) *Tremex* spp. they commence to die specially attacked



Fig. 1.

of the wood, that the I have seen. The grubs when hatched are cylindrical. They are cylindrical with very strong jaws, and perfect insects emerge in a few months they may be seen. 2. *Xiphodria* spp. to the maple," I gave

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Canada to the subject of er, our magnificent forests -sighted manner in which time has hardly come for cannot be wasted labour, ases and enemies of each available. For ornamental

purposes many of our trees are already grown, and our citizens are continually paying more attention to the transplanting of shade trees. The streets in our towns and villages are being beautified and shaded by elm, maple, basswood, etc., and it is to be hoped that the habit of setting out trees by property holders will become more universal. The maple is undoubtedly one of the most important of the trees usually selected for shade. It is hardy and vigorous in a large degree, and its various species have each distinctive excellencies. Its fine shapely green leaf is even recognized as the emblem of our nationality. As a shade tree for our cities and towns it is probably unrivalled, its vitality and robust growth making it exceedingly valuable for street planting. In our magnificent forests it is one of the chief trees, and a "sugar bush" is an object of pride and pleasure (as well as profit) to its possessor.

I have thought, therefore, that an enumeration of the insect enemies of the different maples may be of assistance to those who wish to plant or preserve them. Fortunately they are not so badly infested as the oak, hickory, pine, and some other species, although the following list will show that they have quite enough enemies. In the annual report for 1872, Mr. E. Baynes Reed published a paper describing eight injurious species—Nos. 9, 10, 12, 15, 16, 18, 19, 37, of present paper, and notes on these and other species have appeared since from time to time in the reports, and in the *Canadian Entomologist*.

In 1881 the United States Entomological Commission published (Bulletin No. 7) an exceedingly valuable report by Dr. Packard on insects injurious to forest and shape trees. In that report thirty-seven species of insects are enumerated as infesting maples. I am able in the present paper to double this list, and had my time permitted me to do justice to the subject, and more fully examine recent entomological records, it is certain that many more species would have been added.

HYMENOPTERA.

Of insects included in this order (to which belong bees, wasps, ichneumons, saw-flies, etc.) we do not find that many injure the maple, indeed, only one species, the first of my list, is mentioned by Dr. Packard in his Bulletin.

1—(1) *Tremex columba* Linn. This is a large insect which attacks various trees when they commence to decay, or where they have been injured. Maple and beech appear to be specially attacked by it, and particularly old trees of the former species. The female,



Fig. 1.

Fig. 1., measures from an inch and a quarter to an inch and a half in length, and has a cylindrical body, the extremity of which is rounded and terminated by a short tail. The head, thorax, and antennae are rust-yellow, with black markings; the legs a light ochre-yellow with blackish thighs; the abdomen black, with transverse yellow bands; the wings smoky and expanding about two inches. The male is smaller and has the abdomen flattened, as are also the hind legs. The abdomen of the female is provided with a long slender borer, which is more than half an inch long, and which projects considerably beyond the horny tail which terminates the body. With this borer the insect makes holes in the bark or wood of the tree, in which she deposits her eggs. This boring is a work of much difficulty, and so firmly is the weapon often driven into

the wood, that the poor insect cannot withdraw it, and she remains a prisoner until death. The grubs when hatched bore into the tree and feed upon its substance until full-grown. They are cylindrical fleshy worms, with rounded horny heads, and are furnished with very strong jaws, suited for their work of boring through and devouring the wood. The perfect insects emerge from the trees during August, September and October, during which months they may be seen depositing their eggs in the manner described.

2. *Xiphydria albicornis*, Harris. In the report for 1883, under the title "A new foe to the maple," I gave a full description of the appearance and habits of this horn-tail, so

that I shall now make but a brief mention of it. It is much smaller than the preceding species, the females only ranging from half an inch to somewhat over three-quarters of an inch in length, while the males are correspondingly smaller. It is black with white markings, and the antennæ are usually white, with the exception of the basal joints, whence the specific name. They appear during June and July, both upon old and young trees, and in this city I have noticed them to especially attack newly transplanted trees. The maple being generally used as a shade tree is planted annually in large numbers, and it is while they are less vigorous from the effects of transplantation that the *Xiphydria* selects them as suitable for the deposition of her eggs. I have seen trees hardly more than an inch in diameter attacked.

3. *Oryssus terminalis*, Newman. This insect belongs also to the Uroceridæ, but the abdomen is blunt and rounded at the extremity instead of terminating in a horny point. The ovipositor is concealed in the abdomen, instead of projecting therefrom and being protected by sheaths. It is very slender, hair-like, and longer than the insect itself. The insects are about as long as those of *Xiphydria*, but are much stouter in form. The head and thorax are black; legs and antennæ black, with markings of white; abdomen black, or more or less red; wings clear, with a dusky patch near the tip. Active and restless in their motions, they might easily be mistaken for some species of wood wasps. Their habits have not hitherto, so far as I am aware, been definitely known or recorded, but specimens have been taken by me, both in the act of emerging from the trunk of a dead maple, and in the act of ovipositing therein. They appear in June.

4. *Ibalia maculipennis*, Hald. This curious species belongs to the family Cynipidæ, or gall-forming hymenoptera, and is much larger than any of our other species. It is nearly three-quarters of an inch in length, and the wings expand about an inch. The head and thorax are stout, but the abdomen is compressed laterally until it is very thin, and has the shape almost of a knife-blade. The ovipositor is very long and slender, and when not in use is retracted and coiled up in the abdomen. The insects are rare, and have only recently been recorded (by Provancher) as occurring in Canada. I find both sexes upon old trees in June, and have found the female ovipositing in the bark. The general colour is yellow, with brown spots upon the head and thorax, and with black bands upon the abdomen and the legs. It is possible that the larvæ may be parasitic upon those of one or more of the insects mentioned in this paper.

5. *Megachile optiva* Cress., or a very closely allied bee, (Fig 2 represents a common leaf-cutting bee) sometimes greatly disfigures maples by cutting pieces out of the leaves for the purpose of making its cells. I have seen a small tree nearly defoliated by these bees, of which the habits are most interesting.

LEPIDOPTERA.

This order, which consists of butterflies and moths, furnishes a formidable list of species infesting the various varieties of maples. The following species are recorded:—

6. *Agerix Acerni*, Clem. Of recent years this moth has become generally known as a borer in the maples. It belongs to a genus containing several well-known injurious moths, such as *Æ. Rubi*, the raspberry borer, *Æ. Tipula formis*, the currant borer, *Æ. Exitiosa*, the peach-tree borer, etc. It was figured and described in Report No. 12 (1881), and was then stated to be increasing in numbers every year, and to be very destructive, especially to young maples. In 1883



Fig. 2.

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(Report No. 14) Professor Saunders also referred to it, in his address as president of the Entomological Society, as prevailing to an alarming extent in the neighbourhood of London, to the serious injury of the shade trees. It has been very destructive also in large portions of the United States, especially in Ohio, Illinois and Missouri. It appears to prefer the red maple, but also infests the sugar maple, and to a smaller extent the other varieties. The moth is wasp-like in appearance; the wings being transparent, while the head is orange, the thorax yellow, and the abdomen bluish-black, banded with golden-yellow. The eggs are laid in crevices of the bark, and in a few days the larvæ emerge, and burrowing inward feed upon the inner layers of the bark and the sapwood. Irregular cavities are thus formed, which are packed with the excrements and morsels of wood. The larva when full grown is about two-thirds of an inch long; white, with a yellow head and reddish legs. It may be readily distinguished from the larvæ of the Uroceridæ, already described, or from those of some beetles which will hereafter be mentioned, by the fact of its having sixteen legs, while the others have either only six, or are footless. When fully grown the larva spins a cocoon, and the moths begin to emerge in June, and may be found during that and the following months. Trees with smooth bark do not seem to be attacked, and those suffer most which have already been the victims of injuries, or of the attacks of other borers. It is therefore recommended to coat the bark with a mixture of soft-soap and a strong solution of washing-soda, made about as thick as paint. This will not, of course, kill the larvæ already at work, but will prevent the laying of eggs. I have found the evidences of the presence of this species in increasing numbers during the past two seasons in Ottawa.

7. *Lithacodes Faciola*, H. S., is a small moth, of which the larva is known as the maple-slug. This slug is of a flattened elliptical shape. The moth is small, and has a light band running across the anterior wings.

8. *Edema Albifrons*, Sm and Abb. This greyish moth expands about an inch across the wings, the anterior of which have a white patch on the costal border. The caterpillars are smooth and striped, with yellow and fine black lines, with head and hump on eleventh segment red. They are sometimes very abundant in the autumn. In 1883 they were especially so in this neighbourhood, and apparently elsewhere. At the annual meeting of the Entomological Society, in October of that year, Mr. E. Baynes Reed reported them as common in London on the maples, and on elms in Toronto and Montreal, while other members reported them common on oak. The moths may be found at rest during the day on the trunks of the trees.

9. *Telea Polyphemus*, Hubner. This is one of our largest moths, the wings expanding about five inches. The caterpillar, Fig. 3, is, when fully grown, about three inches long,

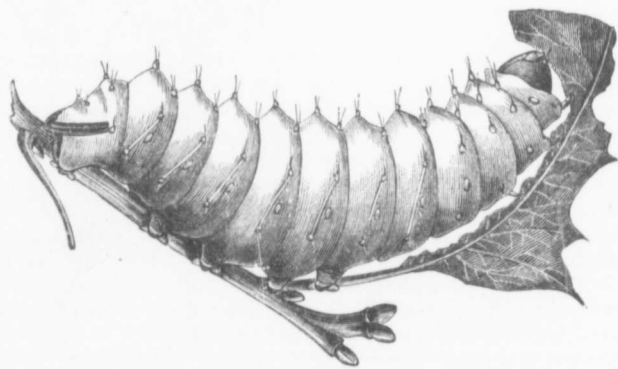


Fig. 3.

and a dusky band, edged with whitish-red running parallel to the outer margins.

and correspondingly stout, of a pale green, with small orange or reddish tubercles on the segments, and oblique whitish lines on the sides of the posterior ones. It is most frequently found upon oak, but feeds also upon maple, and, from the length of its existence in the caterpillar state, its remarkable size, and enormous appetite, it can do much damage. The moth is of a dull ochre-yellow colour, with a clear eye-like spot in each wing,

10. *Platysamia Cecropia*, Linn. This moth is closely allied to the foregoing, and is still larger. The caterpillar, Fig. 4., in nearly four inches long, and is a remarkable and

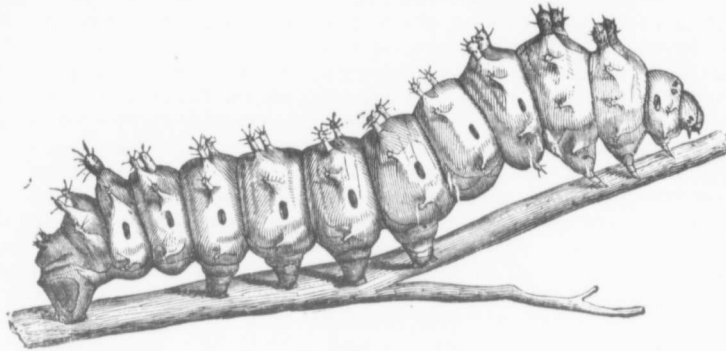


Fig. 4.

beautiful example of insect life. The general colour is a pale green, or bluish green, but the body is studded with elevated tubercles of green, blue, yellow, and red colours. When fully grown it spins a large triangular cocoon, from which it emerges as a most beautiful moth, of a size and richness of colour that causes it to appear quite a tropical insect. Its expanded wings measure from five to seven inches across, and are of a rich brown, with beautiful markings of black, red and white. It is known generally to fruit-growers and others, as it feeds on a great variety of trees, and the caterpillars, cocoons, and moths are all such conspicuous objects as to attract the attention of the least observant. It is a well-known feeder upon the apple and other fruit trees, which it attacks more frequently than it does the maple.

11. *Hyperchiria Io*, Fabr., is closely allied to the preceding, but is a much smaller moth, only measuring from two and one-half to three and one-half inches across the expanded wings, the male being much smaller than the female, and darker in colour. The caterpillar, Fig. 5, is much more remarkable than the moth, and when fully grown is more than two inches long. It is of a pale green colour, with a whitish line down the sides, and is set with bunches of spines arising from small tubercles (several on each segment). These spines shown in Fig. 6, much magnified, can inflict very painful wounds, much resembling those from nettles, and sometimes in picking corn or currants one experiences a very unpleasant sensation, if the back of the hand—which, of course, is always very sensitive—should come in contact with a hidden specimen. Hence this larva is known as the "stinging caterpillar," although it has not a genuine sting. It feeds on a great variety of plants, I have not found it myself upon maple, but it has been so found by Dr. Packard (page 111 of Bulletin on Insects Injurious to Forest and Shade Trees).

12. *Anisota Rubicunda*, Fabr. The larva of this species is known as the green-striped maple worm, and depredates upon the red and silver maples. In the Western States—Illinois, Missouri, and Kansas—it is said to prove during certain years very destructive; so much so as to discourage people from planting the above named varieties of maple. In Canada it is by no means so common, but has



Fig. 5.

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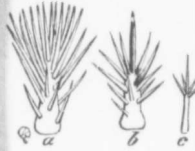


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13. *Clisiocampa* ance and habits o too well-known to of them attacking eluded in Dr. Packa

14. *Hepialus* referred to this sp from a larva foun

15. *Apatele An* moth, and is one of greyish, with variou what darker in colo of long black hairs.

16. *Stegania l* early summer. It l of June it is fully g much more than ha whitish and yellowi jarred the caterpilla they soon regain the reddish spots on the

17. *Eutrappela* caterpillar feeds up caterpillar that prog and then carrying t yellowish moth.

18. *Ohpina B* been bred and descr maple, *Acer dasycy* colour is brownish g it makes a snug litt. The moth expands a brown, and the hind

19. *Incurvaria* capable of greatly d by the enormous nu it has been very n probably five acres, so cut and eaten ths been scorched. Th were covered with thickly scattered all perhaps twice the ar of the moth in oth innumerable quanti injures the leaf not from the leaves ova

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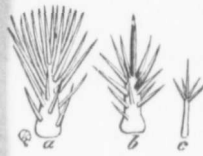


Fig. 6.

been found at times abundant. Prof. Saunders described the larva in the *Canadian Entomologist* for 1870, so that it has been known in Ontario for twenty years. When fully grown it is about one inch and three-quarters long; its colour is yellowish-white, with green stripes. When fully grown they enter the ground and pass the winter there as pupæ; not emerging until the following summer. The perfect insect is a beautiful moth (Fig. 7). The front wings are rose colour, with a pale yellow band; the hinder wings, pale-yellow; thorax, yellow; abdomen and legs, rose-coloured. They fly at night; the wings of the male expand about two inches.

13. *Clisiocampa Sylvatica*, Harris. The appearance and habits of the "tent-caterpillar" moths are too well-known to need description. I have no record of them attacking maples in Canada, but they are included in Dr. Packard's list.

14. *Hepialus Argenteomaculatus*, Fabr. A moth referred to this species has been bred by Mr. Fletcher from a larva found boring in the base of a spiked maple,—*Acer spicatum*.



Fig. 7.

15. *Apatele Americana*, Harris, is known as the maple dagger-moth, or maple owlet-moth, and is one of our larger species, expanding about three inches. The fore wings are greyish, with various lines and markings of black and white, and the hind wings somewhat darker in colour. The caterpillar is covered with long yellow hairs, and has pencils of long black hairs; its length is about three inches. It is found feeding in the autumn.

16. *Stegania Pustularia*, Guenee, the lesser maple span-worm, feeds on the leaves in early summer. It has been bred and described by Prof. Saunders. About the middle of June it is fully grown, and produces the moth early in July. The larva is small, not much more than half an inch long; bluish-green, with thickly set longitudinal stripes of whitish and yellowish; skin much wrinkled and folded. When a maple tree is suddenly jarred the caterpillars may be seen suspended underneath it by silken threads, by which they soon regain their feeding place. The moth expands about an inch; is white, with reddish spots on the border of the fore wings.

17. *Eutrapela Trauersata*, Packard, is called the large maple span-worm, and the caterpillar feeds upon the red maple in July. It is a rather slender "looper;" that is a caterpillar that progresses by drawing the posterior part of its body up to its front feet, and then carrying these forward until it extends its full length again. It produces a large yellowish moth.

18. *Ohpiusa Bistriatis*, Hubner, the maple semi-looper, or banded maple moth, has been bred and described by Prof. Saunders, who found it late in July upon the silver maple, *Acer dasycarpum*. The caterpillar is nearly one and one-half inches long. The colour is brownish green, with numerous streaks and dots of pale brown. Before pupating it makes a snug little case by cutting a leaf and folding it over and fastening it with silk. The moth expands about one inch and three-quarters; the fore wings are a rich chocolate-brown, and the hind wings a reddish brown, all having distinctive markings.

19. *Incurvaria Acerifoliella* Fitch. This is a very small moth, but its larvæ are capable of greatly disfiguring trees, if not of permanently weakening and injuring them, by the enormous numbers in which they frequently occur. During the past two summers it has been very noticeable in one locality near this city. In 1885 a considerable area, probably five acres, of large trees was entirely defoliated, or rather the entire foliage was so cut and eaten that it had a brown withered appearance, as if the trees had died, or had been scorched. The trunks of all the trees in the neighbourhood, not only of the maples, were covered with the columns of these little case-covered caterpillars, and they were thickly scattered all over the ground. Last season they were equally injurious and covered perhaps twice the area formerly infested. I have seen occasional evidences of the presence of the moth in other localities, but it is only in that mentioned that it appears in such innumerable quantities. The worm is only about a quarter of an inch long, but it injures the leaf not only by feeding upon its tissues; it is a regular tailor and cuts neatly from the leaves oval, or nearly circular, pieces to form a case with which to protect itself.



Fig. 5.

able from planting the so common, but has

These pieces are at first very small, but as the grub grows it cuts out larger blankets for itself, and when it is fully grown, these are about the diameter of its own length. Sheltered by this case the worm feeds upon the softer part of the surface of the leaf, forming upon it rings and irregular patches. When the larvæ are numerous more than one will be found upon each leaf, and the work of destruction proceeds more rapidly. When tired of their location they crawl away, bearing their cases with them, to seek fresh feeding grounds. When blown to the ground with falling leaves they apparently crawl up the nearest trunk again. When mature they drop to the ground, or fall with the leaves, and changing to pupæ in their cases emerge the following spring as pretty little moths, of a dark blue colour, with bright orange yellow heads, which may be frequently seen in early summer upon the leaves or flying from tree to tree. When a serious attack, such as I have described, occurs in a grove, upon shade or ornamental trees, or in a sugar-bush, it would be well to burn over the leaves, and to let pigs or cattle range the ground so as to destroy as many as possible of the pupæ.

20. *Thyridopteryx Ephemeraformis* Haworth. This is a very curious insect known as the "bag-worm," because the larva forms a bag to protect it (Fig. 8f) while feeding. The female passes her whole life in this case, being wingless. It is a rather southern insect and will not likely occur in Canada. Among its food plants Mr. Lintner enumerates maple. In Fig. 8, *a* represents the caterpillar; *f*, the same in its bag, fully grown; *b*, the male pupa; *c*, the female moth, legless and wingless; *d*, the male moth; *e*, section of female pupa in the bag, as found in winter.

The following species are also given by Dr. Packard as infesting the maple:—

21. *Gastropacha Americana* Harris. The American Lappetmoth, which is also sometimes found upon apple and cherry trees.

22. *Nadata Gibbosa* Sm-Abb. Also on oak.

23. *Nematocampa filamentaria*, Guen. I have bred this moth from larva found upon hickory, *Carya amara*. It is described and figured in "Insects Injurious to Fruits," Saunders, as feeding on plum trees. The caterpillar is remarkable as having four long slender fleshy filaments arising from the fifth and sixth segment. It occurs also on oak.

24. *Amphidasys Cognataria*, Guenee. This is a large handsome moth, expanding two inches or more. The caterpillar is a greenish "looper" sometimes attacking currant bushes, and feeding on various plants.

25. *Heterophleps Triguttata* H.-Sch.

26. *Lithocolletis Aceriella*, Clemens. The larva of this little moth mines in the upper surface of the leaves, forming a flat blotch therein.

27. *Lithocolletis Lucidicostella*, Clemens. The larvæ form tentiform mines in under surface of leaves.

28. *Lithocolletis clemensella*, Chamb. The larvæ of this species have the habits of previous one.

29. *Gracilaria Packardella*, Chamb. The caterpillar rolls the leaf downward into a conical figure.

30. *Catatega Aceriella*, Clemens. Of this species only the larvæ were known to Dr. Packard, and although they occur here the moth has never been bred. The larva at first mines the leaf, but subsequently it constructs a case of its frass.

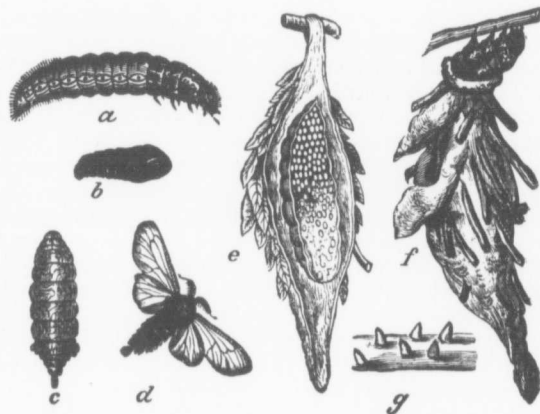


Fig. 8.

The following

State of Illinois
31. *Agrotis*

vegetables, pear

32. *Eacles*

Caterpillar about

oak, pine, maple

33. *Hyphan*



Feeds on a great
oaks, apple, spruce
represents the male
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In this order
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Fig. 10.

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37. *Glycobi*
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The following species are stated to feed on maples by Dr. Thomas, Entomologist for State of Illinois:—

31. *Agrotis C-nigrum* Linn. Larva known as "Spotted Cut-worm," feeds on grass, vegetables, pear tree and maple.

32. *Eacles Imperialis* Hubner. A very large moth, extremely rare in Canada. Caterpillar about three inches long, with rows of spinous tubercles. Feeds on sycamore, oak, pine, maple, etc.

33. *Hyphantria Tector* Harris.

This species is very abundant and obnoxious throughout Canada, being known as the Fall Web-worm, from the fact that the young larvæ live and feed together in a web which they spin upon the branches of the plant upon which they are hatched. The moth itself is a small white miller (Fig. 9, c). The larvæ (Fig. 9, a) feed on nearly all trees and shrubs.

34. *Limacodes laticlavata* Clem.

35. *Orgyia leucostigma* Sm.-Abb. A common moth, having a caterpillar (Fig. 12) covered with yellowish hairs; four brush-like yellowish tufts on back; two pencils of long black hairs on segment behind head, pointing forward, and another on the posterior end pointing backward.

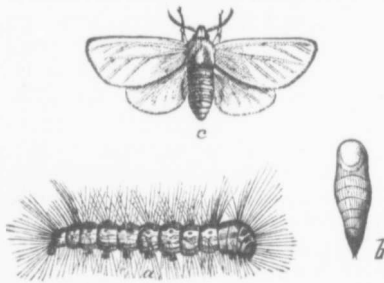


Fig. 9.

Feeds on a great variety of trees, including oaks, apple, spruce, larch, maple, etc. Fig. 10 represents the male moth; fig. 11 a the wingless female; b a young caterpillar hanging by its silken thread; c and d pupæ; fig. 12, the caterpillar fully grown.

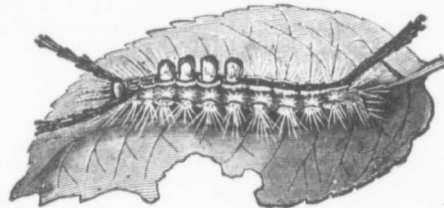


Fig. 12.

DIPTERA.

In this order, that contains the flies, insects distinguished by having only two wings, we do not find many species attacking

the maples. Indeed I have no personal knowledge of any, and Dr. Packard only mentions the following species which does not appear in our Canadian lists of Diptera. It belongs to a genus in which we have several well known destructive insects, popularly known as midges, such as the Wheat midge, *C. tritici*, and Clover-seed midge, *C. lequimicola*.

36. *Cecidomyia aceris* Shimer, on *Acer dasycarpum*, the silver maple.

COLEOPTERA.

Of beetles we find quite a long list infesting the maple. Ten species belong to the Cerambycidae, or long-horned beetles, a family containing nearly all the large beetles of which the larvæ are known as "borers," and of which species infest all our trees, although some trees, such as the pine and hickory, are much more infested than are the maples.

37. *Glycobius speciosus*, Say, is universally known as the sugar-maple borer, and has been frequently referred to in our Reports (See Nos. III., VIII., IX., XI. and XII.) The beetle (Fig. 13) appears to be rare in this neighbourhood, but in the

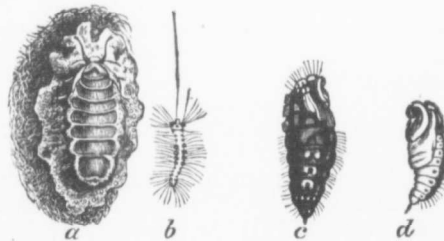


Fig. 11.



Fig. 10.

western part of the Province it is unfortunately sometimes very destructive. At



Fig. 13.

London it has been accused by Professor Saunders and Mr. Reed of doing great injury to trees throughout the city. The larvae bore into the solid wood, both of young trees and of large ones, and Dr. Packard cites several cases where healthy, vigorous trees perished from their attacks. The beetle is nearly an inch long, of a rich velvet-black above with bright yellow markings. The head is yellow, the thorax has two yellow transverse lines on each side; the wing-covers have a yellow band across the middle, above which a "W" with oblique bands over it; the tips yellow, with a black dot on each, and band above; legs and under parts of body yellowish. The larva is hatched in July or August, from an egg deposited on, or in, the bark, and burrows at first between the bark and wood, but the following spring, when large, it bores into the solid wood. Like the "apple borer" it should be searched for by the sawdust ejected from the burrow, and be dug out.

38. *Calloides nobilis*, Say. This beetle is much rarer than the former, and resembles it in general appearance, except that the yellow markings are not so numerous or extensive. I have captured it on maple trees in June. It is recorded as infesting the chestnut, of which we have none here.

39. *Xylotrechus colonus*, Fabr. A beetle similar in shape to the preceding species, but averaging only about half an inch in length, has been found under the bark of an old sugar-maple (by Mr. G. Hunt). The species bores in the oak also, and I have taken specimens upon hickory. The markings of the elytra are whitish.

40. *Clytanthus ruricola*, Oliv. This is a very pretty beetle, which I find upon several trees, including maples. It is nearly of the same size and shape as the preceding beetle, but is of more elegant appearance, and has longer, slenderer legs. It has the rich black and yellow of the maple-borer, but the head is black; there are no transverse lines on the thorax; and the elytra lack the yellow tips and middle band.

41. *Bellamira scalaris*, Say. This beetle is of a different form, being long and slender, especially the males. I have taken the female ovipositing in a maple stump in July. Her length is over an inch; the head is constructed behind the eyes so as to form a neck; the thorax is narrow; the elytra pretty wide at the shoulders but tapering rapidly to the apex, and shorter than the abdomen. Colour reddish, (sometimes dark), with feet and antennae more yellowish, the elytra glistening with a fine pubescence. This beetle has been found to attack birch.

42. *Dryobius sexfasciatus*, Say. This a handsome longicorn recorded by Mr. C. G. Siewers of Newport, Ky., as found under bark of dead maple, (Can. Entomologist XII., pg. 139). As it does not appear to be found in Canada I need not give any description of it here.

43. *Orthosoma brunneum*, Forst. This is one of our largest beetles, and its larva is a formidable grub, which may often be found in old pine logs and stumps, and occasionally it occurs in other kinds of wood. I have on two occasions taken the beetles (Fig. 14). under the bark of dead sugar-maples.

44. *Urographis fasciatus*, DeGeer. Is a grayish beetle, with several wavy black bands. It is slightly over half an inch long, and the abdomen of the female is prolonged into an ovipositor that protrudes beyond the wing covers. It infests also the oak and hickory.

45. *Liopus variegatus*, Hald. This is a smaller beetle which I have once or twice captured crawling on the trunks of old sugar maples.

46. *Saperda tridentata*, Oliv., is the elm-tree borer, which often does great injury to elms. It belongs to a genus which contains several of our best known borers, among others the apple-tree borer (*S. candida*) the linden borer (*S. vestita*), the poplar borer (*S. calcarata*) and the hickory borer (*S. discoidea*), I have



Fig. 14.

not seen any more from pupae taken and the beetle an inch long, in the trees infested off three tooth-

The Lucan juices thereof, is beneficial than some cases injure foliage.

47. *Platyc* attacked by some withered and de- new to me, which gnawed a hole in tender substance were found in trees, and the half an inch long the terminal joint pincers, those o-

48. *Dorcu* has head, thorax female the thorax large and toothed of old sugar-ma-

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Fig. 15.

53. *Dicerc* on a shade map-

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Fig. 14.



Fig. 15.

53. *Dicerca lugubris*, Lec. The only specimen of this beetle which I have taken, was on a shade maple. It is a blackish beetle about the size of the apple-tree chrysobothris.

not seen any mention of it attacking the maple, but I have bred specimens of the beetle from pupæ taken under the bark of a fallen sugar-maple. These pupæ were found in May, and the beetles appeared on 15th June. The larva is a flattened white grub, about half an inch long, mining between the wood and bark, and loosening the latter, to the injury of the trees infested. The beetle has a lateral red line bordering the thorax and elytra, giving off three tooth-like projections on each elytron, whence the specific name.

The Lucanidæ are beetles whose larvæ live in decomposing wood, subsisting on the juices thereof, like those of several of our largest Scarabæidæ. Such habits are rather beneficial than otherwise, as the reduction of fallen timber is thereby hastened, but in some cases injury may be done to living trees by the enlargement of accidental crevices and cavities. Injury may, however be done by the beetles themselves as they sometimes attack foliage.

47. *Platycerus quercus*, Weber. On 6th May 1881 I noticed young maples evidently attacked by some insect, as many of the leaf buds, then almost ready to open, were partly withered and destroyed. On examination I found within several of the buds beetles, then new to me, which proved to be the species under consideration. The beetle had first gnawed a hole into the centre of the bud, and then in concealment had feasted on the tender substance of the young leaves. In one instance a pair of beetles (male and female) were found in the same cavity. I have since found the beetles upon the leaves of various trees, and the larvæ in old logs and stumps of elm, etc. The beetle is a little less than half an inch long ; flattened and black with sometimes a greenish hue ; the antennæ have the terminal joints lamellate, and the mandibles in the male are prolonged like a pair of pincers, those of the female are shorter and she is reddish underneath.

48. *Dorcus parallelus*, Say is a much larger beetle, being an inch long. The male has head, thorax and abdomen all of equal width, (whence the specific name) but in the female the thorax is more round in front and the head smaller. The jaws of the male are large and toothed, those of the other sex small. The beetles are found under the loose bark of old sugar-maples, the larvæ living in the decaying parts of the trees.

49. *Ptilinus ruficornis*, Say. Family Ptinidæ. This is a little brownish beetle not more than one-fifth of an inch long, and having the head almost hidden by the thorax. The male is much smaller and has pretty reddish pectinate antennæ. The beetles are very common and attack various trees, both living and dead. When a tree—say oak, hickory or maple—has been injured by blazing or peeling of bark, this little beetle may frequently be seen boring into the exposed wood ; or if the injury is an old one perhaps numbers may be found emerging. I have seen great numbers issuing from maple trees, leaving the wood riddled with small holes.

50. *Xestobium affine*, Lec., belonging to the same family is recorded by Dr. Packard as found in a stump of red maple. I do not know whether it occurs in Canada or not.

51. *Chrysobothris femorater*, Lec ; family Buprestidæ, is well known as the flat-headed apple-tree borer, (Fig. 15), which has been described and figured so often in our reports. In the Western States this beetle is said to very seriously injure soft maples. I have not observed it to attack our maples here, but have found it to infest hickories.

52. *Dicerca divaricata*, Say., belongs to the same family and is larger. It greatly infests old, and particularly dead maples, and I have frequently seen the females depositing eggs in such trees. On a bright sunny day in mid-summer an examination of any dead maple or beech will probably show one—perhaps many—of these beetles crawling lazily up and down the trunk or sunning themselves thereon. This species is readily distinguished from others of the same family (all hard beetles with bronzy or other metallic lustres) by the prolonged tips of the elytra diverging.

54. *Stenoscelis brevis*, Boh., is a small blackish beetle found boring in poplar and maple, but does not probably do much injury. It belongs to the family Calandridæ.

55. *Eupsalis minuta*, Drury, is a peculiar long-snouted beetle belonging to the family Brenthidæ, of which it is the sole Canadian representative. Fig. 16 shows the insect in its different stages. It has a cylindrical body; thorax egg-shaped and tapering gradually to the head, which is prolonged in a straight snout, hardly as long as thorax; beak of female slender with very small jaws, that of male heavier with strong curved jaws. Smooth and glossy; brown, with broken yellow lines on wing-covers. Size extremely variable, from one quarter to seven-eighths of an inch. The larvæ of this beetle bore in various kinds of oaks, usually in felled trees or stumps, burrowing, it is stated, in all directions through the heart wood. On 22nd May, 1882, I obtained about twenty beetles from under the bark of a large fallen sugar-maple. The larvæ had apparently lived chiefly on the inner layers of the bark and on the sap wood. On another occasion I found specimens emerging from a maple stump.

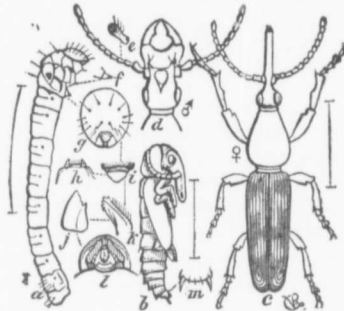


Fig. 16.

The following beetles are also found upon maples, but cannot do much injury, except, perhaps, the last two, should they become very abundant.

56. *Cucujus clavipes*—Fab. A brilliant, flat, pinkish beetle, found with its larvæ, also flat, under bark of various dead trees, especially birch and elm, occasionally of maple.

57. *Alaus oculatus*, Linn. Larva, inhabits decaying wood of various trees. Fig. 17 represents the well-known beetle.

58. *Corymbites sulcicollis*, Say. Beetles found in crevices of bark or under loose portions of large sugar maples; rare.

59. *Nyctobates pensylvanica*, De Geer.

60. *Ipthimus opacus*, Lec.

61. *Upis Ceramboides*, Linn. These three species are large, somewhat flattened, black beetles, often found under loose bark of old trees. The larvæ live in decaying wood of various kinds.

62. *Enchodes sericea*, Hald. Beetles found in old maple logs. Several other species of the same family—Melandryidæ, also occur on old trees, probably to feed on fungous growths.

63. *Tomozia bidentata*, Say. Mordellidæ. I have always found these beetles on old maples or maple stumps.

64. *Pyrochroa femoralis*, Sec. Beetle under bark of dead trees.

65. *Corthylus punctatissimus*, Zimm. Scolytidæ. Stated in classification of the Coleoptera of North America to depredate on maple trees. It is nearly allied to *Monarthrum mali* (Fitch), a minute beetle which attacks apple trees.

66. *Xyloterus politus*, Say. Belongs to same family, and has been reported by M. Lintner attacking maples.



Fig. 17.

HEMIPTERA.

The insects contained in this order are popularly known as bugs. They have a slender jointed proboscis with which they suck the juices either of plants or animals. The species are numerous, varying in size from the Aphides—tiny "lice" feeding upon plants—to the great Belostoma, a rapacious water-bug, preying even upon small fish. Although some kinds of trees are attacked by many species of bugs, the maples seem to be more favored, and to have but few hemipterous depredators. I have only found the following species recorded:—

67. *Pulvinaria innumerabilis*, Rathvon. This is a species of scale-insect or bark-louse, which of recent years has been found badly infesting maple trees in many portions

of Ontario. In a full account of designated the bark-louse. It is observed it for an account of its immatures the females having filaments, and are the latter part of when hatched are the branches, and spots, they insert scale-like form and grown the male emerged but the females al

68. *Lygus m* Ent., Vol. XVIII. in some localities, shrubs. He has United States.

69. *Capsus g* quently on various in its habits.

70. *Ceresa bu* tree-hopper. It is lives upon sap dra

Dr. Pachard r

71. *Psylla an*

72. *Aphis ace*

73. *Lecanium*

74. *Lecanium*

INSECTS TROU

Certain insects "Household Pests." observers; and yet also the right meth

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1. The House Diptera. The beautiful manure. They hate their full growth. I find them in abundance

2 (EN.)

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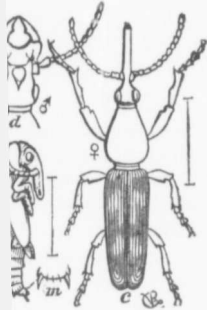


Fig. 16.
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of Ontario. In the *Entomologist* for August, 1884 (vol. XVI., page 141), may be found a full account of it by Prof. Saunders, who suggests that it might with great propriety be designated the maple tree bark-louse instead of, as it is commonly called, the grape vine bark-louse. It was first described in 1884 by Dr. Rathvon, of Lancaster, Pa., who observed it for several years on basswood, and who gave it the name *innumerabilis* on account of its immense numbers. The lice appear in the form of brown scales; those of the females having waxy filaments projecting from them. The eggs are laid among these filaments, and are very numerous—from 500 to 2,000—the female commencing to lay in the latter part of May, and continuing for several weeks until she dies. The young lice when hatched are yellowish white, and can move freely about. They soon spread all over the branches, and seek the twigs and places where the bark is tender. Selecting suitable spots, they insert their beaks and commence to devour the sap, gradually assuming the scale-like form and becoming incapable of further change of habit or position. When fully grown the male emerges from his scale and appears as a delicate, minute two-winged fly, but the females always retains her degraded form.

68. *Lygus monarchus*, Uhler. This bug has only recently been described (Can. *Ent.*, Vol. XVIII., page 208) by Mr. Uhler, who states that it is a very common insect in some localities, and has been taken by him on maples, alders, and many other trees and shrubs. He has found it near Quebec, and it seems to have a wide distribution in the United States.

69. *Capsus goniphorus* (Say.) is a brilliant red or scarlet bug, found not unfrequently on various trees, including maples. Mr. Fletcher informs me that it is nocturnal in its habits.

70. *Ceresa bubalus* (Fab.) is one of the tree-hoppers, its popular name being the Buffalo tree-hopper. It is found upon a great many species of trees, and like all these insects lives upon sap drawn from the tree by means of its proboscis.

Dr. Pachard mentions also the following:

71. *Psylla annulata*, Fitch. On sugar maples.

72. *Aphis aceris*, Linn. On *acer pensylvanica*.

73. *Lecanium acericola*, Walsh and Riley.

74. *Lecanium acericorticis*, Fitch. On silver maple.

INSECTS TROUBLESOME IN THE HOUSEHOLD AND HOW TO DEAL WITH THEM.

BY THE REV. THOMAS W. FYLES, SOUTH QUEBEC.

Certain insects are so troublesome within doors that they may well be denominated "Household Pests." Many of the species are easily recognized by the most careless observers; and yet their life-histories are to many persons altogether unknown, as are also the right methods to abate the annoyances they occasion.

It shall be my effort to give, in this paper, a brief account of the most troublesome of these insect offenders and to point out some of the remedies that may be used against them.

I shall tell of some insects affecting (1) Personal Comfort, (2) Food, and (3) House Plants.

I.—INSECTS AFFECTING PERSONAL COMFORT.

1. The House Fly (*Musca domestica*) belongs to the family *Muscidæ*, in the order *Diptera*. The beautifully reticulated eggs of the insect are laid by the parent fly in horse-manure. They hatch in twenty-four hours, and a week suffices to bring the maggots to their full growth. In turning over the manure pile, in the summer months, the farmer will find them in abundance, as he will also the pupæ, which, in form and size, resemble grain,

2 (EN.)

but in colour are a reddish brown. The perfect fly bursts from the pupa-case in six or seven days. Seen under the microscope it is a remarkable and beautiful object. Its eyes are compound, each presenting four thousand facets. Its wings are beautifully hyaline, flashing in the light rich tints of purple and crimson. The labium, or tongue, terminates in a sucking disk, divided into two leaves, which are ribbed underneath like a rasp (Fig. 18). It is the friction of these ribs which leaves the sensation of a bite upon the skin, when the insect has tried its powers upon us.

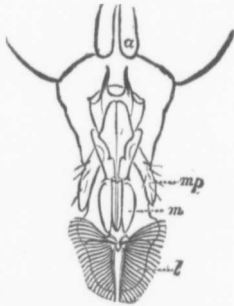


Fig. 18.

Insects belonging to the genus *Musca* are very prolific. Leeuwenhoek calculated that in three months, the natural and unchecked increase from one pair of flies would be 700,000. Vast numbers of the maggots of the house-fly are eaten by domestic poultry, and vast numbers of the perfect insects by hornets and wasps. The fly, moreover, is subject to a strange disease, in which the abdomen becomes distended and a fluffy substance appears in the joints. The fungus is *Sporendonema muscae*. It spreads through the system, saps the life and the fly succumbs.

Much may be done to keep down the numbers of the house-fly. The horse-barn should be placed at a distance from the dwelling house. The manure pile should be frequently turned, and the poultry allowed free access to it. The house should be supplied with doors and blinds of gauze-wire or netting, which will admit light and air, so necessary to the health of the inmates, and shut out flies and other intruders. Care should be taken to destroy every fly that shows itself in the winter—hibernating insects will start fresh colonies in the spring. A simple and very effective fly-trap may be made thus:—Fill a tumbler to within an inch of the top with strong soap-suds. Take a slice of bread, cut in the centre of it a hole about an inch in diameter; moisten the under surface; spread it freely with Muscovado sugar; place it with the sugared surface downward, over the tumbler, so that the hole may come in the centre. The flies will soon discover the sugar, descend through the hole, and very soon attempting to fly, will be engulfed. When the flies blacken the suds they can be taken out and thrown into the stove.

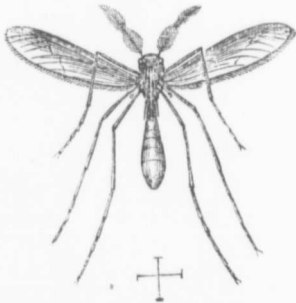


Fig. 19.

2. The Mosquito (*Culex* ———) belongs to the family *Culicidae* in the order *Diptera*. Several species of the genus *Culex* are assigned to British North America. The names of these different species are suggestive,—*excrucians*, *impatiens*, *implacabilis*, *provocans*, *stimulans*, etc. The mosquito lays her eggs in a boat-shaped mass on the surface of the water. She delights in pools, for her progeny feed upon the decaying matter which abounds in stagnant water. They are familiarly known as "wrigglers." They are often seen in rain-water which has been allowed to remain too long in the butt. The breathing apparatus of the larva is situated at the extremity of the body, and is described by Packard as a "star-like respiratory tube which connects with the tracheæ." The creature is often seen hanging with its head downwards and its respiratory organ at the surface of

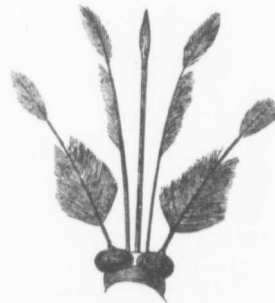


Fig. 20.

the water. Its larva or nymph is active, mining leaves, or padding the mosquito through divides, and the pe having been shaker

It is the fem magnified; and Fig of a number of lanc which the blood is caused by the rapid

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3. The Bed Bug *Hemiptera*. This sometimes brought and in second hand When I was a boy housekeepers in the who wrote 150 year timber for the re-b sources that the bu have been, for trad occurred. But, pr The name bug is at the Scriptures read

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4. The Louse *Hemiptera*. This Yet, despite the ca

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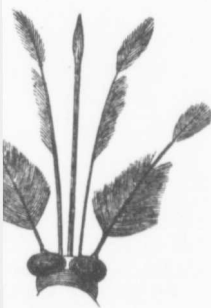


Fig. 20.

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the water. Its large head and thorax act as a weight to keep it in position. The pupa or nymph is active also and moves with a succession of jerks, and by means of two swimming leaves, or paddles, placed at the end of the abdomen. One month suffices to carry the mosquito through its preliminary stages. The pupa rises to the surface; the skin divides, and the perfect insect steps out, using the empty case as a raft until its wings, having been shaken out and dried, are in a condition for flight.

It is the female mosquito only that attacks us. Fig. 19 represents the female, magnified; and Fig. 20 the mouth parts much enlarged. The weapon she uses consists of a number of lancets, which, compressed in the wound they make, form a tube through which the blood is drawn. The shrill warning of its approach which the creature gives is caused by the rapid vibration of its wings.

The mosquito, however troublesome, is doubtless a beneficial insect. Its larvæ consume decaying matter which would generate miasma and the perfect insects do their best to drive men from unhealthy localities. As a tract of country is made fit by thorough drainage, for human habitation, they disappear. *Drainage* is the great remedy against them. Wire doors and blinds will keep them out of the house, and the application of a little salt and water will allay the irritation of the wounds they give. As a preventive against their bite [and against those of the Black Fly, (*Simulium molestum* which is found in Company with them] woodmen and tourists make use of pennyroyal, oil of tar and carbolic ointments.

3. The Bed Bug, (*Acanthia lectularia*) belongs to the family *Membranacei* in the order *Hemiptera*. This disgusting creature finds its way, unexpectedly, to new quarters. It is sometimes brought in the clothing after a journey. It is sometimes introduced in parcels and in second hand books, etc. It is well to know its history, and how to deal with it. When I was a boy it was known in the "Home Counties" as the "London Bug"; and housekeepers in those parts examined suspiciously all packages from London. Southall, who wrote 150 years ago, tells us that the creature was brought over from America in timber for the re-building of the city after the great fire of 1666. We learn from other sources that the bug was not known in Europe previous to that event. This may well have been, for trade with America had been carried on for many years before the fire occurred. But, probably, the main colony was introduced in the way that Southall says. The name bug is an old word signifying a *terror*. Psalm xci, 5, in the early versions of the Scriptures reads "Thou shall not be afraid of any bugge by night."

The female bed-bug lays her eggs, about fifty in number, in crevices. They are oval, small and white, and are protected by a coating of varnish. They hatch in about three weeks, and in three months the young attain their full size. There are four broods in a year. The full grown bug is two-and-a-half lines in length, rust-red in colour, flat and wingless. Its abdomen is disproportionately large. Its antennæ are four-jointed and its beak has a three-jointed labium, or sheath.

To keep the house clear of this pest extreme cleanliness is necessary. The walls of bed-rooms should be lime-washed or painted—*not papered*. Iron bedsteads are preferable to wooden ones. The joints of wooden bedsteads should be washed with a solution of *bi-chloride of Mercury*. It can be applied with a paint-brush or a feather. The floors should be often washed with scalding water. To eradicate bugs when they have well established themselves, rooms should be well fumigated with brimstone. The *modus operandi* is thus given by Dr. Lintner, State Entomologist of New York, in his Second Annual Report, page 18:—"Place in the centre of the room a dish containing about four ounces of brimstone, within a large vessel, so that the possible overflowing of the burning mass may not injure the carpet or set fire to the floor. After removing from the room all such metallic surfaces as might be affected by the fumes, close every aperture, even the key-holes, and set fire to the brimstone. When four or five hours have elapsed the room may be entered and the windows opened for a thorough airing."

4. The Louse (*Pediculus humani capitis*) belongs to the family *Pediculina*, in the order *Hemiptera*. This insect is quite as disgusting and unwelcome as the last described. Yet, despite the care of fond mothers and careful nurses, it does occasionally find its way

to the heads of children, especially of such as are wont to make chance acquaintances. The insect itself is of a venturesome disposition, as Burns has sung:—

“Ye ugly, creepin’ blastit wommer,
Detested, shunn’d by saunt and sinner,
How dare you set your fit upon her,
Sae fine a leddy!
Gae somewhere else and seek your dinner
On some poor body.”

* * * * *
“Now haud you there, ye’re out o’ sight,
Below the fatt’rils, snug and tight;
Na, faith ye yet! ye’ll no be right
Till ye’ve got on it,
The vera topmost, tow’ring height,
O’ Miss’s bonnet!”

Perhaps Burns regarded the louse too unfavourably. There is reason to believe that the insect has brought distinction to at least one noble family. Quartered, 2nd and 3rd, in the arms of the Earl of Lathom are those of Bootle:—

“Gules on a chevron, engrailed, between three *combs* argent, as many crosses patée, fitchée of the field.”

The combs are represented as veritable “small tooth-combs.” Under what circumstances the distinction was granted I know not. It may be that in former days some lady of the Bootle line proved herself particularly useful in the royal nursery; or that the suzerain observed, on some noteworthy occasion, that each retainer brought into the field by the head of that family, was, *with his familiars*, truly a host; or that in the days when hair-shirts were seldom changed, and St. Jerome’s advice to Rustique, “Never flatter the body by the use of the bath,” was held in high esteem, some particularly saintly Bootle—perchance on his return from pilgrimage—was honoured by his king in having allotted to him the suggestive combs and crosses, “*ut reg.*” as Debrett has it. However the case may be, we have here an instance of a noble family attaching importance to its “small tooth combs”; and we learn from it that things aristocratic and things vulgar are sometimes brought into juxtaposition.

Leeuwenhoek has told us that the increase from one female louse may in eight weeks number five thousand. No wonder that the lodgement of a creature so fecund is dreaded. The eggs or “nits” of the louse hatch in eight days; and the young attain their growth in less than a month. The insect is wingless. Its abdomen is large and has nine segments. Each of six legs terminates with a hook. Its antennæ are filiform and five-jointed. It has a retractile beak or sucker. Its eyes are not faceted.

A comb smeared with white precipitate ointment and run through the child’s hair will soon dispose of this obnoxious pest.

5. The Flea (*Pulex irritans*) belongs to the family *Pulicidae* in the order *Diptera*.

The eggs of the flea, which are oval and one forty-fifth of an inch in length, are laid in hearth rugs, etc., or in the fur of animals, from which they are shaken to the floor or ground. The larvæ live in the dust and dirt, and feed on decaying vegetable substances. They are footless, long, and somewhat hairy; and, at the end, they have two long spines. In colour, the head is honey-yellow, the rest of the body, white. The antennæ are three-jointed. These larvæ attain their growth in twelve days, and then form a silken cocoon in which they undergo the pupal change. The insect remains in pupa about two weeks. In the perfect flea, the body is compressed, the wings are represented by minute scales on the thorax; the beak or rostrum is formed both for laceration and suction; the eyes are simple; the skin is polished and horny, and set with sharp bristles pointing backwards; the long, hindmost pair of legs are formed for leaping. A flea can leap thirty times its own height.

Dogs and cats troubled with fleas should be frequently washed with strong soap-suds. To banish fleas from the house old Tusser’s remedy (quoted by Kirby and Spence) may be tried:—

“While wormwood hath seed get a handful or twain
To save against March, to make flea to refraine,
Where chamber is sweeped and wormwood is strown,
No flea for his life dare abide to be known.”

6. The Grasshopper (*Lepidoptera*). Its glossy fore wings are black the second in A

The caterpillar, mingling grain itself. It is found tangled in mischief, are ye half-an-inch long about the size of

To remedy, passed through small tight bins

7. The Mealybug (family *Tenebrionidae*) sometimes called

The larva is segmented, besides stores, bakeries, and through the their pets.

The perfect chestnut brown cover the abdomen

To keep them



8. The Flea (*Pulex irritans*). Its head is rather within its own body

II.—INSECTS AFFECTING FOOD.

6. The Grain Moth (*Tinea granella*) belongs to the family *Tineidae* in the order *Lepidoptera*. In its perfect state this insect is about one-third of an inch long. It has glossy fore wings marbled with grey and brown, and spotted with dark spots. Its hind wings are blackish. There are two broods in the year. The first appears in May, and the second in August. The young from the latter live through the winter.

The caterpillars, as soon as they are hatched commence to eat the grain, and to spin a web, mingling with it rejected fragments of their food, and, as they increase in size, the grain itself. Where the creatures abound the whole surface of the grain in the bin will be found tangled into a crust of webs and damaged grain. The caterpillars, that do the mischief, are yellow or buff in colour, and have reddish heads. When full grown they are half-an-inch long. They creep into some nook or crevice to spin their cocoons which are about the size of a kernel of wheat. The chrysalis is brown and shining.

To remedy, in a measure, the effects of the creature's operations, the grain should be passed through a fan. To prevent attacks it should be kept in barrels, headed up, or in small tight bins, in cool and dry apartments.

7. The Meal Worm (*Tenebrio molitor*). This grub is the larva of a beetle belonging to the family *Tenebrionidae* in the order *Coleoptera*. The beetle is very common, and is sometimes called the "black beetle," and sometimes the "flour beetle."

The larva is about an inch long. It is cream coloured and has twelve clearly marked segments, besides the head. It is smooth and glossy. It abounds in corn-mills, flour-stores, bakeries, etc. It often does much damage on ship-board, biting its way through and through the biscuits stored in casks. It is sought for by bird-fanciers as food for their pets.

The perfect insect is of a compact ovate form. Its colour on its first appearance is chestnut brown, but exposure darkens this rapidly into blackish brown. The elytra cover the abdomen and are striated. The legs and antennae are long and slender.

To keep the store-room free from the worms, *kill the beetles*.

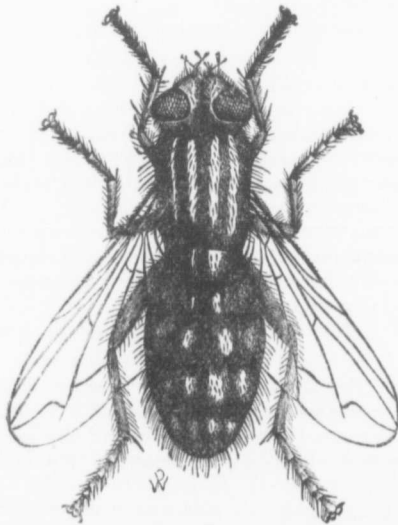


Fig. 21.

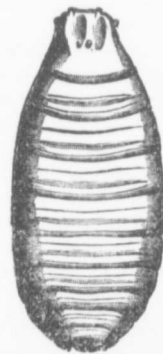


Fig. 22.

8. The Flesh Fly (*Sarcophaga carnaria*) belongs to the family *Muscidae* in the order *Diptera*, Fig. 21. It is black, striped and checkered with grey. Its legs are stout and hairy. Its head is rather small. It is viviparous—it deposits living maggots, the eggs hatching within its own body. It is marvellously prolific, producing as many as 20,000 larvæ, Fig.

22. The voracity of these is so great, and their growth so rapid, that it is said they will increase two hundred times in weight in twenty-four hours. Linnaeus asserted that three female flies and their immediate progeny would devour a horse more quickly than would a lion.

The well-known Blow Fly, or Blue Bottle (*Musca vomitoria*), in the same family and order, unlike the flesh fly, lays eggs.

The larvæ of both the above-named flies are pointed at the head and truncated at the tail. They are used by anglers, and are called gentles.

To preserve meat from fly-blows, keep it in ice-houses, refrigerators, or wire safes.

9. The Bacon Beetle (*Dermestes lardarius*) belongs to the family *Dermestidae* in the order *Coleoptera*. This insect is well known, and is much dreaded by Entomologists on account of the destruction it works among their dried specimens. The creature lays its eggs upon stuffed birds, skins, hams, dried meat, etc. The hairy larva is whitish brown above, and white beneath. Its body is elongated and tapers towards the tail, which ends in two spines. The cast skins of the larvæ are often the tokens of its presence. The perfect beetle is about a quarter of an inch long. Its colour is dull black, relieved by a broad greyish band across the base of the elytra. This band is a growth of thick grey down, and the spots that are found in it are places where the down is wanting. The insect is oblong and compact. Its elytra cover the abdomen. The antennæ are clavated.

The use of benzine will save the stuffed birds; and care and cleanliness will banish the beetles from the larder.

10. The Cheese Fly (*Piophilæ casei*) belongs to the family *Muscidae* in the order *Diptera*. The larvæ of this insect are the well-known "hoppers" found in cheese. They are whitish in colour; and in shape they are tapering—pointed at the head and truncated behind. The head is furnished with mouth-hooks, by means of which the creature draws itself along. It has the power of leaping four or five inches. To accomplish the feat, it brings its head and tail together, grappling the edge of the latter with the hooks at the mouth, and then, suddenly quitting its hold, it is jerked by the rebound to the distance named.

The perfect insect is a shining black fly, three-twentieths of an inch in length. Its wings are transparent, and its hindmost and middle legs are yellow.

To preserve cheese from the fly, keep it in a closely covered earthen jar.

III.—INSECTS AFFECTING HOUSE PLANTS.

11. The Scale Insect (*Lecanium hesperidum*). Oleanders, rose-bushes, abutilons, etc., are often infested with this creature which belongs to the family *Coccidae* in the order *Hemiptera*. The scale is convex, smooth and shining. It is dark brown in colour and of an oval shape. The short legs and thread-like antennæ are hidden by the shell. The insects are found lying longitudinally, with the head upwards, on the stems and branches. The damage they do is caused by suction—the creatures insert their beaks and imbibe the sap, and so doing weaken the plants. The young larvæ are of a yellowish colour.

The presence of the scale insect betokens too dry an atmosphere.

Wash the affected plants with a mixture of kerosene oil, milk and water, in equal parts. It can be applied with a rag or sponge.

12. The Mealy Bug (*Dactylopius adonidum*). This also belongs to the *Coccidae*. It is universally distributed. When full grown it is one-eighth of an inch in length. It is of an oblong shape flattened at the head. It has two long spines at the end of the body, and other spines along the side. It is covered with a white mealy substance. The male is a winged insect.

Whiskey applied with a brush will kill the bugs.

13. The Red Spider (*Tetranychus telarius*). This pest is a mite belonging to the family *Trombidinæ*, in the order *Aptera* or wingless insects. The creature is very minute and can hardly be distinguished by the unassisted eye. It varies in colour from green to brick-red. Like other mites it has eight legs. It works on the under side of the rose-leaf, lacerating it with its jaws and draining its juices by means of its beak or sucker. It

spins a fine web yellow and drop denuded.

For a remedy the affected plant

14. The Thrip. It is almost a little more than parent wings. The skins of the specimens should be



Fig. 14.

wingless female autumnal brood descendants of a

nine hundred and The sweet dew." It is this upon the creature

To destroy with suds made

The writer information supplied in publications of

Insects have for their preservation a likeness which to living creatures. This resemblance

The caterpillars resemble, in color their growth as exact counterparts unopened buds of green leaves,

spins a fine web as a protection to itself and its young. The leaves attacked by it turn yellow and drop off; and, unless the pest is overcome, the plant will soon be entirely denuded.

For a remedy, dust the under sides of the leaves with flour of brimstone. Exposing the affected plant to a good shower is beneficial.

14. The Thrips (*Erythronoeura rosæ*) belongs to the family *Cercopidae* in the order *Hemiptera*. It is almost as injurious to the rose-bush as the red spider. The perfect insect is a little more than a tenth of an inch long, and has a yellowish body, and white transparent wings. Its eyes are brown. The female lays her eggs in June. The empty pupa-skins of the species are often very conspicuous on the under side of the leaves. Affected plants should be well showered with an infusion of tobacco.



Fig. 23.

15. The Plant Louse (*Aphis rosæ*) Fig. 23, belongs to the family *Aphidae* in the order *Hemiptera*. The winged males and females of the species appear in the fall. The insect is green, flask-shaped—the abdomen being large and round. The wings are transparent, much longer than the body, and have a few veins which extend outward from the costa. The upper wings are nearly twice as large as the lower. The head of the insect is small. It is furnished with tapering antennæ and with a long tubular beak. The eyes are globular. The legs are long and the feet two-jointed. At the upper side of the body, near the extremity, are two little tubes or pores, which exude, in droplets, a honey-sweet fluid.

The female aphid, having outlived her mate, lays her eggs and dies. The eggs hatch in early spring, and produce wingless females. These are viviparous, and bring forth, in each case, about ninety young ones resembling themselves. The new brood rapidly attain their growth, and produce other wingless females; and so the ever-increasing multitudes are generated until, in the final autumnal brood, winged males and females again appear. Réaumur calculated that the descendants of one female would, unchecked, amount, in five generations, to five thousand nine hundred and four millions nine hundred thousand.

The sweet fluid exuded from the abdominal tubes of the aphid is known as "honey-dew." It is this fluid which attracts ants, and is the cause of their diligent attendance upon the creatures that produce it.

To destroy the aphid, sprinkle the plants affected with tobacco water, or wash them with suds made with carbolic soap.

The writer of the preceding notes on troublesome insects has drawn largely upon information supplied in valuable papers which have appeared from time to time in the publications of the Entomological Society.

MIMETIC ANALOGY.

BY THE REV. THOMAS W. FYLES, SOUTH QUEBEC.

Insects have numerous enemies, and it is interesting to notice the provisions made for their preservation from them. One of the most remarkable of such provisions is the likeness which they, in many cases, bear to objects among which they are placed, or to living creatures with which they consort—creatures less likely to be molested than they. This resemblance is called Mimetic Analogy.

The caterpillars of *Geometra papilionaria*, which feed upon the birch, closely resemble, in colour, size, and general appearance, the catkins of that tree. They attain their growth as the catkins attain theirs. The caterpillar of *Amphidasis betularia* is the exact counterpart of an oak twig. The brown bifid head of the larva resembling two unopened buds of the plant. One insect (*Phyllia foliata*) would be mistaken for a bunch of green leaves, and another (*Gastropacha quercifolia*) for a bunch of dry ones. Dr.

Hartwig, in his fascinating work on the Tropical World, thus tells of a leaf-like butterfly:—

“Mr. Wallace describes the *Kallima paralekta*, a large, beautifully coloured butterfly when flying, but which, when alighted, cannot be distinguished from a dead leaf, except upon the closest scrutiny. He had often seen it flying, but had never been able to capture one. At last he actually saw one alight close by where he was standing, but it disappeared as if by magic. At last he detected it, and having secured it, was able to perceive how it was able to hide itself, when in plain view. The upper end of the wings terminates in a fine point, while the lower wings are lengthened out into a short thick tail; between these points runs a dark line like the midrib of a leaf, with marks on each side resembling leaf-veins. When the wings are closely pressed together, the whole outline is exactly like that of a half-shrivelled leaf, which it then resembles in colour. The tail of the hind wings forms a perfect stalk, and rests upon the twig, while the insect is supported by the middle pair of legs, which are hardly to be distinguished from the twigs around. The head is drawn back between the wings, at whose base is a notch to let it in. Knowing all this, one must look closely at the picture which he gives in order to distinguish the alighted butterfly from a leaf.”

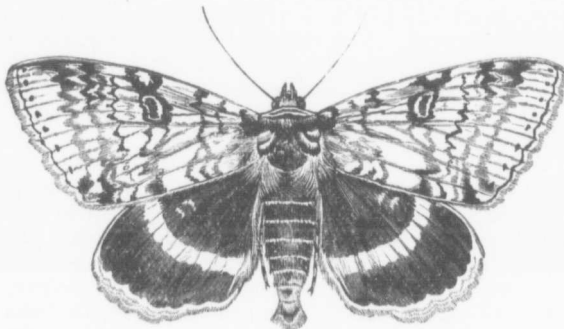


Fig. 24.

disturbed by my efforts to secure it, and flew off. I watched it threading its way amongst the maples for some moments; and then it disappeared. I proceeded in the direction it had taken, and, after half an hour's search, discovered it again. Again it escaped me. It was too good a prize to be lightly abandoned, so I once more set out in pursuit, and I went

— across the bush,
And through and through the bush
And round and round the bush,

and, after three hours' search, I found it, and had the satisfaction of boxing it.

Who has not been startled, when walking along a dusty roadway in the fall to see the Rattling Locust (*Edipoda sulphurea*), which perhaps he had mistaken for a piece of dirt, suddenly spring up at his feet, spread its handsome sulphur-coloured and black under-wings, and fly off with a series of snaps which sounds like an explosion of derisive laughter?

But the most interesting instances of Mimetic Analogy, are those wherein one species of animated creatures bears a resemblance to another with which it consorts. When the apple-trees are in blossom, great numbers of large humble bees, noisy, fierce, well armed fellows, which neither boy nor bird would have the hardihood to molest, may be seen hovering over the blossoms. But, mingled with them, and closely resembling them in size, colour and mode of flight, will be found the yellow-belted moth, *Amphion nesus*, and the “Clear wings,” *Macroglossa pelagius* and *Macroglossa diffinis*. A fear of the bees secures the moths, just as, in the east, a wholesome dread of the military escort saves the peaceful traveller from the Bedouins.

In South America, there are certain butterflies which have an offensive odour—so bad an odour that the birds and the dragon-flies will not honour them with their attention.

With them are the ill-smelling between the kin

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 with their attention.

With them are others of different genera, and quite inoffensive, but so closely resembling the ill-smelling ones in general appearance that it requires a trained eye to distinguish between the kinds.

The theory of Natural Selection is, that nature in the weaker creatures is straining after a resemblance to the stronger. But, oh, do not think that perfection would be reached when the weaker butterfly, *Leptalis orise*, became as ill-savoured as its associate, *Methona psidii* and *Macroglossa pelasgus*, could sting as sharply as *Bombus terricola*, and other fancied improvements in insect economy had been made; for while these changes were taking place the birds and the dragon-flies would often, it will be perceived, have to go supperless to bed, and they too, to use the words of Mrs. Chick, would find it necessary to "make an effort," and would rise superior to their sense of smell; and then there would be a general disarrangement of aims; so that, after all, we cannot wonder that untold centuries, as believers in Darwinism tell us, were necessary to change the monad into the man.

"Not one or two ages sufficed for the feat,
 It required a few millions the change to complete;
 But now the thing's done and it looks rather neat,
 Which nobody can deny."

This theory of Natural Selection runs counter to certain long-received statements, among which is this: "*He* hath made everything beautiful in its season; there can nothing be added to it, and nothing taken away from it."

Southey, in one of his poems has shewn us that we could make no improvement even upon the pig—that alterations would but mar its pig-perfection:—

"Jacob! I do not like to see thy nose
 Turn'd up in scornful curve at yonder pig,
 It would be well, my friend, if we, like him,
 Were perfect in our kind!
 * * * Give thy fancy scope,
 And thou will find that no imagined change
 Can beautify the beast. Place at his end
 The starry glories of the Peacock's pride,
 Give him the Swan's white breast; for his horn hoofs
 Shape such a foot and ankle as the waves
 Crowded in eager rivalry to kiss,
 When Venus, from the enamor'd sea arose;
 Jacob, thou canst but make a monster of him!
 All alteration man could think would mar
 His pig-perfection."

And a class of students once tried their hands at insect manufacture, but were not eminently successful. They took the thorax of one species, the head of another, the abdomen of a third, the legs of a fourth, the wings of a fifth, and the antennæ of a sixth; and by the aid of mucilage, and with careful manipulation, they succeeded in setting up a very extraordinary object. An innocent-looking individual of their number was chosen to be spokesman; and they presented themselves in a body before one of the professors distinguished for his knowledge of Natural History—"Would the Professor oblige them so much as to tell them the name of that bug?" The old gentleman took it—looked at it—put it down, and took out his glasses and examined it again—and a twinkle was seen in his eye, "Gentlemen," he said, "that is a remarkable bug—a very remarkable bug! It looks to me like a specimen of the *hum-bug*."

The instances of Mimetic Analogy which I have hitherto brought forward have betokened providential care for the safety of insects, without loss or detriment to the creatures to which there has been a resemblance. I will now cite one or two of a somewhat different character.

There are certain species of parasitic bees called cuckoo bees, which do not construct cells, and provide a store of pollen for their own larvæ, but visit the nests of their more industrious relations, and lay their eggs in the cells which the owners had prepared for their own young. A bee comes to deposit an egg in a cell which she has previously stored with pollen; but the cuckoo bee has been before her, and she finds an egg therein. She turns away—we can almost fancy her saying to herself, "Dear me, how forgetful I am"—and goes to work upon another cell.

The cuckoo bee bears a close resemblance to the bee whose domain it invades. The chief difference that appears is that, whereas the industrious bee has the broad hollowed shank which all the pollen collectors have, the parasite has a rounded shank.

But there is a third insect, strangely like both the others, which frequents the nest, and which is not a bee at all, but a two-winged fly—an insect more to be dreaded than the cuckoo bee. The young of the cuckoo bee eats the pollen that has been provided for another larva; the young of the fly eats the larva itself. Mr. Noel Humphreys thus describes the creature and its operations:—

“This odious looking creature, with its broad tail, armed with sharp spines, and its muscular body tapering to the head, and furnished with rigid serrations along each side, forms a striking contrast to the soft helpless larva of the bee. Like all the larvæ of the Syrphidæ to which the genus *Volucella* belongs, it is blind, but resting attached by the broad tail, it moves its head rapidly about as a feeler, before changing its position. The spines at the tail may be adapted to enable it to raise itself up the smooth sides of the cell of the bee larva, in case that one infant bee should prove insufficient, and that it might require to pass on to the next cradle. But it may be as well to describe the progress of the parasitic larva on the supposition that one baby bee will prove enough for its purpose. The devoted larva of the bee, then, is gradually eaten alive by the parasite, which, with seemingly horrible instinct, spares all the actually vital parts, taking only the more fleshy portions, until the carnivorous young *Volucella* feels itself full fed and ready to undergo its torpid state of change. Then the last remains of the wretched infant bee are greedily consumed, and the parasite passes into its sleepy chrysaline stage, taking its long *siesta* in the comfortable cradle whose infant tenant it has devoured, and from which it eventually comes boldly forth in all the pride of its winged and perfect state, walking out of the bee-home as from its own proper abode, and attracting no notice whatever from the bees in whose nursery it has performed the odious act of eating a baby bee, and appropriating its comfortable cradle cell. The stolid unconsciousness with which the bees allow this insect vampire to pass out and escape from the scene of its horrid proceedings with impunity, has induced some naturalists to believe that the carnivorous *Volucella* owes its safety to the complete disguise in the colouring of the bee, which is supposed to be so perfect as to deceive the bees themselves into the belief that these strangers are members of their own fraternity.”

Instances of Mimetic Analogy are not confined to the insect tribes. Did the reader ever see a flock of young grey turkeys throw themselves upon a granite rock and lie motionless keeping a watchful eye on the hawk gliding in the sky above them? How closely do the female Bob-o'-link and its eggs resemble in their colours the foliage around the nest! How difficult it is to distinguish the young of the ruffed grouse as they crouch in the herbage when an intruder comes suddenly upon them. It cannot be doubted that numberless lives are prolonged, by the resemblances to surrounding objects, and the instinct to make the most of these resemblances, with which God in His providential care has gifted so many of His creatures.

NOTE ON THE TIGER BEETLES.

BY REV. THOMAS W. FYLES, SOUTH QUEBEC.

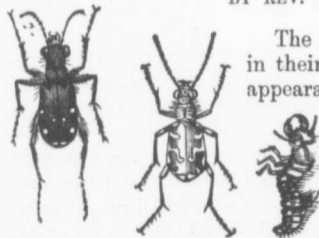


Fig. 25.

Fig. 26.

Fig. 27.

The insects called Tiger Beetles (Figs. 25 and 26) are predatory in their nature, very active in their habits, and elegant in their appearance. Many of them are perfect gems, clean cut and polished.

The plan pursued by the larvæ (Fig. 27) of the Tiger Beetles for capturing their prey was first made known by M. Desmarets. The account reads like a chapter in one of those dreadful sensational stories, in which trap-doors are made to open upon indescribable horrors.

The *Cicindela* larva sinks a narrow shaft about a foot deep in the soil, then climbs

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to the top of it, covers its broad flat head with sand, and waits. By-and-bye some poor innocent, taking the air, steps upon the living door of the deadly oubliette. Down goes the larva *instanter*, and down goes its prey; and what transpires when they reach the bottom must be left to the imagination.

The perfect insect is as voracious as the larva, but it hunts down its victims in the face of day and often has to do battle for the prize. I have in my cabinet a specimen of *C. vulgaris* which has a peculiar lump upon one of its front legs. That lump is an honourable distinction. It is the head of a large ant (*F. Pennsylvanica*) slain in single combat—the whole head. How much more complete a decoration than the necklace of the teeth of his slaughtered foes, which the South Sea Islander used to wear, is this! On that fatal day—the day of the combat—the beetle and the ant set out from their respective abodes, each with courage high and appetite keen. Both were distinguished warriors, and

“When Greek meets Greek, the tug of war begins.”

They met, and, as the Yankees say, “went for one another.” The ant seized the beetle by the leg, but that was enclosed in armour of proof. The beetle seized the ant by the neck—a smaller neck than poor Ann Boleyn’s; no wonder the head came off! But those determined jaws held on grimly in death. No effort of the conqueror could relax them and by no effort could he reach the head to bite it away; and so he carried it about with him as a trophy of victory.

THE HESSIAN FLY.

BY JAMES FLETCHER, OTTAWA.

The above is the title of an admirable pamphlet just issued by Miss Ormerod, Consulting Entomologist to the Royal Agricultural Society of England, and adds one more to the many boons for which the agricultural classes in England are indebted to this talented lady. Although all the information published is contained in twenty-one of the small pages of a crown octavo pamphlet, so methodical is the arrangement and so concise are the statements, that it may be said to contain all that it is important for the farmer to know of what has been positively ascertained concerning the habits of this destructive insect, and the most approved remedies for keeping it in check. With Miss Ormerod’s pamphlet he can, in a few minutes, learn from her excellent illustrations whether an attack upon his crop should be ascribed to the Hessian fly or not, and if so he will also find himself provided with advice as to the best steps to take to limit the injury to the smallest possible amount.

Immediately upon the first appearance of the Hessian fly in England, Miss Ormerod, with characteristic promptness, visited the fields attacked and at once identified the marauder. That there should be no mistake in the matter, she referred specimens to the highest authorities, and amongst others to our ex-President Prof. Saunders. All of these agreed with her that it was the true Hessian Fly. She then lost no time in writing to the newspapers, and in describing how the attack might be recognised. In a few weeks she had examined all the literature on the subject, and had accumulated a vast amount of information as to the extent of the injury committed; so that before the winter set in she was able to give the farmers good practical advice as to the best means of stamping out the new enemy. This she has now consolidated into the useful report under consideration. We have first a short historical sketch of the fly as an injurious insect; then an estimate of the injury caused during the past season in England and Scotland, which was considerable. In one English and three Scotch localities, the loss was calculated to be several bushels to the acre. The appearance of the attacked crops is described in a plain, intelligible manner, together with the insect in its different stages, from the egg to the perfect insect, and an abstract is given of its life-history. The important question, “Where does the Hessian fly come from?” is then discussed. This treats of the different means by

which the insect may be introduced, and it is shown that it may come in the "flax-seed" state amongst seed-grain, or in straw which, having come from infested countries, either as straw-cargoes or as packing, is used for horses and cows in London, and then sent out to farms in the country as slightly used litter, or as "long-manure." When this is the case, says Miss Ormerod, "a sufficiently large proportion of the flies in the flax-seed state are likely to develop to cause mischief, such as we have seen in the past season. On the first farm on which the attack was observed, near Hertford, I found, on enquiry, that London manure had been used of mixed kind, but mainly cow and horse manure, in 'very long' condition."

An observation of the greatest importance was made by Mr. Palmer, of Revell's Hall, near Hertford, viz., that the flax-seeds are separated from the straw in threshing. This was previously thought not to be the case; as however, they are thus loosened from the straw, they are of course liable to be mixed with grain and with it transmitted from place to place; but, in Mr. Palmer's case, they were not found amongst the grain, nor in the chaff, but in the dust and rubbish which falls beneath the threshing machine. In a handful of siftings he found no less than fifteen "flax-seeds." This rubbish is comparatively worthless, and if English farmers are careful always to burn it upon a waste spot, it will certainly reduce the number of the parent flies from which another serious attack may originate. It is the custom amongst our best Canadian farmers to do this in districts where the wheat midge (weevil) is prevalent, and it is attended with very satisfactory results.

Our authoress continues: "From the above observations it appears that puparia or 'flax-seeds' may be transmitted in corn rubbish. In samples of screenings and 'sweepings' from imported corn I have found, besides a large amount of live and dead beetles, also weed-seeds, smut and other matters undesirable to spread abroad, (as may easily be done where these are used for poultry food, and thus thrown out in farm yards), and as with these broken bits of stem are to be found, it appears at least possible that "flax-seed" may also be conveyed. In Dr. Packard's paper on the subject, he alludes to the possibility of the pest being transmitted in wheat."

The best methods of prevention are treated of at some length, and their applicability to the farming process in vogue in England is reviewed. The favorite preventive remedy—late sowing—is shown to be applied in England as an ordinary part of the regular arrangements of the work on most farms. As a rule, wheat is not sown until some time after the 20th September, the date which we consider the latest it is necessary to wait to avoid attack, and thus the young wheat plants are not up until after the autumn brood of the fly is dead. The importance of this point cannot be laid too much stress upon, for if late sowing be regularly practiced, the Hessian fly must be dependent, for its subsistence upon self-sown plants in fields which had been attacked, or upon rye or other grain sown as sheep-feed. This reduces to narrow limits the lines in which experiments may be successfully tried to prevent this enemy to England's staple crop from establishing itself and getting beyond the control of the farmers.

Perhaps, the most satisfactory feature about this outbreak of the Hessian fly in England, is the fact that it has appeared in so many places, and has thus been brought forcibly before the attention of farmers in all parts of the kingdom, and they being aroused, will now see the necessity of promptly carrying out the instructions necessary for its extermination.

The Royal Agricultural Society, through Miss Ormerod, and the Government, through Mr. Whitehead, have done everything in their power to apprise the farmers of their danger, and have put in their hands as weapons, with which they may confidently hope to cope successfully with their new enemy, concise information as to its life-history and habits, which will enable them to recognise it at once, and apply without delay the proper treatment.

Briefly, this consists of (a) late sowing of the main crop, so that there is no accommodation ready for the autumn brood by which a large proportion will necessarily perish without egg-laying; (b) feeding off, or ploughing in any early-sown or volunteer crops,

which may be found (c) deep ploughing the ground to allow

From the history appear that although the scourge in North America occurred in Great

The large number have now been re-established for some energy and zeal which assistance has taken place in the kingdom; or again had failed to do so. An observant body of it existed at all, though on the other hand into the British Isles present rapid and been introduced or before now secured with regard to the injurious insect?

The existence not so much a question conditions suitable instance, troubles Europe from this. we originally received ground, e. g., (*Cynoglossum officinale*) tail Grasses (*Setaria*) fewer, there are some which, except in seasons, e. g., the (*Anagallis arvensis*, *spernum arvense*) way there is no doubt has been many times finding there could

Miss Ormerod's habitat of the Hessian fly in Western Asia, in a climate of far greater North America, and this pest to our sorrow weather during the

In view of the numbers in many its widespread area which had not yet having established. Furthermore, if obtain the pamphlet offered them, I can relegate the Hessian

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there is no accom- ill necessarily perish or volunteer crops,

which may be found to be infested, so that the eggs and maggots may be destroyed; (c) deep ploughing by which loose puparia, or infested stubble may be buried too deeply in the ground to allow the perfect flies to emerge.

From the historical sketch which is given of the occurrence of *C. destructor*, it would appear that although a watch has been kept upon it since its first outburst as a destructive scourge in North America, in the year 1786, it had never been actually identified as occurring in Great Britain until July, 1886.

The large number of widely separated localities, however, from which its ravages have now been reported, might lead one to the conclusion, either that it must have been established for some time previous to that date, and that it was only Miss Ormerod's energy and zeal which then brought its operations to light; or that some special circumstance has taken place during the past summer by which it has been distributed over the whole kingdom; or again, that some special climatic condition has allowed it to exist where it had failed to do so before. For several years Miss Ormerod has had an active and observant body of intelligent workers in all quarters of Great Britain, and it is strange, if it existed at all, that nothing has been heard previously of its operations. Nevertheless, on the other hand, from the large quantities of straw and seed grain imported annually into the British Isles from countries known to be infested by this fly, together with the present rapid and easy methods of transport, it is at least extremely probable that it has been introduced over and over again, and it is difficult to understand why it has not long before now secured a firm foothold there. May it not be hoped that the law which applies with regard to many noxious weeds, will also be found to hold good in the case of this injurious insect?

The existence of any plant as an aggressive weed in a given locality, appears to be not so much a question of the introduction of the seed, as of the plant finding there the conditions suitable to its growth and healthy reproduction. There are many plants, for instance, troublesome weeds here, which must have been frequently introduced into Europe from this Continent, (or in some instances taken back again to the place whence we originally received them), but which have never yet taken forcible possession of cultivated ground, e. g. the Common Purslane (*Portulaca oleracea*), Hound's Tongue or Burrs (*Cynoglossum officinale*), Small Burrs (*Echinosperrnum Lappula*), and the common Fox-tail Grasses (*Setaria glauca* and *viridis*); and then, although relatively they are far fewer, there are some which must have been frequently introduced on this continent, but which, except in a few localities, cannot (or do not) exist for more than two or three seasons, e. g. the Common Scarlet Corn Poppy (*Papaver Rhæas*), Scarlet Pimpernel (*Anagallis arvensis*), Common Groundsel (*Senecio vulgaris*), Corn Gromwell (*Lithospermum arvense*), and the Common Nettles (*Urtica dioica* and *U. urens*). In the same way there is no doubt whatever, that the Colorado potato beetle (*Doryphora 10-lineata*), has been many times conveyed to the British Isles on transatlantic steamships; but not finding there conditions suitable to its requirements it has failed to establish itself.

Miss Ormerod, quoting from Bulletin 4, U. S. Ent. Com., tells us that "the original habitat of the Hessian fly is considered most probably to have been Southern Europe and Western Asia, i. e., about the shores of the Mediterranean Sea," a district with a summer climate of far greater heat and aridity than is found in the British Islands. Again, in North America, where, whether introduced or indigenous matters not in this connection, this pest to our sorrow flourishes to a most remarkable degree, it has always dry, hot weather during the periods in which it passes through its active stages.

In view of the above facts, and notwithstanding that it has occurred in considerable numbers in many parts of Great Britain during the past summer, I think it probable that its widespread appearance as an injurious insect, was due either to some special cause which had not existed before, or to some unusual climatic condition, rather than to its having established itself in a new habitat suitable to its reproduction and increase. Furthermore, if the farmers can only be frightened sufficiently to induce them to obtain the pamphlet under consideration, and to follow closely the advice which is there offered them, I cannot help thinking that before very long Miss Ormerod will be able to relegate the Hessian fly to a place amongst the foes she has conquered.

A NEW LIBRARY PEST.*

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

Everybody now-a-days has books, even if he never reads them. It has become an acknowledged fashion—the more books the larger the wisdom, the finer the culture. The climax is reached in France, where you can buy as decoration for fine rooms large libraries, where all the prominent classic authors are represented only by the handsomely lettered backs of the volumes, stored in cabinets with glass doors. The key of the cabinets is invariably mislaid; in fact, the cabinets do not open at all. But even where book-cases contain real volumes, it is interesting to observe which authors are never taken out. In German private libraries, the binding of Klopstock's masterpiece, the Messiah, is almost invariably as fresh as possible, and in England and here I have often seen Paradise Lost in a very fine condition. As an instance of the contrary, when I was a young man, an older prominent naturalist singled out a volume from my library in a condition best to be described by book and binding in tatters, and then exclaimed: "That is just how I like to see books." It was on bugs, and my scientific digestive organs were at that time in excellent condition. Later I was always interested in picking out books in similar condition in libraries, in order to have an idea of the taste and favorite studies of the patrons. I should state that the first prize could be given to a copy of Peppy's Memoirs, in the truest Billingsgate condition, greasy as candles. It was in a library intended for the culture of the young.

Let that be as it is; but certainly no owner of books likes to have his property destroyed except by himself. I had believed until recently that the most obnoxious enemies of books were my special friends, the insects. But I see now that I was decidedly wrong. A most interesting publication, "The Enemies of Books," by William Blades, in London, which has gone through three editions during the past five years, shows conclusively that men are far greater enemies of books, at least in old England. Mr. Blades describes everything injuring books—fire, water, gas, heat, dust, neglect and ignorance. Then come two short chapters on the book-worm and other vermin, followed by chapters on bookbinders and collectors. The small volume contains facts which will be read with virtuous astonishment and disgust. A rich shoemaker, John Bagford, one of the founders of the Antiquarian Society, in the beginning of the last century, went from library to library, tearing away title pages from rare books of all sizes. These he sorted out according to nationalities and towns, and so formed over a hundred folio volumes now preserved in the British Museum. Others collect initials on vellum, all rich in gold and colors, floral decorations ranging from the 12th to the 15th century, all nicely mounted on stout cardboard. A Mr. Proeme collects only title pages, to follow a senseless kind of classification. One of his volumes contains coarse or quaint titles, showing how idiotic or conceited some authors have been: "Bowels Opened in Diverse Sermons," "Die and be Damned," and many others too coarse to be quoted. Certainly it is sure that the poor bugs cannot compete with such rivals, except some more enterprising ones, apparently bound west, and going straight through eighty folios of patristic works, making them look like a spy glass, in a fashion never dreamed of by Chrysostomus and his partners.

Nearly six years ago, I was invited to make a communication about library pests, at the meeting of the librarians in Boston. After a review of the literature then at my command, I came to the conclusion that only two insects were to be considered very dangerous and obnoxious in North America, the Anobium and the White Ants. The Anobium is a small beetle, which is also very destructive to old furniture and old picture frames. All who have the infirmity to indulge in the love for old furniture, will have often observed with disgust small round openings in their treasures, out of which a fine mealy dust falls in little heaps on the floor. I observed myself such a case long ago, when I was a boy, but I confess that the remembrance of this case is always accompanied

* Read before the Boston Thursday Club.

by a strong itching owner of such old enough to write ventured to show only-acknowledged

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Three additio they contain only insects mentioned the new comers w the matter carefu of more or less qu was not to be fou the most import books wanted by

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One mornin and help agains untouched, but a or nearly destroy lose their value i been chosen last square open box to keep the label in order to affor this upper half writing is injure similarly injure proved never to which it was pre the whole collec the discovery of cabinets. The to be presumed Professor C. L. without doubt t fact. It has bee does not like st paste as was ma drugs of the mo things. It is, with an unpleas hater of Rockf common hand l

The Lepis fessor Packard name Thysano principal one fo fish. This lit fast, and being

by a strong itching of my right ear. A lady cousin of mine, who was a lover and lucky owner of such old jewels, had decided to take care of them herself. I had been naughty enough to write the date in these dust heaps with my fingers. When I impudently ventured to show her about a fortnight later the date I had written still undisturbed, the only acknowledgement of my service came forth with admirable dexterity.

Use every man after his desert, and who should 'scape whipping?

Nevertheless I gave up forever this kind of chronological record.

Three additions to my communication before the librarians have been published, but they contain only isolated cases, certainly nothing of general importance. Of course the insects mentioned had injured books, and as everybody likes to have his own little pest, the new comers were chronicled with some emphasis. Nevertheless I have followed up the matter carefully during these six years, and would be able to give a nice list of names of more or less queer composition. Six years ago a part of the publication on book pests was not to be found here. But in the meantime I have been able to get some of them, the most important ones through the splendid custom of the public library of ordering books wanted by scientists for their study.

There is, in fact, no end of obnoxious creatures. "Misery acquaints a man with strange bedfellows." Perhaps the word obnoxious is not exactly in the right place, as probably those bedfellows may consider the intruding stranger decidedly obnoxious. Nevertheless, as such philosophical views would destroy every legitimate museum's business, we are bound to our accustomed impoliteness towards all intruders.

One morning Mr. R. T. Jackson, assistant in Geology in the Museum, asked my advice and help against a new pest in his department. The stones and petrefacts were left untouched, but all the new labels, written during the past year, were more or less injured, or nearly destroyed. Of course this is a serious danger for a collection, as the specimens lose their value if the locality or the scientific name is lost. A new form of labels had been chosen last year, printed on excellent card paper. The stones are kept in small square open boxes, the label is folded in the middle; upon the lower half the stone is laid, to keep the label in place; upon the upturned half the locality and the name are written in order to afford an easy view of the contents of the collection. Now, since last winter this upper half has appeared to be scraped on both sides in such a manner that the writing is injured and in some cases has disappeared. The lower half of the label was similarly injured, so far as not covered by the stone; the under side of the lower half proved never to be injured, and was apparently protected by the bottom of the box, to which it was pressed by the weight of the stone. The damage is a considerable one, as the whole collection has again to be provided with new labels. A careful research led to the discovery of an insect belonging to the genus *Lepisma*, which lived in the boxes and cabinets. The old labels of common writing paper were never attacked, therefore it was to be presumed that the finish of the new labels was the attraction to the insects. Indeed, Professor C. L. Jackson found the new labels finished on both sides with starch, and without doubt the starch covering attracted the *Lepisma*. I was rather puzzled by this fact. It has been known for more than a century that the greatest library pest, *Anobium*, does not like starch. Therefore it was recommended to use in binding books only such paste as was made of pure starch without meal, of course also with the addition of several drugs of the most vicious odour; and now a new customer proves to prefer starch to other things. It is, by the way, a queer but very common association of ideas that substances with an unpleasant scent to man should also be unpleasant to insects. But the virtuous hater of Rockfort or Limbourg cheese would directly be disabused by discovering with a common hand lens a lively carnival of bugs in those disgusting dainties.

The *Lepisma* destructive to the labels is a true American insect, described by Professor Packard as *L. domestica*. It belongs to a small group of insects with the euphonious name *Thysanoura*, and there are half a dozen species known in the United States. The principal one found in Europe is the *L. saccharina*, better known as the small blue Silverfish. This little insect is found in dark places or corners near provisions, running very fast, and being so soft that it is crushed by the lightest touch. In Europe it has always

been considered, but without proof, as imported from America. It has been known there for more than 200 years, but its existence cannot be traced before the discovery of America. The whole body of the insect is covered with very fine iridescent scales, which have been used as a delicate test object for microscopes, and are the cause of its vulgar name, Silver-fish.

The earliest notice of the small European species is in R. Hooke's *Micrographia*, a folio, London, 1665. It was printed at the expense of the Royal Society, and is an account of innumerable things examined by the microscope. The book is still respected for the accuracy of the author's observations. Mr. Blades calls it most amazing for its equally frequent blunders. I have reason to suppose that the absurd blundering is more on Mr. Blades's side. R. Hooke calls it book-worm, and states that it corrodes and eats holes through the leaves and covers of books. The figure is, for the time, tolerably good and recognizable. On Mr. Hooke's authority, *Lepisma* was reported as obnoxious to books. As Mr. Hooke has apparently mixed up the destructions done by *Anobium* with those of *Lepisma*, of which in the following hundred years no damages were observed, the whole observation was doubted, and Prof. Herman, in Strasbourg, in his prize essay on library pests, declared (1774) that *Lepisma* was erroneously recorded as obnoxious. This was the reason that I did not mention *Lepisma* in my communication to the librarians, the more so as in the past hundred years no new observations had again been recorded. I did not mention other remarkable facts, as the *Jethio-Bibliophage*, a codfish which had swallowed three Puritanical treatises of John Frith, the Protestant martyr. No wonder, after such a meal, the fish was soon caught and became famous in the annals of literature. This is the title of a little book issued upon the occasion: "Vox Piscis, or the Book-fish, containing three treatises which were found in the belly of a Codfish in Cambridge Market, on midsummer eve, 1626"; great was the consternation at Cambridge upon the publication of this work.

Nevertheless, just after the delivery of my communication, new proofs of the depravity of *Lepisma* came forward.

"God made him, and therefore let him pass for a man."

Prof. Westwood, of Oxford, showed to the Naturalists' Association in 1879, a framed and glazed print of which the plain paper was eaten by *Lepisma*, while the parts covered by the printing ink were untouched. I accept this as a sufficient proof of obnoxiousness, the more so as the white paper is often the best part of a print. Prof. Westwood mentioned that the same fact had been observed in India, where some of the Government records had been injured in the same manner.

Patrick Brown states in his *Natural History of Jamaica*, that *Lepisma saccharina* is very common there, and is extremely destructive to books and all manner of woollen clothing. This notice had been reproduced by Linnæus, but was later considered as not reliable.

Mr. De Rossi writes, in 1882, as follows: *Lepisma saccharina* likes damp places and destroys in my house paper hangings from inwards entirely. Muslin curtains were perforated and the living animals found near fresh holes. Probably the curtains were starched, though it is not stated. Also, insect boxes and the wings of butterflies have been damaged.

Prof. Liversidge, in Sidney, reports the same year *L. saccharina* as very common in New South Wales. It does not do so much harm to books, as it cannot well get in between the closely pressed leaves of a book, but it injures loose papers, maps and labels; the loose edges of piles or bundles of letters suffer more than the central portion. Writing paper, too, probably contains more attractive matter in the way of size. The labels were written only fifteen months ago, and some hundreds have been rendered totally worthless.

The same calamity is reported by Mr. H. Lucas, assistant in the Museum of the Jardin des Plantes, in Paris. *L. saccharina* destroys labels of white paper, but the parts printed with oil and minium remain untouched. The labels on starched paper were very much injured, but only the white parts. When leaving for the country in 1862, he put in a drawer various articles of clothing, all starched, collars, cuffs and bonnets, and returning after six weeks, he found numerous holes, round or oval, in a bonnet, and *Lepisma* near by.

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was nearly destroyed.

Mr. Samuel enclosed purposely and ascertained the

The well-known ravages done to books by eating parts of it impossible for *Anobium*. Prof. *Lepisma*, which at Horne, in London. The insect evidenceless makes holes damaged account

After all the undisturbed, may long ago? may be famous!" I think work in the same. Many times I have been destroyed by attack wool. Inc desires belong to

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On the labels of Polyps, Madrepores and others in the Museum, the writing was in a great part destroyed. Dr. Aube, in Paris, says that the black part of the backs of bound books was nearly destroyed, probably by *Lepisma*.

Mr. Samuel Henshaw, Assistant of the Society of Natural History in Boston, enclosed purposely living *Lepisma* with soft paper, part of a newspaper, in a glass jar, and ascertained that the insects had eaten large holes in the paper.

The well-known antiquary, Mr. Quaritch, in London, had complained, 1870, of the ravages done to books; and Mr. Lewis, in London, after careful examination, stated that by eating parts of the bindings the books were caused to fall to pieces; yet he considered it impossible for *Lepisma* to bore holes in the books, which were probably made by *Anobium*. Prof. Packard, in his Guide, reports of silk and silken tapestry eaten by *Lepisma*, which also devour the paste, making holes in the leaves of books. Also Mr. Horne, in London, alluded to the damages done to silk garments in India by *Lepisma*. The insect evidently attacks the silk on account of the stiffening matter in it, but nevertheless makes holes in the fabric. Finally, Mr. Adkin showed a species of *Lepisma* which damaged account books kept in the iron safe of an office in London.

After all these reliable facts, there is of course no doubt that *Lepisma*, when left undisturbed, may become very obnoxious. The question, Why has that not been observed long ago? may be answered by the well known "I awoke one morning and found myself famous!" I think there is a very simple explanation. There are so many rogues who work in the same way, that the swiftest one to disappear is often easily overlooked. Many times I have been told by ladies that their silk dresses, always black ones, had been destroyed by carpet bugs, and have always answered that the carpet bugs only attack wool. Indeed, I confess that I have only recently learned that these aristocratic desires belong to the Silver-fish.

If we tabulate all the facts, we find directly that all damages, except those to paper and its combinations, have been inflicted on silks, clothing and muslin curtains which were invariably starched or finished with some stiffening size, making them more easily eaten or eroded. Secondly, the backs of books have been more or less seriously injured. But just here paste had been used in quantity. The gold lettering of the backs is commonly done by putting the gold on paste and burning the hot brass letters into the back. I have been assured that in one case only the gold of the lettering had disappeared. There is no wonder that silken and paper tapestry has been eaten; but it is to be hoped that the industry now common of making paper hangings solely of arsenic may induce *Lepisma* to emigrate to more hospitable quarters.

That labels in collections have been destroyed, is observed here, in France and in New South Wales. All those labels were starched. Prints have been destroyed in England; letters, when lying loose or in heaps, and Government records in England, in New South Wales and in Boston. I think many gentlemen present will find the most rascally instance of destruction is the making erasures in account books in the safe.

After all these facts, there is no doubt that maps, engravings, collections of photographs, herbariums, even label catalogues, are in evident danger. But if we look more closely at the injuries reported, we find directly that all such papers, when pressed firmly together, were not reached by *Lepisma*, and in this way a large number of accidents may be avoided. Engravings and maps, which would suffer if pressed too hard, will be perfectly safe in simple pasteboard boxes, provided that they are made to close perfectly, so that it is impossible for *Lepisma* to find an entrance. Insect powder sprinkled in the nooks and corners where *Lepisma* is often observed—in Cambridge, behind the kitchen stove or range—kills directly all reached by the powder, and I should recommend the same for silk dresses or the closets and drawers in which they are stored. Concerning valuable engravings, I would cover the backs of those framed with common paper fastened on with a paste mixed with insect powder or tincture. I consider, therefore, *Lepisma* as not dangerous *when proper care is taken to prevent the danger*.

The most dangerous enemies to papers and books are the White Ants, the Termites, because they destroy everything and avoid the daylight when they work. As I had before this the pleasure of delivering a communication on this subject, I will give only some additional facts which have come to my knowledge during late years. The com-

mon white ants of the United States are to be found everywhere, from Manitoba down to the Gulf of Mexico, and from the Atlantic to the Pacific. In the mountains in Colorado, Washington Territory and Nevada, they ascend to 5,000, and even above 7,000 feet. It is of course not possible to exterminate them, but they must behave if they intend to live together with man. Their depredations should not exceed certain limits allowed to them. Everybody is accustomed not to forget for one moment the precautions necessary to protect his property against destruction by fire, and if the same precautions were taken and not for one moment forgotten, against the destruction by white ants, I think all that men are able to do would have been done. Of course, very valuable property we are accustomed to shield by fire-proof buildings, and similar caution will be necessary to protect very valuable property, *i. e.*, libraries, against white ants. Buildings should be stone or brick, and all stumps or roots of trees taken out of the bottom of the cellars to a depth of six feet before the cellar floor is carefully cemented. Outside the building should be surrounded by a deep open area; no flower beds, shrubs, ivy, as the necessary manure is the greatest attraction for white ants.

Large cities are certainly in less danger, at least some parts of them. I am sure that all that is called Back-bay in Boston, will be free from white ants, if they are not brought in by nice parks and similar fineries. The older parts of Boston are by no means free from the pest, but for palpable reasons the owners of infected property do not like to speak of such things. Their presence in the State House, in the so-called Dungeon, was noted in the papers four years ago. As nothing has been done to prevent the pest from entering other parts of the building, it is very probable that they have spread further. The note in the newspapers about the sudden break down of the wooden stand supporting the ensigns and standards, looks very suspicious. Perhaps white ants may know more about it. In the Dungeon only the taxation papers of the State were stored, and the white ants, when I saw it, had arrived at the twentieth year of this century. According to another notice in a newspaper (I cannot say if it is true), the archives of the Board of Health have been placed in the Dungeon—as the notice stated—for preservation. As the State House was built on a place that was formerly a beautiful garden, it is very possible that stumps not taken out may be the cause of the presence of the pest. To find out where the white ants came into the Dungeon, and to follow their gangs outside the building, would be the first and most important step to take. Indeed, two years ago a Bill asking for a paltry sum for this purpose was brought before the Legislature, but laid upon the table. In a boarding house in France, infested by white ants, the floor of the dining room suddenly came down two flights, together with the table boarders. It is gratifying to learn that nobody was hurt, and, as it is stated, they lost only their appetites for one day. So we may hope that if the Legislature should come down in a similar soft manner, they may lose only their appetites for one day, and that this *argumentum a posteriori* may be followed by an enlightenment about the pest. Indeed, the State House is not the only place infested by white ants in those parts of the city. A few months ago an old bachelor, in a house very near Mt. Vernon street, had to take out all the injured lumber supporting the walls and to replace it by new. When told by one relation that it was rather dangerous, he answered that he felt very comfortable, as it was only every ten years he had to meet this expense. In the neighborhood of the State House, in small courts, are some sickly-looking old trees, probably dear old pets of the owners. They have decidedly the appearance of knowing something about white ants. That may be as it is, but I believe that no library here is more in danger than that in the State House, and I am told that it contains very rare books, difficult or impossible to be replaced. The Athenæum, situated near the State House on one side bordering on an old churchyard, seems at first in a rather dangerous situation. But the very substantial building, with high, and, I believe, vaulted basements, makes danger to the library appear very improbable. Nevertheless, it would be reasonable to always have the pest in mind, and to often make a revision of those parts of the library which are little or rarely used. The Public Library does not seem in danger, but I know the surroundings only imperfectly. After all these gloomy predictions, I may assert that nobody would be happier than I if they were forever unfounded, and the librarian might say, What's Hecuba to him, or he to Hecuba!

On a hot, b particularly rich (*Cypripedium s* in all their glory to find out, if p their store of ne the curious moc the behaviour of certain insects o fertilisation of t of the peculiar c smaller openings; must of necessit gummy pollen, v

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* See "Le D Ont. (1886), p. 45.

BEGINNING AN ACQUAINTANCE WITH WILD BEES.

BY J. A. GUIGNARD, OTTAWA.

On a hot, bright day of July, 1883, I visited a cedar and larch swamp near Ottawa, particularly rich in plants of that magnificent Canadian orchid, the showy Lady's Slipper, (*Cypripedium spectabile*). Their conspicuous pink and white blossoms were at the time in all their glory; however, they were not exactly the attraction for me. My object was to find out, if possible, what insects know how to appreciate them and take advantage of their store of nectar. Which of those dwellers of the air could it be, that so far trusted the curious mocassin-shaped lip, as to dare to penetrate its recesses? Having observed the behaviour of flies imprisoned in such flowers,* I had been led to understand how certain insects of proper size, in their search for the sweet juices, must be the agents of fertilisation of the plant. They enter through the large aperture above, but on account of the peculiar conformation of the cavity, they can come out only through one of the smaller openings under the anthers at the base of the flower, and there, if of proper size, must of necessity rub their backs against the anther above, thus detaching some of the gummy pollen, which they afterwards unconsciously carry to the stigmas of other flowers.

Though I had before taken advantage of every opportunity of watching *Cypripedium* flowers, I had not yet succeeded in finding any live insects in them. But, as I now kept peering into every lip that I could see amongst the high herbs and grass, at last I noticed a dark object in one of them. I quickly threw my net over the flower and very soon there came out a bee through one of the posterior apertures. A bee, I said;—it was at least an insect very like the honey-bee, as to size and general appearance, but blacker and more massive in all the parts of its body. The posterior legs, however, were shorter and lacked the characteristic width of the part which the honey-bee uses as a basket for carrying pollen from the flowers to the hive. But this deficiency in the wild insect was amply compensated by a thick lining of black hair covering all the lower surface of the abdomen; and in many species of this and allied genera, I have since often found this brush loaded with white, yellow, red, or brown pollen altogether concealing the hairs.

In Lady's Slippers, however, such a brush was of no use to the insect, as the adhesive pollen of the stamens could only mat the hair, coating and crippling at the same time the legs and other organs which might become besmeared with it. The anther, nevertheless, does not let the bee escape without some pollen adhering to its back, where it can least impede its movements. I replaced the insect several times in different flowers, and saw it always follow in them the same road; it immediately disappeared in the narrow passage under the stigma, which retained some of the pollen and issued under one of the anthers after a more or less energetic struggle, according to the size of the aperture and the rigidity of its edges, which always become relaxed with age. If introduced into a flower of small size, from which it could not force its way as before, the insect had a very quick method of regaining its liberty; it immediately began to bite and tear away the walls of its prison with its two powerful jaws or mandibles, and very soon enlarged the opening or cut a new hole. The mandibles are indeed remarkable instruments, stout and strong, compared to which those of the honey-bee are like knife blades by the side of lumbermen's axes. They are triangular in shape and toothed on the inside edge, where they close against each other, so as to form excellent nippers.

I had never previously felt the need of much knowledge of bees, nor indeed of any other insects, but I very naturally felt now a desire to know the name of this useful servant of the showy Lady's Slipper. I therefore brought it to entomologists of my acquaintance,—eminent entomologists, deeply versed in the lore of beetles, of moths, of butterflies, but who, to my great disappointment, had up to that time somewhat neglected that of bees, so that I could not get from them the help I wanted. I then turned to books, and again, was not a little astonished to find that there was not one single work in English treating of the classification of American bees in the same way as the numerous

* See "Le Naturaliste Canadien," Vol. XIII. (1882), p. 221 and XVth Report of the Entom. Soc. of Ont. (1886), p. 45.

works on the North American flora, elaborately describe the different orders, genera and species of plants. I was, therefore, glad to find the information desired in a French work published in Quebec, Abbé Provancher's "*Petite Faune Entomologique*," just then completed to the end of the order Hymenoptera, which comprises the bees, wasps, ants, ichneumon-flies, saw-flies, etc. After some little labour, I succeeded in ascertaining in that too modestly named Fauna, both the generic and specific names of my insect,—*Megachile melanophæa*, i.e. the black-brown Leaf-cutter.

The name of the genus having thus been obtained, it was easy to gather more information in works treating of Hymenoptera, especially in those describing the labours of the parent bees on behalf of their offspring. Thus I found that the habits of the Leaf-cutters were observed and described by the French naturalist Reaumur, as early as the beginning of the last century. Mr. E. Baynes Reed, in the Second Annual Report of the Entomological Society of Ontario (p. 24), and Mr. W. H. Harrington in the XVth. (p. 53), have given the principal facts of their history, how they cleverly cut circular pieces of leaves with their mandibles, and use these pieces in the construction of the cells of their nests.

Megachile centuncularis, L., which is spread all over the continent of Europe and also occurs commonly in Canada, chooses for its nest either an old post or decaying tree or the soft mortar of an old wall, or again burrows in the ground (Smith, Brit. Museum Cat. I. p. 174). The powerful mandibles are of course the instruments used to dig the gallery in which the cells are then placed end to end from the bottom up to its mouth. The bees also sometimes take advantage of cavities which they find suitable for their purpose, such as a nail hole, or the deserted tunnels of wood-borers. I have seen repeatedly come in and out of such holes the active little *M. optiva*, which is easily recognized by its red ventral brush, and *Gnathocera cephalica*, Prov., a bee very closely allied to the Leaf-cutters, but which at last stopped the aperture with mud, and probably like other bees builds its cells of that substance. I was not able in the latter case to ascertain what was the material of the nest itself, as it was in a post of a public bridge. But I opened, after its completion, the nest of *M. optiva*, which was in a board of a shed and found it to be composed of several rows of cells packed up side by side, the cavity being too wide for a single row. The insect seemed, however, to have always made as many cells as possible in one line, according, no doubt, to its habit of doing so in the straight galleries which it digs itself. The cells were formed with morsels of leaves and flowers of scarlet runners. The aperture itself, which was just large enough to admit the insect, was stopped up with about twelve round pieces laid on each other, each slightly larger than the hole, but forced in so as to fit perfectly, the last one outside being a red one. The nest contained about twenty cells which I was very careful to secure and preserve in the hope of procuring the perfect insects, and if possible, by some happy chance, to obtain in the number a male, that sex of this species still being unknown to science. My hopes, however, were doomed to disappointment. After the return of spring, weeks succeeded weeks, but the cells still remained closed; and finally, instead of the bees, there issued from them through tiny holes, scores and scores of a Chalcidite, *Semioteilus cupræus*, Prov. These small parasites had not spared a single one of the larvae for which the mother *Megachile* had on the preceding summer provided with so much solicitude and industry.

On a subsequent occasion, I found the broken stem of a sun-flower in the hollowed pith of which some Leaf-cutter had built half a dozen cells with morsels of rose leaves. These pieces were much looser than those in the nest of *M. optiva*, and made the cells appear much larger, so that I expected to see much larger bees come out of them. They proved, however, to be of a rather smaller species, *M. brevis*, Say (Fig. 18), of which I have found the males very abundant, but have never been fortunate enough to secure a female. From this nest I obtained only males, two of them, and—four parasites, again Chalcidites, but much larger than in the preceding case, so that each had required a whole *Megachile* larva for its subsistence. These parasites were two males and two females of the pretty wasp-like *Leucospis affinis*, Say; other species of the same genus have also been found in Europe infesting *Megachile* nests.

A most peculiar Mr. E. Baynes Reed rolled-up leaves of 28). I have seen cutting pea leaves, same insect had re pieces that were w of an ash-leaved close by.

The males of *Megachile* have the oddly dilated and hairs; some have be grooved in front for pouch. In *M. fi* extends only to th joint; but in *M. scr* above the second, t even projects over and third. Of what can be to these i to conjecture. I fou particles of vegetabl to have been nippec helps the female in vegetable matter fo closing the cells of the *Dasygastrea* (s which I have exam crust composed of p that I could perceiv gether from flowers of evening primrose

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A most peculiar situation for the nest of a Leaf-cutting bee has been described by Mr. E. Baynes Reed in the article already mentioned. The cells were made in the rolled-up leaves of a plum-tree (Fig. 28). I have seen *M. optiva* at work cutting pea leaves, and I suspect the same insect had removed the circular pieces that were wanting from leaves of an ash-leaved maple that grew close by.

The males of many species of *Megachile* have the anterior tarsi very oddly dilated and fringed with long hairs; some have besides the first joint grooved in front forming a remarkable pouch. In *M. frigida*, this pouch extends only to the end of the first joint; but in *M. scrobiculata* it projects above the second, and in *M. pugnata* even projects over both the second and third. Of what use this appendage can be to these insects is not easy to conjecture. I found in one two little particles of vegetable fibre which seemed



Fig. 28.

to have been nipped from some young plant-stem or branch. Could it be that the male helps the female in the preparation of the nest, and brings in his pouches masticated vegetable matter for the purpose? Smith (*l. c.*, p. 158), states that such matter is found closing the cells of an *Osmia*, a genus belonging to the same sub-family as the *Megachile*, the *Dasygastræ* (so called from *Dasy*, hairy, and *Gaster*, belly). In the two nests which I have examined, I could not, however, find anything else in the cells besides a crust composed of pollen grains united by some gummy matter having no sweet taste that I could perceive. The pollen, examined with the microscope, seemed to come altogether from flowers of compositæ, with the exception of a few stray grains, in one case, of evening primrose, in the other, of pumpkin.

It is a most interesting sight to watch the busy mother bee intent at work on a composite head of flowers. It collects the honey by protruding its long tongue into one corolla after another, while with the posterior legs it brings the stamens of other flowers against its ventral brush, which retains the delicate pollen granules. When gathering pollen only, it may occasionally be noticed, moving rapidly over the disc of flowers while sweeping the stamens with its brush. But who will ever succeed in witnessing the manner in which the pollen is afterwards removed from the brush, heaped in the prepared cell and mixed with honey to form the food of the larvae not yet born? I have noticed once a *Gnathocera* female just coming out of its nest, re-enter it backwards either to deposit pollen or more likely to lay an egg, and soon come out again, but only to go in once more, head first this time, to see if all was right and then fly away.

After I had once been induced, as I have related, to give some attention to Hymenoptera, and seeing how great a part this order of insects plays in the fertilisation of plants, I could not stop at my first steps in their study, and have found, whenever I had the possibility, much pleasure and instruction in trying to improve my first acquaintance with them. There is yet so much unknown as to the life history of those that have been observed at all, so many have as yet received no attention whatever, that they offer an immense field of discovery for any one willing to use his eyes in observing what is going on about him on all sides. In the middle of the city of Ottawa, in my house and yard (the latter ten yards by four, but as thickly filled with plants as they can grow), I have captured specimens of more than 120 species of Hymenoptera alone, about 30 of which when submitted for identification to Abbé Provancher, our highest Canadian authority on Hymenoptera, have been declared by him to be new to science.

SHEATH-BEARING INSECTS.

BY REV. THOMAS W. FYLES, SOUTH QUEBEC.

It has been said that man is the only animal who is born naked, and the only one who can clothe himself. This is not strictly true. At any rate quite a number of caterpillars are expert tailors.

The smallest of the English thick-bodied moths is *Fumea nitidella*. As soon as the tiny caterpillar of this insect bursts from the shell, it commences to make itself a coat. The workman in his finished work, seen by the naked eye, resembles a minute pillar of pith set on end. Seen through a microscope the covering is thimble-shaped, and appears as if made of tissue-paper of variegated colours (Rev. E. Tearle in Ent. Int. No. 147); and the caterpillar, seen through the same medium, resembles that of *Cossus ligniperda*. The young exquisite, when sporting its elegant attire, walks with its fore legs, and holds its coat on with its hind ones, toppling about unsteadily. Sometimes it is quite extinguished by its apparel. It reminds one of a little child wearing its father's hat—you see the laughing face for a moment, and then the big *chapeau* slips over it, and it is gone.

As the *Nitidella* grows, it finds it necessary not only to enlarge, but to strengthen its coat; so it attaches to it ribs made of small pieces of pine-needles, or of stems of grass, which seem to answer the purpose admirably.

The coat of the *Nitidella* is an important article. It is not only the winter clothing of the caterpillar, it is also the case which protects the chrysalis. The female, indeed, never leaves her coat; she creeps as a perfect insect. (In one sense, perhaps, she ought not to be called a perfect insect, for she has only rudimentary wings.) She creeps from under her coat and then takes her seat upon it. She sits upon it with as much determination as an old lady in a railway station sits upon her trunk to keep it safe. She holds her court upon it. She lays her eggs around it, and at its foot she dies. The coat is her home in life, and her monument in death. Her infant progeny, opening their eyes to the light, see her good work, and go and do likewise—they take, severally, in paper of their own manufacture, a pattern of the coat.

The Coleophore, of which forty-one are described by Stainton in his Natural History of the Tineina, afford remarkable instances of caterpillars having the power to clothe themselves. Mr. Lane Clarke, who turned one of these insects out of its case, thus describes its proceedings for the formation of a new one:—

"It had fixed near the edge of the leaf, and was carefully eating out the parenchyma of each serrature, leaving the edges untouched, as it thereby saved a seam in the tent, yet emptying each tooth to make it light and less brittle. When all was clear, the larva measured a gentle curve a little larger than its body, and began to draw the cuticle together on the opposite side to the serratures—tacking it loosely at first, and biting the membrane between the fibres, sewing it more neatly then, and careful not to cut the supporting braces formed by the nerves of the leaf. Then it rubbed the interior of the case with its head, as if to smooth it, and presently began to darken it with a web of fine silk, rendering further operations invisible, only I perceived that one end was left open,"

* * * "and that the fibres were cut mysteriously away, when the tent, by powerful muscular action, was raised from the leaf, and the Coleophora marched off to refresh himself in a new excavation." (Int. Obs., vol. IV, p. 4.)

In Europe the Coleophore are met with at every turn, on the heath of the commons, on the elms in the green lanes, on the plants by the way-side. They look like moving atoms of the plants they feed on; and they have the power of throwing themselves strangely into position to deceive the over curious eye.

Of the case-bearers of this continent, the apple-tree case-bearer (*Coleophora malivorella*, Riley) is an interesting example. The larva of this insect feeds upon the buds and leaves of the apple tree. The case it constructs for itself is curved like the handle of a pistol. The moth appears in July. It is mottled, brown and white, and is about half-an-inch in expanse of wings. The young larva feeds on the under side of the leaves, until the frost comes; then it fastens its case to a twig, making itself comfortable for the winter; in spring it feeds up upon the buds of the tree, and in June it goes into chrysalis.

The basket-we coverings for themselves of trees. The you leaves it feeds upon covering, till at len pupal change the i she has been impre falls to the ground

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The basket-worms of the Southern States are instances also of creatures that construct coverings for themselves. *Thyridopteryx ephemeraeformis* (Haworth) is found on a variety of trees. The young larvæ appear in May. Each of them forms a case of pieces of the leaves it feeds upon, held together by a silken web. As it increases in size it enlarges its covering, till at length it hangs like a small purse or bag. When about to undergo the pupal change the insect fastens its case to a twig. The female moth is apterous. After she has been impregnated she retires into her case to lay her eggs; having laid them she falls to the ground and perishes. The male is black, and has transparent wings.

Platoceticus Gloveri (Packard) in its habits closely resembles the insect just described. It is found in Florida, feeding upon the orange and the fig. The female moth is light-coloured, and apterous. The male is an elegant little creature, with feathered antennæ, and is of a dark-brown hue.

The larvæ of some insects belonging to the genus *Incurvaria* have the habit of constructing flat cases for themselves. *Incurvaria acerifoliella* (Haworth) is one of the insects that, of late years, have worked their way northward from the United States. It did not come under my observation until the year 1881. In that year and in the following it was exceedingly abundant. In the county of Missisquoi the leaves throughout extensive maple woods were so skeletonized by it, that they presented a scorched appearance that was very remarkable. Looking at the groves from a short distance one might have thought that a hot blast had passed over the country, or that autumn had come before its time, and had browned, instead of crimsoning, the maple leaves.

The *Acerifoliella* larva bites, from the leaves, discs, about two-eighths of an inch or three-eighths of an inch in diameter. It joins several of these together, and takes up its domicile within. When it feeds, it thrusts out its head and fore-legs, and then eats the parenchyma of the leaf away, working systematically from a centre. When full fed it finds its way to the ground, and turns to a pupa within its leafy covering. The perfect insect has glossy blue fore wings; the hind wings are brown, shot with purple; the head is decorated with a tuft of yellow hairs. In the years mentioned, clouds of these beautiful little moths would rise from the foliage shaken by the passers-by.

We cannot but admire the instinct, which, in every case, impels the larva to form a covering so well adapted to secure the possessor's comfort through the vicissitudes of the seasons, and, at the same time, so likely, by its resemblance to surrounding objects, to prevent attacks from insectivorous creatures.

REMEDIES FOR NOXIOUS INSECTS.

BY THE REV. C. J. S. BETHUNE, M.A., D.C.L., PORT HOPE.

For the convenience of farmers and fruit-growers, I propose in this paper to set forth, in alphabetical order, under the popular names of the insects, the remedies that have been found by practical experience the most useful in counteracting their ravages. As far as possible, I shall also give a wood cut of the insect, so that all may know what particular enemy is referred to. In many instances the remedies are familiar and in general use, but I think it desirable to insert them in order to make the list as nearly complete as possible. Free use is, of course, made of the writings of our leading economic entomologists, such as Professor Riley, Chief of the United States Entomological Commission at Washington; Dr. Lintner, State Entomologist of New York; and Professor Saunders, of London, whose name is familiar to all our readers, and whose work on *Insects Injurious to Fruits* should be in the hands of every intelligent farmer and fruit-grower in Canada.

APHIS, OR PLANT-LOUSE.

It may almost be said of this familiar pest that there are as many varieties of plant lice as there are species of plants in the world; nearly every form of vegetable life

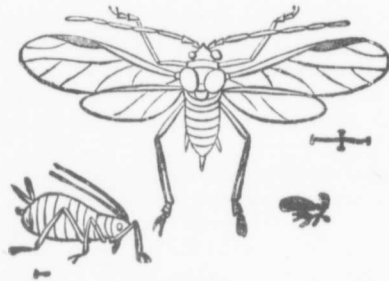


Fig. 29A.

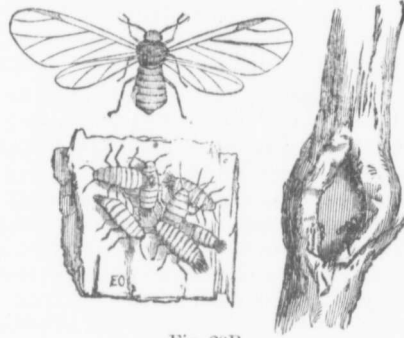


Fig. 29B.

has its own Aphis to suck its juices and to impair its vitality. It would, therefore, be an endless task to attempt to enumerate all the different kinds of Aphis that are to be met with and fought against; the same remedies, however, will apply with almost equal efficacy in all cases, allowance being made for the difference of application requisite in treating, for instance, an apple tree and a wheat plant, a hop vine and a window flower. The illustration (Fig. 29A) given herewith represents a highly magnified winged male and wingless female of the plant-louse attacking the apple (*Aphis mali*, Fabr.); the species infesting other plants are very similar, varying chiefly in colour from pale green to deep black. Fig. 29B represents the winged form of the woolly Plant-Louse of the apple, a group of the larvæ, and a twig perforated by the insect.

The ordinary remedies for this pest are (1) watering the infested plants with strong soap-suds, or a decoction of coarse tobacco; (2) dusting with lime or sulphur; (3) exposing them to the fumes of strong tobacco. The first remedy is applicable to most cases, and the third only to plants in pots, or those sufficiently small to be covered over while undergoing fumigation.

Many experiments have recently been made both in England and the United States, for the purpose of finding out a cheap and thoroughly effective remedy against this and other insect pests. Coal oil (or kerosene) is so cheap, so universally an article of domestic consumption, and so deadly to all insect life, that experiments have been especially directed towards its employment as an insecticide. The great difficulties to be overcome are its destructiveness to vegetation, when applied undiluted, and the almost impossibility of diluting it, beyond a mere mixing of a momentary character with water or other liquid. These difficulties have, however, been at last solved by means of "emulsions." One of these, recommended by the United States Department of Agriculture, is made as follows:—

"Take of refined kerosene (coal oil) two parts, and of sour milk one part. Mix in a pail, or tub, by continuous pumping with a force-pump back into the same vessel through the flexible hose and spray nozzle. After passing once or twice through the pump the liquids unite and form a creamy emulsion, in which finely divided particles of oil can be plainly detected. Continue the pumping until the liquid curdles into a white and glistening butter, perfectly homogeneous in texture, and stable. The time required for producing this butter varies with the temperature. At 60° it will be from one-half to three-quarters of an hour; at 75°, fifteen minutes; and the process may be still more facilitated by treating the milk up to, but not beyond, the boiling point.

"Upon standing for a day or two the milk (if sweet has been used) will curdle, but it only requires to be stirred, not churned again, to bring it back to its former smoothness. But if sour milk is used no fermentation ensues, and if not exposed to the air the butter can be kept unchanged for any length of time.

"When needed first thinned with plant lice, or other times with water a is found to injure usually suffice for t cost of this article,

Another emul quantity is require soap, or whale-oil add it boiling hot and spray nozzle, f thickens on cooling before using, one p emulsion thus mad cent per gallon.

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FIG. 30.

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"When needed for use, the butter will mix readily with any proportion of water, if first thinned with a small quantity of the liquid." In using the emulsion for killing plant lice, or other insects, care should be taken to dilute it at least twelve or sixteen times with water and then try the effect on a small portion of the infested plant; if it is found to injure the foliage, then dilute still further. One pint of the butter will usually suffice for two gallons of water. Dilute only as needed for immediate use. The cost of this article, which is very effective, is exceedingly trifling.

Another emulsion is made with coal oil and soap instead of milk. When a moderate quantity is required, take two gallons of coal oil, half a pound of common bar soap, soft soap, or whale-oil soap, and one gallon of water. Dissolve the soap in the water, and add it boiling hot to the coal oil. Churn the mixture, as before, by means of force-pump and spray nozzle, for five or ten minutes. The emulsion, if perfect, forms a cream, which thickens on cooling, and should adhere without oiliness to the surface of glass. Dilute before using, one part of the emulsion to nine parts of cold water. The three gallons of emulsion thus made produce, when diluted, thirty gallons of wash at a cost of about one cent per gallon.

These emulsions have been found thoroughly effective remedies, not only for plant lice, but also for many other insects. They can be used in the field, hop-yard or orchard on a large scale, and in the garden with equal efficiency. In England, similar washes have been applied to hop-yards for the destruction of the Aphis by the aid of steam power.

APPLE TREE BORERS.

There are two beetles whose larvæ are especially injurious to young apple trees; they are familiarly known as the flat-headed and round-headed borers, from the shape of the grubs. The former belongs to the family Buprestidæ, and is a common insect all over North America. Its scientific name is *Chrysobothris femorata*, Fabr; the annexed wood-cut represents the grub and the perfect insect. It does but little noticeable harm to healthy full-grown trees, but is often very destructive to young, freshly transplanted, or sickly trees. The presence of the borer within the trees may often be detected by the discoloration of the bark over the spot where it is at work, the cavity beneath causing a dried and flattened appearance, and also by the presence of its sawdust-like castings, or the exudation of sap. In such cases, the simplest remedy is to cut out the grub with a knife, or destroy it by means of the insertion of a stiff wire.

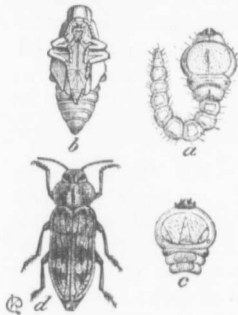


FIG. 30.

The best preventive remedy for this insect, so far as known at present, is a wash made of soft-soap and carbolic acid. Soft-soap and lime, with a little dissolved glue added to cause adherence, is also recommended; or soft-soap reduced to the consistency of a thick paint by the addition of a strong solution of washing soda in water. Any of these washes, to be effective, must be applied to the branches and twigs as far as practicable, as well as to the trunks of the trees, for this borer does not confine its work to any particular part. The application of the wash should be made in May, and again in early July and late August, in order to prevent the deposit of eggs by the female beetle. A gentleman (quoted by Professor Riley), who has had much experience with this beetle in the West, states that he has taken as many as a hundred borers from one small tree, and advises that "those having trees subject to attacks should look over them every week if possible, or every two weeks at least, from the first of June to the fall, for exudation of sap from the bark, which is a sure indication of their presence. When noticed, the borer may be destroyed by cleanly cutting out a small slice of the bark." This method involves great labour, but it is worth doing in the case of a young orchard that is found to be infested by this creature. The writer just referred to states that "carelessness in this respect the past season has cost me more than three hundred trees, all young."

The round-headed apple tree borer (*Saperda Candida*, Fabr., Fig. 31c) is not nearly so common as the species just referred to. It is found in the Niagara district and other parts of

the western peninsula of Ontario, but I have never met with it north of the lake or east of Toronto. The beetle can be at once recognized by the two creamy-white stripes running the whole length of its brown body, while the grub (Fig. 31a), may be distinguished from the other species by its round, chestnut-brown and shiny head and thick body. For a full description of the insect and its habits, the reader is referred to Saunders' "Insects Injurious to Fruits." The

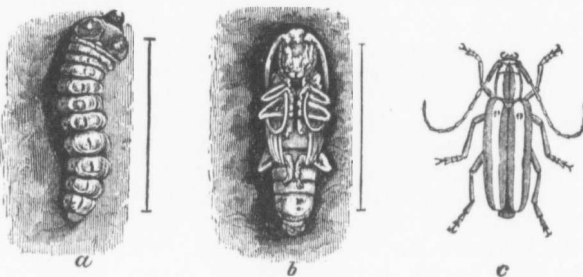


Fig. 31.

remedies to be employed in warding off the attacks, or destroying this insect, are the same as those given above for the flat-headed borer; it should be noticed, however, that the work of this creature is almost entirely confined to the base of the tree, near the ground, and therefore it can be more easily detected and dealt with. A sure indication of its presence is afforded by the castings which, when first discharged, "look as if they had been forced through barrels of a minute double-barreled gun, being arranged closely together in two parallel strings." When observed, a sure remedy may be found in cutting out with a knife, or probing the burrow with a wire.

APPLE-ROOT PLANT-LOUSE.

This insect (*Schizoneura lanigera*, Hausm.) has two forms, in one of which it attacks the branches of the apple tree; in the other it works under ground upon the roots.

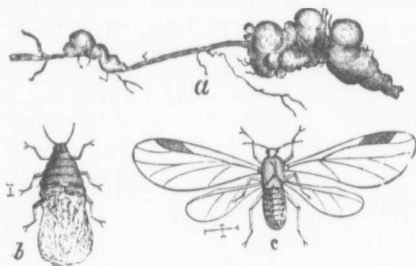


Fig. 32.

the tender roots, sucking their juices, and weakening, oftentimes seriously, the life of the tree. When an apple tree is found to be sickly without any evident cause, the presence of this insect may be suspected. The tree should then be dug about, and the earth removed from the roots in order to see whether they are knotted as in the figure, which would indicate the work of the louse.

The simplest remedy, when the roots are uncovered and the lice are brought to view, is to scald them with hot water, nearly boiling, or to drench them with strong soap-suds.

For the use of coal oil against this and other underground pests, such as the grape Phylloxera, etc., a plan has been devised by Dr. Barnard, of Washington, D. C., that seems to be effective. The great difficulty hitherto in the use of coal oil for root insects has been its application on, or just beneath, the surface of the ground, and close to or above the roots; when applied in this way its contact with the roots themselves and their consequent destruction can hardly be avoided. Dr. Barnard employs what he calls a "nether inserter," which is thus described (*Psyche*, vol. iv, p. 134): "It consists of a tube which is made to fit closely around a central solid shaft somewhat longer than the tube and pointed at its lower end. The tube may have an internal diameter of 15 mm. (about half an inch) and the shaft a diameter of 12 mm. The upper end of the tube expands like a bowl. The upper portion of the shaft is weighted with a heavy ball so disposed

that the shaft can be pushed into the tube and then withdrawn. The tube is then pushed into the ground, both tube and shaft is then wholly inserted. When it is placed beneath the insect, the shaft is withdrawn and the insect is killed by whatever may be used. In a later communication the effective use of this treatment applies in many cases among others the insect Aphis, as it is some- evidently the distribution of danger of contact with passage upwards to

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Fig. 33.

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Fig. 35A.

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that the shaft can be grasped above the ball. By withdrawing the shaft partially from the tube and then returning it with force, as the lower end of the tube rests on the ground, both tube and shaft can be driven into the ground to any required depth. The shaft is then wholly withdrawn and the insecticide poured into the tube, by which means it is placed beneath the roots without coming into contact with them. The tube is then withdrawn and the hole made by it filled up with earth. The insecticide (coal oil, or whatever may be used) being volatile, rises through the ground and becomes diffused. In a later communication to the same journal (*Psyche*, iv., 143), Dr. Barnard speaks of the effective use of this instrument against the grape Phylloxera, and states that the same treatment applies in the case of all other root insects or subterranean pests, mentioning among others the insect now before us, the apple-root plant-louse, or American Blight-Aphis, as it is sometimes called. The great point in the application of this remedy is evidently the distribution of the coal oil, or other insecticide, beneath and beyond the danger of contact with the roots, the destruction of the insect pest being caused by the passage upwards to the surface of the vapour of the petroleum.

THE ARMY WORM.

Almost any caterpillar that appears in large numbers and covers a wide area of country is locally called "The Army Worm," but the species to which the name properly belongs from its habit of devastating whole fields at a time, marching on in regular column to fresh pastures and devouring all green things as it goes, is the *Leucania unipuncta*, Haw.

Fig. 33 represents the caterpillar in the attitude of eating, and fig. 34 the moth.

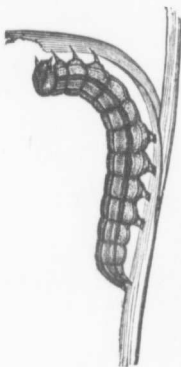


FIG. 33.

This insect may be found every summer in small numbers, and so far has seldom appeared in destructive hosts in Canada. The best and simplest remedy for it is to apply Paris green copiously to the fields where it abounds, or, when it has commenced its march, to broad strips of meadow immediately in front of its main body, taking care to plow under the poisoned surface as soon as the remedy has done its work. The moth, which appears towards the end of summer (we have taken it this year late in October), can easily be captured by hundreds by the process of "sugaring," that is by spreading a mixture of coarse sugar and stale beer on fence boards and trees at dusk, and visiting the bait



FIG. 34.

with a lantern during the night.

BARK LICE.

There are two or three kinds of bark lice injurious to fruit trees, but the species that is most common and destructive in Canada is that represented in the adjoining wood-cuts (Fig. 35A and 35B), and known from its shape as the oyster-shell bark louse (*Mytilaspis pomorum*, Bouché). To get rid of this pest, which if let alone will soon cover the bark of the whole tree from top to bottom, two or three operations are necessary: first, during the winter or in early spring examine the orchard and scrape the scales off every infested tree as far as they can possibly be reached; but as the scales will be found on the smaller branches and twigs which cannot be got at, the insect must be further fought at the time when the eggs are hatching



FIG. 35A.

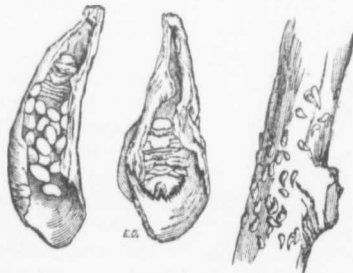


FIG. 35B.

and the young lice are crawling over the limbs; this takes place about the end of May or early in June, according to the season. As soon as observed, the twigs where the young lice appear, should be brushed with a strong solution of soft-soap and washing soda, or showered with a solution of washing soda in water, made by dissolving half a pound or more in a pailful of water. The emulsions mentioned for use against the *Aphis* may also be employed with effect.

THE BEAN WEEVIL.

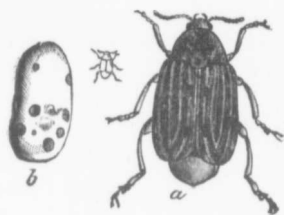


FIG. 36.

This insect, *Bruchus obsoletus* Say (*B. Fabae*, Riley), is often exceedingly injurious to bean crops, especially in the neighbouring state of New York. The wood cut, Fig. 36, represents the tiny beetle life size, and *a* highly magnified; *b*, an infested bean from which the insects have emerged.

In order to get rid of this pest, seed beans intended for next year's sowing should be carefully examined in the autumn or winter, and if found to be infested by the insect, should be placed in tight boxes—tins would be the best—in a very warm place. In a very short time, the heat will cause the creature to complete its transformations and come out of the bean; it can then be easily killed by dipping in hot water, or left to die; the beans, if not badly perforated, may then be safely used for sowing the next spring.

Another method, similar in its character, is to keep the beans in tight vessels in a dry place over one year before sowing; by doing so, the beetles will come out and die during the first summer and leave the seeds in good order for the following year. There is, of course, some danger of a failure to germinate, if kept so long in a warm and dry place. Dipping for a few moments in very hot water just before sowing may also be employed as a remedy.

CABBAGE BUTTERFLIES.

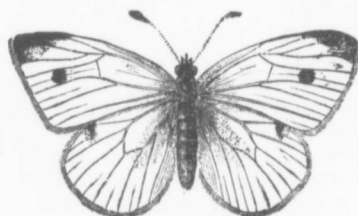


Fig. 37.

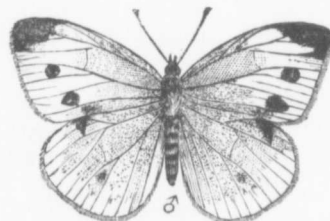


Fig. 38.

There are three white butterflies whose caterpillars feed on the cabbage, all belonging to the same genus *Pieris*, but the only one whose injuries are serious is the imported species, *P. rapae*, Linn. Fig. 37 represents the male butterfly; Fig. 38 the female; and Fig. 39, *a*, the caterpillar, and *b*, the chrysalis. As this has become of late years one of our commonest butterflies, every one is no doubt familiar with it; and every gardener must know equally well the green caterpillar, clinging closely to leaf or stem, and resembling so nearly the colour of the plant, whether cabbage, cauliflower or mignonette, as to be scarcely distinguishable without close searching.



Fig. 39.

It is difficult to apply remedies for this pest as the caterpillar feeds within the folds of the leaves, and any poisonous preparation applied for its destruction is liable to remain within the cabbage and render it unfit for food. This is certainly the case with violent poisons, such as Paris green or hellebore; but the "Persian insect powder," made from the flowers of the *Pyrethrum*, may be used with good effect. It should be dusted freely on the infested plants, or mixed with water and poured or syringed into them. While destructive to most insect life, this remedy is quite harmless to man, and in any case can be pretty well removed by washing before the vegetable is cooked. It has been found at the New

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York Agricultural Experiment Station, that a mixture of one part of powdered Pyrethrum, with three parts of plaster or air-slacked lime is quite effective in destroying this insect. It is applied with a small bellows, by inserting the nozzle among the leaves, so that the powder is driven through the plant. Another mixture, cheaper than the foregoing, is one part of the powder to twenty of flour, applied in the same way; experiments with this showed that the caterpillars were killed by it in twelve hours.

A still cheaper remedy, and one more quickly applied, is the following:—Dilute one table-spoonful of the cheapest black carbolic acid in one gallon of water, apply sparingly after heavy rains, and at intervals of three or four weeks, if the caterpillars are observed. It is said by those who have tested it, to give them uninjured crops of cabbage.

CABBAGE MOTHS.

The caterpillars of two kinds of moths, are also injurious to the cabbage and allied plants. One of these, the Cabbage Plusia, *P. brassicae*, Riley, has of late years become increasingly destructive in some of the neighbouring States, and is also found in this Province. Fig. 40, *a* represents the larva, *b* the chrysalis, and *c* the perfect insect. The caterpillar is pale green, lined with white, and has a few scattered black hairs rising from small white spots; when walking it loops its body in a peculiar manner, as shown in the cut. The moth, which is dark gray, almost brown, is especially distinguished by the silvery spots on the forewings.

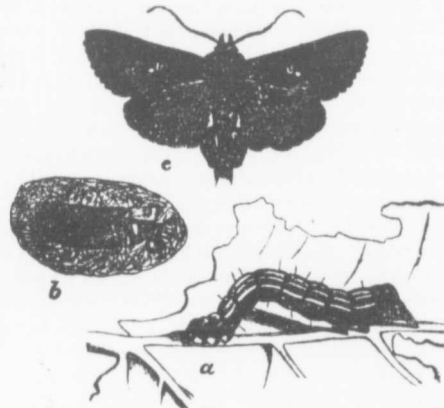


Fig. 40.

The other cabbage moth is represented in Fig. 41, in both stages of caterpillar and perfect insect. It is known as the Zebra, *Mamestra picta*, Harris, from the peculiar markings, which render the caterpillar quite handsome.

As the larvæ of both these moths feed for the most part on the outside of the plants they infest, they may often be kept in check without difficulty by hand picking. They may also be destroyed by sprinkling the plants with hot water a little below the boiling point. The Pyrethrum insect powder may be employed as well; a tablespoonful thoroughly mixed through two gallons of water and sprinkled over the plants, is said to be effective in destroying the caterpillars.

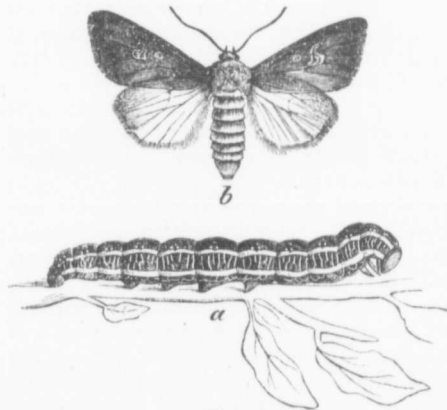


Fig. 41.

CANKER WORMS.

There are two species of insects whose caterpillars are commonly known as canker worms; the moths of one species, *Anisopteryx pomataria*, Harris, appear chiefly in the autumn, those of the other, *A. vernata*, Peck, partly in the autumn, but most abundantly in the spring. They resemble each other very much in appearance, and possess the same habits; the remedies to be employed against them are therefore the same in both cases.

Fig. 42, represents the Fall Canker worm, as it is termed; *a* the male moth, *b* the female, natural size, *c* joints of female antenna, *d* one joint of female abdomen, magnified. The resemblance between the two species will be observed by comparing the above with



Fig. 42.

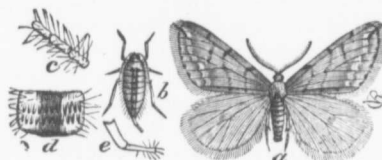


Fig. 43.

Fig. 43, which represents the Spring Canker worm; the letters have the same references, with the addition of *e*, the ovipositor of the female, magnified. The worms themselves are geometers, or loopers, that is, they alternately loop up and extend their bodies when walking. If disturbed, and also when fully grown, they let themselves down from the branches of the trees by silken threads. They especially infest the apple tree and elm, but are also known to attack the cherry, plum, linden and other trees. They are usually confined to small localities and do not spread with any rapidity, owing to the wingless female being incapable of flight, or travelling to any great distance. Remedies may, therefore, be successfully applied where they are found, as there is little danger of a fresh invasion when one colony is exterminated.

The most effective remedies against this insect are those based upon the habits of the moth. As the female has no wings, it is obliged, in order to lay its eggs, to climb up the tree from the ground where it passes its pupa state. It is evident, then, that if she can be prevented from doing so, there will be no new brood of worms. One of the simplest modes of accomplishing this, which has been successfully employed for many years, is to encircle the trunk of the tree a short distance above the ground with a band of cloth or of thick paper, folded to a width of four or five inches, and covered with tar or a mixture of tar and molasses. The bandage must be tightly tacked to the tree on the lower edge to prevent any of the insects from creeping under it, and the ring of tar must be renewed every few days to prevent its becoming too hard to stop the moths from crossing it. Care must also be taken to keep the tar sticky during cool evenings, for the moth is nocturnal in its habits; for this purpose it is well to mix with it some raw oil or molasses. The bandages must be applied in the latter part of October, and kept on till the leaves are expanded the following spring; it is also necessary to look to them during any mild weather in the winter. Tin, lead and wooden troughs, filled with oil, have also been used to encircle the trunks of the trees, with the same object in view, but the tar bandages are the simplest, cheapest, and most effective if attended to.

Another kind of remedy consists of collars of tin or other material, fastened round the tree and sloping downwards like an inverted funnel. These are employed to prevent the moths from ascending the tree, as the insect will climb up as far as it can, and then travel round and round beneath the protector till it becomes exhausted and falls to the ground. The eggs, however, will, in such cases, be deposited in large numbers beneath the obstruction, and unless they are brushed off and destroyed the tiny young worms will manage to crawl through any crevice and get to the foliage above.

Should the moths succeed, through oversight or neglect, in getting up the trees and depositing their eggs, and thus produce a swarm of the caterpillars upon the foliage, it will be necessary to resort to other measures for the destruction of the pest. The simplest and most effective is to spray the trees by means of a force-pump with a mixture of Paris green, or London purple, and water. This may be done with safety upon apple trees so early in the season as the time when the canker worm is prevalent.

THE CHINCH BUG.

This terribly destructive insect has happily given us no trouble in Canada as yet, though a few specimens have from time to time been found by Entomologists. But it has

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come so very near to us that it is well to be on our guard against it, and to know how to repel its attacks in case of necessity. Dr. Lintner, in his Report for last year, gives an account of its appearance in large numbers, and of the damage it inflicted on several farms in St. Lawrence county, New York, at Morristown, opposite Brockville, and other places near the river further west. During the seasons of 1882 and 1883 it was abundant and destructive, but was afterwards apparently killed out, partly by the measures taken to exterminate it, and partly by the unfavourable weather.

The chinch bug (*Blissus leucopterus*, Say) is a very tiny creature, and not likely to be recognized by any one unfamiliar with insects. The annexed wood cut (Fig. 44) represents the creature highly magnified on the left, the hair line beneath shewing the actual size; the figure to the right represents an ordinary bug, shewing the difference in shape from the chinch bug. Should any farmer observe in the autumn patches of dead grass in his meadows, looking as if winter-killed, and on inspection find minute insects at the roots smelling like ordinary bed bugs, he will do well to send some specimens at once to a competent entomologist for identification.

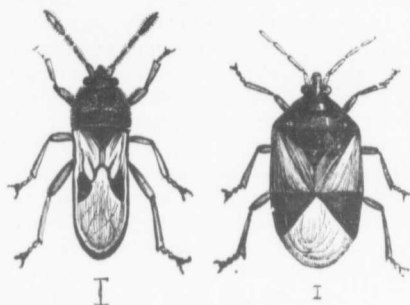


Fig 44.

(Mr. James Fletcher, Department of Agriculture, Ottawa, is the proper person to apply to). If it should prove to be the chinch bug, the following remedies may be employed:—

1. Burn the dead grass on the infested spot and fifteen or twenty feet around it. This may be done by spreading over it a covering of straw and setting fire to it when the wind is favourable.
2. Plough the burned area, or, better still, the whole field, in broad and deep furrows, turning the sod completely and flatly over, not permitting it to be in ridges.
3. To insure the more effective burying of the insects that may be feeding upon, or preparing to pass the winter among the roots of the grasses, harrow the ploughed surface slightly and follow with a heavy rolling.
4. If it can be obtained, spread gas-lime over the infested parts at the rate of 200 bushels to the acre. It should only be applied to the parts of the meadow actually attacked, as when fresh it will kill the grass.

CLOVER INSECTS.

Between twenty and thirty insects are known to entomologists as more or less injurious to clover in Canada, while many more are found in the United States. The most important of these—seven in number—have been so fully and satisfactorily described and illustrated by Mr. Saunders, in a late issue of these reports (12th Annual Report of the Entomological Society of Ontario, 1881, pages 37 to 48), that I need only refer the reader to his paper, and not attempt to repeat the matter here. The Clover Seed Midge is also referred to by Mr. James Fletcher, in his report for 1885, to the Minister of Agriculture at Ottawa (pages 12 and 13); the remedy that he has found most effective in Ontario, where this tiny insect has proved very injurious where clover is grown for seed, he gives as follows:—

“The only instances where any seed has been reaped are where, instead of allowing the clover to stand in the field till the end of June, it has been fed off by cattle and sheep till the beginning or middle of June, and then left to go to seed for the autumn crop. . . . The verdict of all the growers who have tried the experiment now seems to be that two crops cannot be secured, and to get any seed at all the first crop must be pastured until the beginning, and not later than the middle, of June. In this way the minute larvæ of the flies, which are to lay the eggs for the second brood, are eaten by the cattle at the same time as the clover and destroyed. It is quite apparent that, if all persons will adopt this plan, much good will be done, and if some fall dressing for the land can be devised to destroy the hibernating brood, we may hope before long to get rid of this injurious insect.”

THE CODLING WORM.

Every fruit-grower is, of course, perfectly familiar with this destructive and most troublesome insect. It is wide spread over the whole Dominion from Nova Scotia to British Columbia, and destroys every year a large proportion of the crop. The accompanying wood cut (Fig. 45) illustrates its mode of burrowing into the fruit of the apple.

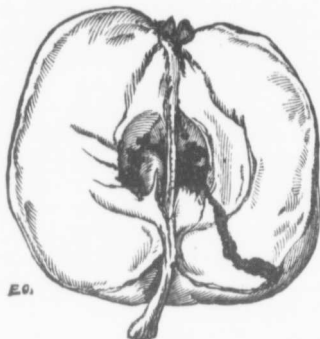


Fig. 45.

For a long time it was supposed that the only satisfactory remedy for this pest was to entrap the worms, when about to change to the pupa state, by means of bandages of carpet, cloth, or sacking tied around the trunks of the trees during the months of June, July and August. These bandages require to be removed every few days and passed through an ordinary laundry "wringer" in order to kill all worms or pupæ that may be attached to them, and then replaced on the trees. In a large orchard this plan involves an immense deal of continuous labour. Happily, it has recently been discovered that the insect may be kept under control far more easily and effectively by the use of Paris green. A very small quantity of the poison diluted in water—some experimenters say as little as a table-spoonful in a barrel of water is sufficient—should be sprayed

upon the trees as soon as the blossoms have well passed maturity, and before the young fruit has turned down from its increasing weight. Animals should, of course, be kept away from the orchard till after heavy rains have removed any danger to them from the poison. This remedy is supposed to operate in two ways—first, by killing the young worms that consume what may be attached to a blossom, and, secondly, by causing the parent moth to abstain from laying her eggs on trees that have been so treated. However this may be, we are informed that the remedy is most effective, and we strongly recommend our readers to try it during the coming season.

These notes on "remedies" have extended to so much greater length than the writer anticipated that he must defer the continuation of them to another year, by which time he hopes to be able to give the results of further experiments made with reference to many more of our most obnoxious insects.

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