CIHM
Microfiche
Series
(Monographs)

ICMH
Collection de
microfiches
(monographies)

Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

Technical and Bibliographic Notes / Notes techniques et bibliographiques

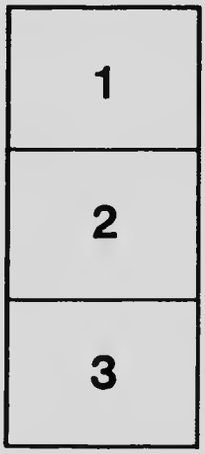
The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming are checked below.

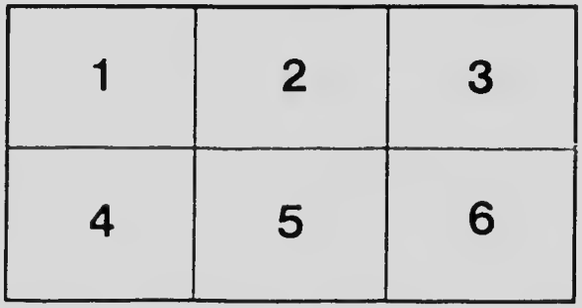
- [x] Coloured covers / Couverture de couleur
- [ ] Covers damaged / Couverture endommagée
- [ ] Covers restored and/or laminated / Couverture restaurée et/ou pelliculée
- [ ] Cover title missing / Le titre de couverture manque
- [ ] Coloured maps / Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black) / Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations / Planches et/ou illustrations en couleur
- [ ] Bound with other material / Relié avec d'autres documents
- [ ] Only edition available / Seule édition disponible
- [ ] Tight binding may cause shadows or distortion along interior margin / La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure.
- [ ] Blank leaves added during restorations may appear within the text. Whenever possible, these have been omitted from filming / Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- [ ] Additional comments / Commentaires supplémentaires:

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- [ ] Coloured pages / Pages de couleur
- [ ] Pages damaged / Pages endommagées
- [ ] Pages restored and/or laminated / Pages restaurées et/ou pelliculées
- [x] Pages discoloured, stained or foxed / Pages décolorées, tachetées ou piquées
- [x] Pages detached / Pages détachées
- [x] Showthrough / Transparence
- [ ] Quality of print varies / Qualité inégale de l'impression
- [ ] Includes supplementary material / Comprend du matériel supplémentaire
- [ ] Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image / Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.
- [ ] Opposing pages with varying colouration or discolourations are filmed twice to ensure the best possible image / Les pages s'opposant ayant des colorations variables ou des décolorations sont filmées deux fois afin d'obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below /
Ce document est filmé au taux de réduction indiqué ci-dessous.





Contributions from the Entomological Branch, Department of Agriculture, Ottawa.

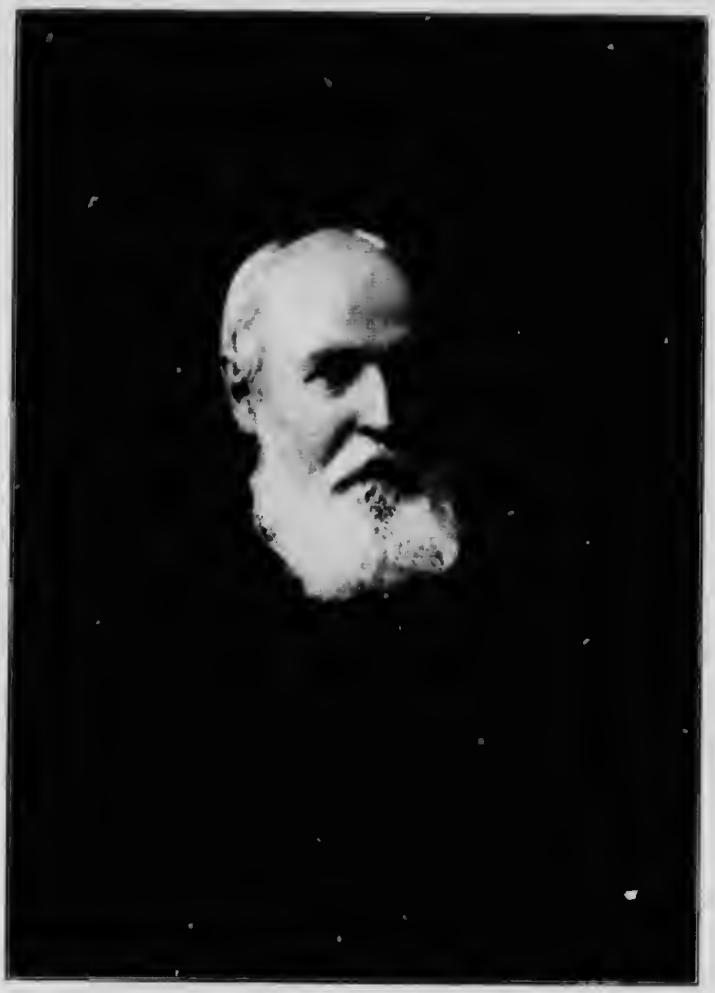
Applied Entomology in Canada:

Its Rise and Progress

BY

C. GORDON HEWITT, D.Sc.,
Dominion Entomologist.

Reprinted from "The Forty-fifth Annual Report of the Entomological Society of Ontario, 1914," pp. 38-41.



Rev. Dr. C. J. S. Bethell

DR. WILLIAM SAUNDERS, C.M.G.

PRESIDENTIAL ADDRESS.

C. Gordon Hewitt, D.Sc., F.R.S.C., Dominion Entomologist, Ottawa.

In welcoming you to the Fifty-first Annual Meeting of our Society, it is my sad duty first to call attention to the deaths, since our last meeting, of two of our former Presidents, one of whom was at the same time one of the founders of the Society, and both have placed us under a deep debt of gratitude by their devotion to the welfare of the Society and to entomology in Canada. I refer, as you will all know, to the deaths of Dr. William Saunders, C.M.G., LL.D., and to Mr. Henry H. Lyman, M.A. Worthy tributes to these two men have been written by a more competent hand than mine in the current volume of our journal,* but I should like to add a few words of personal appreciation.

Henry Herbert Lyman.

The memories of the terrible disaster to the steamer "Empress of Ireland," on the 29th of May last are still acute in the minds of many of us who lost friends and knew the ship; I came out to Canada on it in 1909, and recrossed two years later. To me the feelings of horror were intensified by the fact that I had spent some time with Mr. Lyman on the afternoon of the 27th, when as your Delegate, he attended the meeting of the Royal Society in Montreal and read his report to that Society. His high sense of duty which characterized all his actions was particularly exemplified at that meeting. The afternoon was hot, the time available for receiving reports was very brief, and most of the delegates from Societies presented their reports by title. In view of these circumstances and for personal reasons, for he told me how unusually busy he was preparing for his departure to Europe, I strongly suggested to him that he should hand in his report to be read by title. But no, the report was read in the voice we all knew so well, and the meeting was informed of the manner in which we celebrated our Jubilee meeting. I believe the reading of that report was his last public act, and that I was the last entomologist who performed the duty of an ear for him and conversed with him by means of his scribbling pad; I cannot forget the happy banter of our conversation. He filled a unique place in our meetings, and in entomological meetings which he so zealously attended in other countries, and we shall miss his kindly presence and good-humoured impatience with those who, like myself, presented papers at the meetings without having prepared manuscript which his increasing deafness required as a substitute for the sound of the speaker's voice. At our Jubilee meeting we welcomed his charming wife, and our hope that his constant attendance at our meetings would by her assistance be assured will never be realized.

---

*Henry Herbert Lyman, by C. J. S. Bethune, Can. Ent. Vol. 46, pp. 221-225. 1914.
Dr. William Saunders, by C. J. S. Bethune, *Ibid* pp. 333-336.

William Saunders.

The illness which prevented Dr. Saunders from attending the Jubilee Meeting of our Society last year was responsible for his death in September last in his seventy-ninth year. I shall have occasion to refer to his influence on Canadian entomology in my address to you. Those of us who had the privilege of coming into close contact with Dr. Saunders, and of working with him, can understand the reasons for the successful development of all he undertook: his private business as a druggist, the progress of our Society and success of our journal *The Canadian Entomologist* in the early and more difficult days, and finally the organization and development of the Experimental Farms of the Dominion. The last will ever stand as a lasting monument to his enthusiasm and untiring industry. The significance of his work in connection with the development of Canadian agriculture has not been sufficiently recognized by Canadians generally. No man has ever done more, and no single man will ever have the opportunity which he had and of which he took the fullest advantage, to increase the production of the land in Canada. The value of such an accomplishment cannot be reckoned in terms of dollars and cents, it is inestimable; but it is appreciated by those who, in all countries, are striving towards the same ends.

We are concerned with him, however, as an entomologist. He was before all things a lover of nature, and his passion found an outlet in the study of insects and plants. In association with Dr. Bethune he marshalled the scattered workers of kindred tastes and our Society came into being. He was one of the first to realize the practical significance of entomological work, as our records show. In addition to the contributions to our Annual Reports he published in 1883 his "Insects Injurious to Fruits," which for many years was the standard work on the subject, and is now one of our entomological classics. When I undertook, five years ago, the organization of the Division of Entomology under his direction I had ample opportunity of appreciating his kindly thoughtfulness, and though he had grown out of touch with the modern developments of his old science, owing to the exacting demands of other branches of agriculture, his interest in the subject which he had done so much to advance in Canada never flagged, and his reminiscences were always full of interest. His career and industry should be an inspiration to all of us.

I have chosen as the subject of my address:

APPLIED ENTOMOLOGY IN CANADA: ITS RISE AND PROGRESS.

Several reasons have guided me in the choice of the subject of my address as your President. Last year the Society reached the fiftieth year of its existence, and while our proceedings were enriched with delightful reminiscences of earlier years, no record was given of the gradual development in Canada of the economic or practical side of entomology, the growth of which has been so closely associated with the history of our Society. I have already referred to the loss during the past year of one of our founders, Dr. William Saunders, who, with the co-operation of Dr. Bethune, was largely responsible for the early development of our work. Moreover, it was my desire to pay a tribute to the work of these leaders in applied entomology in Canada by describing its growth and present status.

The economic aspect of entomology was first recognized officially in Canada in 1856, when the Bureau of Agriculture and Statistics of the Canada of that day, which of course comprised only Upper and Lower Canada (Ontario and Quebec), offered three prizes of £10, £25 and £15 for the three best essays on "The Origin, nature and habit—and the history of the progress, from time to time—and the cause of the progress, of the weevil, Hessian Fly, midge and such other insects as have made ravages on the wheat crops of Canada; and on such diseases as the wheat crops have been subjected to, and on the best means of evading or guarding against them." The essay was to be designated by a motto. The first prize was won by Prof. H. Y. Hind, Professor of Chemistry at Trinity College, Toronto, whose "Essay on the Insects and Diseases Injurious to Wheat Crops" was published by the Government in the following year 1857, and was widely distributed to the farmers. Whether the agriculturists of that day were impressed by Prof. Hind's motto, history does not relate, but he selected the following extract from a speech of Napoleon III: "The progress of agriculture ought to be one of the objects of your constant care; for upon its improvement or decline depends the prosperity or decline of Empires." Even the suggested relation of insect pests to the decline of Empires did not produce any impression upon the mind of the Government of that day sufficiently great to induce it to do more than distribute the prize money—and the essays, for we have no record of any further official activity until about twelve years later.

Nevertheless, systematic entomology prepared the way for the permanent entrance into Canadian affairs of its practical sister. In 1863 our Society was organized as a result of the activities of the Rev. C. J. S. Bethune and Mr. William Saunders, and I have been fortunate enough to hear the story of its origin and early years from the lips of both of these sponsors, but this story is told elsewhere. It may be remarked, however, that the origin of the Society in Canada may be traced to the publication in the *Canadian Naturalist and Geologist* for June, 1862, of a "List of Entomologists in Canada" by these two gentlemen. This list contained the names of thirty-six persons interested in the study of insects.

The objects of the Canadian Entomological Society were: The formation of a collection of Canadian insects; the charge of a depository of duplicate specimens for distribution among members, and the holding of entomological meetings. It was inevitable that in the course of these mutual studies the members should be concerned from time to time with those species of insects which attracted the attention of other persons than entomologists, and insects of economic importance therefore received attention. In 1865 the Hon. George Brown engaged Dr. Bethune to edit the entomological section in *The Canada Farmer*, and for eight years information on injurious and useful insects was given through this medium

to the farmers and fruit growers. Added stimulus to the investigation of the life-histories and habits of insects affecting the agriculturist was given by the determination of the Society five years after its foundation to publish an entomological journal *The Canadian Entomologist,* which came into existence in 1868 and soon began to publish articles of value to the practical entomologist.

The real birth of economic entomology in Canada, in my opinion, took place in 1869 when our Society received a grant of $400 from the Council of the Agricultural and Arts Association of Ontario, on condition that "the Society furnish an Annual Report and form a cabinet of insects useful or prejudicial to agriculture, and horticulture, to be placed at the disposal of this Council, and that they also continue to publish their journal." These conditions were readily accepted by the Society, and accordingly the "*First Annual Report of the Noxious Insects of the Province of Ontario*" was prepared in 1870 and published by the Provincial Government of Ontario in 1871. It contained three papers on the insects affecting the apple, the grape and the plum, written respectively by Rev. C. J. S. Bethune, Wm. Saunders and L. Baynes Reed. Most of the insects were illustrated. Until a few months ago these pioneers were still with us. We are happy to know that Dr. Bethune is still able to carry on the duties of Professor of Entomology at the Ontario Agricultural College, Guelph, and that Mr. Baynes Reed, though he has transferred his attentions from insects to that still more elusive natural phenomenon, sometimes noxious, generally beneficial—the weather, takes a kindly interest in the work of his successors. The popularity of the first Canadian entomological report is evidenced by the fact that an edition of three thousand copies was soon exhausted.

Further government aid to Economic Entomology was received in 1871, when the Government of the Province of Ontario passed a statute incorporating the Entomological Society of Canada as the Entomological Society of Ontario, which was instituted for "the investigation of the character and habits of insects, the improvement of entomological science, and more especially its practical bearing on the agricultural and horticultural interests of the Province." A grant was made to the society by the Provincial Government, and the "*First Annual Report of the Entomological Society of Ontario*" was published. Without intermission that series of annual reports has been continued, and with the assistance of the government grant, which now amounts to one thousand dollars per annum, our Society has continued to render its services of increasing value not only to the agriculturists of the Province of Ontario but to the Dominion generally; and I feel that I must confess my regret, which is shared by others whose interests are not confined to Ontario, that it was not possible to retain the old name of the Entomological Society of Canada, which the Society virtually is, as it has as affiliated Societies the Entomological Society of British Columbia and a branch in Montreal, and members are to be found in every Province.

Thus we trace the origin of applied entomology in Canada and find that the real stimulus to its development came from the agricultural society (The Agricultural and Arts Association of Ontario). In this connection it is of great interest to note in passing that applied entomology had a similar origin, which preceded ours, in the United States. First in the State of New York and subsequently in Illinois and Missouri the development of entomological work, with which the names of Fitch and Riley are associated, can be traced to the agricultural societies of these States.

We have seen that applied entomology in Canada had its genesis and official recognition in the Province of Ontario. Let us turn to the recognition by the

Dominion Government of the fact that the study and control of injurious insects constitutes an integral factor in the development of agricultural and forestry resources of the country.

Development of Dominion Work.

In 1884 the Minister of Agriculture, (Hon. J. H. Pope), on the recommendation of a Select Committee, and in accordance with recommendations from different parts of the country, appointed a Dominion Entomologist; the position being an honorary one in the first year. Fortunately for the country there was at hand a man eminently suited to undertake such work, and the appointment of the late Dr. James Fletcher, at that time working among books in the Library of Parliament during the day, and among insects during his "spare" and happier moments, was a most happy choice, for I have reason to know to what extent he endeared himself to all with whom he came in contact, and with what zeal he worked to create in the minds of the agriculturists an interest in insect pests and later, in farm weeds and other plants, for his work became of a dual nature. In 1886 the Dominion Experimental Farms were established, under the direction of an entomologist, the late Dr. Saunders, who continued their direction until 1911. As that was the only scientific branch of the Department of Agriculture at that time, and to increase his sphere of action, Dr. Fletcher was attached to the staff of the Experimental Farms Branch in the joint capacity of Entomologist and Botanist, a position which he occupied until his death in 1908. The uninterrupted series of Annual Reports which he published from 1884 until he died in harness testify to the infinite variety of problems with which he dealt.

Here I wish to digress a little, and in order to indicate in the words of one closely associated with him the character of Dr. Fletcher's work and the conditions which existed until the time of his death, I will quote the conclusion of Dr. Bethune's valuable paper on "The Rise and Progress of Entomology in Canada,"* written in 1898. Concluding a most interesting review of Canadian entomology he says: "Of one other name I must make special mention—that of our much esteemed colleague, Dr. James Fletcher. No one in Canada has done so much as he to instruct the people in a practical knowledge of their worst insect foes and the best means of dealing with them—but how strange it is that he should not be provided with adequate assistance. As Dr. Howard, President of the Association of Economic Entomologists of America well expressed it: 'Canada has the man and the knowledge, but has been hampered by want of funds. The result is that while she has immediately and intelligently adopted the results of researches made in the United States, she has not been able to lead us in original investigations.'" After describing the extent to which entomological work was supported in the United States, particularly at Washington, Dr. Bethune concluded: "Here in this vast Dominion of Canada we have only Dr. Fletcher, with merely one assistant, a secretary to help him in his immense correspondence, whereas he ought to have not only further help in Ottawa but also at least one competent entomologist under his direction in each province and territory from the Atlantic to the Pacific . . . . . It is earnestly hoped that this unsatisfactory condition may soon be rectified, and that entomology, especially in its economic aspect, may no longer be starved in this country, but with liberal aid may make more and more progress in its own field of work, and by its practical results justify all that may be done for it."

*Trans. Roy. Soc. Canada, 2nd Ser., Vol. 4, Section IV; pp. 155-165. 1898.

Following the death of Dr. Fletcher the entomological and botanical sections of his work were separated, and new Divisions of Entomology and of Botany of the Experimental Farms Branch were instituted. By my appointment as Dominion Entomologist in 1909 it fell to my lot to organize the new Division of Entomology, the staff of which consisted of Mr. Arthur Gibson, as Assistant Entomologist, and one clerk.

The next step in the development of the Dominion work was the enactment of The Destructive Insect and Pest Act in 1910. The San José Scale Act, passed in 1898, concerned itself with one insect only; under the Act ports of entry were determined for nursery stock and fumigation stations were established there. The threatened introduction of certain insects, particularly the Brown-tail and Gipsy Moths, made it necessary that the Dominion should have power to take steps to prevent the introduction and spread of any serious insect pest. These powers were secured by The Destructive Insect and Pest Act, and since its enactment regulations have been passed which have as their direct object the prevention of the introduction of the San José Scale, the Gipsy and Brown-tail Moths, Potato Tuber Moth, Mediterranean Fruit Fly, and Woolly Aphis, and as their indirect objects the prevention of the introduction and spread of numerous other insects whose presence can be detected by inspection or death caused by fumigation. The passage of this Act enabled us to add to the entomological staff gradually a number of trained officers as Inspectors and Field Officers. Additional men have been appointed on the outside staff in connection with the next important development of the Dominion work.

With so extensive a territory to serve involving a great diversity of climatic, soil, topographic, and cultural conditions, with a pressing need for original investigations by trained men of our more serious insect pests in the regions where they occurred, involving the most important feature of all, namely, direct contact with the men whose problems we were studying and whom we desired to assist, an immediate extension of our work along definite and obvious lines was necessary; field or regional laboratories in different parts of the country were required. The first of these was established in the Niagara Peninsula in 1911 for the study of fruit insects. Additional field stations have been established each year until there are now nine stations from the Atlantic to the Pacific* each in charge of a trained entomologist, and the problems that are being studied cover the whole range of applied entomology.

The value of the work of the Dominion field officers in various parts of Canada cannot be overestimated. In most cases they are carrying on pioneer work, studying problems in provinces in which no previous entomological investigations have been carried on, and thus assisting in a most highly important manner in the development of entomological work in hitherto neglected fields. Such missionary work is undoubtedly the most necessary and at the same time the most valuable kind of endeavour to which our efforts can be devoted, and great credit is due to the men who are ploughing the virgin soil.

As a result of this development along special lines both in regard to administrative work and the investigation of entomological problems the Entomological Service was separated from the Experimental Farms Branch in April last and raised to the status of an independent Branch of the Department of Agriculture. The sanction of Parliament to increased appropriations, which are now more in

*The Dominion Entomological Field Stations are established at the following points: Bridgetown, N.S.; Fredericton, N.B.; Covey Hill, Que.; Vineland Station, Ont.; Strathroy, Ont.; Treesbank, Man.; Lethbridge, Alta; Agassiz, B.C.; Vancouver, B.C.

accord with the needs of the country, is encouraging evidence of a desire to afford the means whereby the entomological service of the Dominion shall be in a better position to meet the requirements of the situation. Our greater ability to assist the agriculturists, foresters and others demanding our help in preventing the introduction of insect pests, and in controlling by natural and artificial means the spread of those already within our borders, has been the stimulating factor in our development, and I venture to think that the grounds for Dr. Bethune's earlier reproach which I have quoted have been already removed.

The Development of Applied Entomology in the Provinces.

It is natural that the study of insects affecting agriculture, using the term as I do in its widest and inclusive sense, should develop early and make the most progress in these provinces in which agricultural methods and practice were most advanced. Accordingly, in tracing the early development of applied Entomology we have seen that it had its birth in Ontario, and forty years ago could be said to have been a sturdy though solitary infant. I now propose to trace the development and to give briefly the present status of applied entomology in the various provinces of the Dominion. We shall find that the impetus to the development of Entomological work in the provinces, as in the Dominion, has been largely due to the necessity of combating serious insect pests which have set foot in the country.

Ontario.

The early history of applied entomology in Ontario has been given, as it alone constitutes the earlier work in Canada. Such advances as were made in the science were entirely due to the activities of our society and of its members. When the headquarters of the society were removed to the Ontario Agricultural College additional stimulus was undoubtedly given to the work of the College in applied entomology. The Entomological Department of the Ontario Agricultural College has always combined with its function as an educator of the agricultural student the duty of assisting that wider circle of students, the farmers and fruit growers of Ontario, in solving their entomological problems. In this latter respect it has been virtually, and still is, the entomological bureau of the Provincial Department of Agriculture. This is certainly the case in so far as the investigations of insect pests and the assisting of the agriculturists and fruit growers are concerned.

Sheer necessity has also helped to develop the entomological work in the Province, and we shall find the same to be true not only in this Province, but in all the provinces in which the control of insect pests is undertaken by the Government, and the same applies to the Dominion. In fact, it is the outstanding feature of the origin of government entomological work [illegible] is forced upon the government from the outside usually by an exceptional [illegible]rious outbreak, or by the introduction or threatened introduction of an insect, the seriousness of which has been demonstrated by previous experience elsewhere. The most notable example is the San José Scale, which has been the original cause of most of the legislative measures in the United States and Canada.

Following the discovery of the San José Scale in Ontario in 1897, the Provincial Government passed an Act forbidding the importation of infested plants and providing for the inspection of orchards and destruction of infested trees. As a result of the drastic steps which were necessarily involved in energetically carrying

out this Act opposition was created, but a Commission of Inquiry supported the policy of the Government, and a further Act was passed in 1899 providing for the fumigation of nursery stock and the inspection of nurseries. This work was at first under the direction of the Professor of Entomology at the Ontario Agricultural College (then Prof. Wm. Lochhead), whose skilful management did much to prevent the spread of the scale in those early days. The Fruit Pest Act was passed and was amended in 1912. This Act is administered by the Fruit Branch of the Ontario Department of Agriculture. So that the entomological work is now carried on jointly by the Fruit Branch and the Entomological Department of the Agricultural College, whose teachers direct the work of the inspectors in addition to carrying on the educational and investigatory work in the Province. In 1912 the very necessary step of appointing a Provincial Entomologist was taken, and Mr. Lawson Caesar, who had carried on for several years the duties of such an office with commendable zeal and success, was appointed to the position. His recent promotion to be Associate Professor of Entomology in the Agricultural College is a deserved reward for the excellent practical work which our fellow member is carrying on. I have no hesitation in saying that the provincial entomological organization in Ontario, under Professor Caesar, who directs an excellent staff of inspectors, will not suffer from comparison with similar services in any of the states to the south of us.

British Columbia.

As early as 1887 the Rev. George W. Taylor, whose subsequent reputation as an entomologist was by no means confined to this country, was appointed Honorary Provincial Entomologist of British Columbia, but I am inclined to believe that the duties were more along the lines of systematic than applied entomology. Owing no doubt to the fact that a considerable proportion of the people who settled in the Pacific coast province came out from England, and because of the rich and attractive insect fauna which was discovered there, we find that entomology has always had a number of zealous devotees in the province, among whom may be mentioned the names of Taylor, Harvey, Hanham and Day. In spite of the temporary suspension in 1908 of the activities of the British Columbia Entomological Society, which was started in 1901 and affiliated with our society in 1905, the interest in entomology did not die out, for the society was resuscitated through the energetic efforts of Mr. R. C. Treherne in 1911.

During this period a change in the public estimation of entomology in the province has been brought about. Formerly it signified the collection of insects and their study; now it involves not only this systematic aspect but a consideration of the practical bearing of insect life upon human activities. I am confident that with the co-ordination of these two independent sections of entomological work entomology in British Columbia has a firm establishment, and the present growing society will not suffer the fate of the former society, which had not the same amount of human interest in the subject.

For this entomological revival in British Columbia much credit is due to Mr. Treherne, who, as an officer of the Dominion Entomological Service, was sent out to take charge of the work in that province in 1911, and in 1912 commenced a series of investigations at the Dominion Entomological Laboratory established that year at Agassiz.

The applied entomological work of the Provincial Government, until a year or two ago, has taken the form of the administration of legislation having for its

object the prevention of the introduction of insect pests into the province. Great praise is due the Province for its activities in this important direction. Following the organization of the fruit-growers about twenty-five years ago, the Provincial Government passed the Horticultural Board Act in 1894, under which a Provincial Inspector of Fruit Pests was appointed. This officer's duties were somewhat extensive; they were educational, in that he was required to "hold meetings throughout the Province in the interests of horticulture and impart such information and instructions to fruit-growers and farmers as may tend to the improvement and expansion of the fruit industry of the province." In addition (and this, as this title would indicate, has proved to be the chief duty of the officer), the Inspector of Fruit Pests was required to carry out the Board's regulations relating to the prevention of the introduction and spread of insect pests and plant diseases. The first inspector was Mr. R. M. Parker. It is largely due to the zeal and extraordinary enthusiasm of the present Inspector of Fruit Pests, Mr. Thomas Cunningham, that the Province is so remarkably free at the present time from such orchard insects as the Codling Moth and San José Scale, to mention the most important, when other newly-developed regions have succumbed to their invasion. The work is now carried out under the Agricultural Associations Act of 1914. Formerly the fumigation and inspection of imported nursery stock and plants was carried on by the Dominion and Provincial Governments at Vancouver, but the duplication of work which necessarily followed has been abolished by an arrangement whereby compliance with the Dominion regulations is effected by the Provincial Inspectors of Fruit Pests under the supervision and with the co-operation of the Dominion Department of Agriculture, and the system is working admirably.

In passing, mention should be made of the entomological work of Mr. J. R. Anderson, formerly Deputy Minister of Agriculture, who has always been a keen observer and has assisted in the development of applied entomology in the Province. His bulletin on "Farmers' Foes and Their Remedies," published in 1908, has done much to create an intelligent interest in the subject of insect pests in the province.

In the spring of 1912 Mr. W. H. Brittain was appointed Provincial Entomologist and Plant Pathologist under the Fruit Branch of the Department of Agriculture, but his removal to Nova Scotia in 1913 caused a cessation of the investigations on fruit insects which he had started, and which, with those carried out by the Dominion Field Officer, Mr. Treherne, constituted the first serious efforts on the study of practical entomological problems in the province.

I should include in this statement the investigatory work of Dr. Seymour Hadwen, of the Health of Animals' Branch of the Dominion Department of Agriculture, who in the course of his study of animal diseases has been able to carry on entomological work on insects affecting live stock, which studies have been productive of excellent results, his work on the Warble flies (*Hypoderma* spp.) and ticks being particularly important.

The provincial entomological work, apart from the inspection work under the Provincial Horticultural Board, is being carried on at present by the Provincial Plant Pathologist, pending, I venture to hope, the appointment of a Provincial Entomologist, upon whom will devolve a large amount of highly important work as British Columbia has many problems peculiar to itself.

Nova Scotia.

Although Nova Scotia is one of our oldest provinces where educational facilities have always been exceptionally good, we do not find any early development of practical entomology; indeed, the number of collectors in the province has never been so great as one would expect. From the establishment of the Provincial Agricultural College, Truro, until 1912, Prof. H. W. Smith, Professor of Biology, undertook any local entomological work that might be required, such as replying to enquiries regarding the control of insect pests, chiefly those affecting fruit, and attending meetings of fruit-growers and agriculturists. He also contributed articles on applied entomology to the *Annual Report of the Provincial Department of Agriculture*. In 1900, following the activities of the Dominion and Ontario Departments of Agriculture, the Provincial Government passed a San José Scale Act, but no enforcement of the provisions of the Act were required.

The necessity of possessing wider powers, indicated by the introduction of the Brown-tail Moth, led to the passage of the Injurious Insect Pest and Disease Act in 1911. This Act was more comprehensive and enables the Provincial Department of Agriculture to appoint inspectors and to take the necessary steps to prevent the introduction of and eradicate insect pests. This measure was passed none too soon, for in 1912 Mr. G. E. Sanders, of the Dominion Entomological Service, discovered San José Scale in the province, into which it had been introduced on nursery stock from Ontario. It is an ill wind that blows no one any good, and again the discovery of a serious insect pest led to necessary progress in applied entomology. Not only did the Nova Scotian Government appoint a Provincial Entomologist in 1912, in the person of Dr. R. Matheson, but the Ontario Government recognized the need of such an official to have charge of the nursery inspection. Dr. Matheson organized an inspection service, and it is largely due to the energetic measures taken by him in eradicating infested trees that the Scale has been practically exterminated in the Province. Dr Matheson returned to Cornell University in 1913, and was succeeded by Mr. W. H. Brittain, who now occupies the position of Provincial Entomologist and Professor of Entomology in the Provincial Agricultural College.

In addition to the San José Scale inspection work carried on by the Provincial Department of Agriculture, the Province co-operates with the Dominion Department of Agriculture in the work against the Brown-tail Moth, for which work the latter Department is responsible, by supplying an equal number of inspectors to those employed by the Dominion.

The prospects for applied entomology in the Province are unusually bright; there are many important problems awaiting solution and much educational work is necessary. Already the joint efforts of Mr. Brittain and the Dominion Field Officer, Mr. G. E. Sanders, who has charge of the Brown-tail Moth work in the Province, have had a marked effect, particularly in the direction of increased efforts on the part of the fruit-growers, not only to control insect pests but to do so intelligently.

Quebec.

While insect pests have not spared the fields and forests of Quebec during its development, the progress of ideas in regard to the scientific control of insect pests has been slow. Although the Abbé Leon Provancher was a most industrious student and a prolific worker on the insects of Quebec, he did not concern

himself with the practical application of entomological knowledge, but confined his attention to the collection and classification of insects of the Province, in which work he persevered in spite of lack of access to literature and other collections. The results of his efforts are evident in the pages of "*Le Naturaliste Canadien*," which he founded in 1869, and in which he commenced his "Faune Entomologique du Canada" in 1874, which he completed in 1890, two years before his death.

Prior to the establishment of Macdonald College, in 1907, and the location of a Dominion Entomological Laboratory at Covey Hill, Que., in 1912, I do not know of any investigations on insect pests. For a number of years, however, Mr. J. C. Chapais, of St. Denis en Bas, has taken advantage of his journeys through the Province as Assistant Dairy Commissioner for the Dominion Department of Agriculture to disseminate useful information regarding the control of insect pests affecting agriculture, and his pioneer work in this direction is deserving of much credit.

Valuable educational work was also carried on in the Province, particularly in the Eastern Townships, by the Rev. T. W. Fyles, who, in 1880, was awarded a prize by the Missisquoi Agricultural Society for an essay on "How to Guard against the Ravages of the Potato Beetle, Locust, etc.," which was subsequently published in the Provincial *Journal of Agriculture*. By his charming popular writings and exhibits of insects he has done much to create an interest in entomology in the minds of those who would be benefited by its practical application. As a society we are pleased that, in spite of his increasing years, he is still able to take part in our deliberations and to contribute to our Proceedings.

The establishment of the MacDonald College, at St. Anne's, in association with McGill University, brought Prof. Wm. Lochhead and a staff of enthusiastic workers who have taken the most prominent part in the arduous task of developing the study and practice of applied entomology in the Province. In 1908 Prof. Lochhead founded the Quebec Society for the Protection of Plants from Insect Pests and Fungous Diseases, which receives a grant from the Provincial Department of Agriculture to enable it to carry on the valuable and very necessary educational work in the Province. The wide range of subjects and useful character of the practical information contained in the six annual reports of the Society which have been published up to date indicate the important part it is playing in the development of applied entomology in the Province.

The Department of Agriculture of Quebec realising the necessity of safeguarding the interests of its nurserymen and fruit-growers appointed a Provincial Entomologist in 1912, the Abbé V. A. Huard, Curator of the Provincial Museum at Quebec, and editor of "*Le Naturaliste Canadien*," being selected for the position and in 1913 an Act was passed providing for the inspection of nurseries and giving the Provincial Entomologist the necessary powers to make such inspections and issue certificates. We are looking forward with interest to the development of the practical side of entomology under the Provincial Department of Agriculture, the Fruit Branch of which is displaying commendable activity in connection with their work in demonstration orchards.

Before this review of work in Quebec is closed reference should be made to the educational work that is being carried on in certain of the educational institutions in which, as our correspondence indicates, there is a growing interest in entomology. Particularly should the energetic efforts of Father Leopold, of the

Trappist Agricultural College at Oka, P.Q., be mentioned in this connection, as his influence will be widespread in directions in which information on the scientific control of insect pests is sorely needed.

New Brunswick.

For a number of years Mr. Wm. McIntosh, Curator of the New Brunswick Natural History Society's Museum at St. John, N.B., has carried on pioneer work of an educational character in the province, particularly in the schools, and he has assisted the Provincial Department of Agriculture in entomological matters from time to time. Particularly valuable has been his educational work since the establishment of the Brown-tail Moth in Canada. The work of Mr. R. P. Gorham, Assistant Horticulturist in the Provincial Department of Agriculture, is also deserving of mention.

Since the field work against the Brown-tail Moth was commenced in the Province by the Dominion Entomological Service in 1911, the Provincial Department of Agriculture has co-operated in the work by providing half the staff of inspectors required, this excellent plan being followed in both the infested provinces, Nova Scotia and New Brunswick. A further necessary step was taken by the Province in 1913, when an "Injurious Insect and Pest Act" was passed giving the Provincial Department of Agriculture powers to take the necessary steps to prevent the introduction and spread of serious insect pests and plant diseases.

Manitoba, Saskatchewan and Alberta.

In the three prairie provinces the agricultural conditions are probably responsible for the fact that, except for occasional serious outbreaks of locusts or cutworms which have been of the usual duration, there has been no insistent demand for entomological work. With the adoption of more diversified methods of farming and the necessity of increasing the production and discontinuing "mining" the soil, greater attention must be paid to the methods of insect control. The farmers in these provinces have looked to the Dominion Department of Agriculture for assistance and have been well served. The establishment of field stations in southern Manitoba and southern Alberta for special investigations indicates the intention of the Dominion Government to assist the agriculturists of the West. Notwithstanding the fact that no official Provincial Entomologists have been appointed in the prairie provinces, there are a number of men who have had a marked influence on the progress of applied entomology in that important section of the country.

In Manitoba Mr. Norman Criddle has studied the native injurious insects for many years. His work first came to the notice of Dr. Fletcher in 1901. Not only has he become widely known to the farmers of Manitoba through his contributions to the agricultural press, but his investigations have been productive of results of practical value. His remedy for locusts, now well known as the "Criddle Mixture," has proved of immense value. His appointment in the Dominion Service to carry on investigations in Manitoba is a deserved recognition of his ability, and an important step in the direction of assisting the grain growers in the control of insects affecting cereals. Prof. F. W. Brodrick, Professor of Horticulture at the Manitoba Agricultural College, Winnipeg, Man., has also taken a keen interest in entomological work, and he and Prof. V. W. Jackson, Professor of Botany, have done much to extend a knowledge of the control of insect pests among the students

and agricultural community in the province. I understand that the establishment of an Entomological Department in the Agricultural College, with a competent man in charge, is contemplated: such a forward step would be in every way desirable and justified.

Throughout Saskatchewan the name of Mr. T. N. Willing, Associate Professor of Natural History in the Saskatchewan Agricultural College, Saskatoon, is known for his educational work among the farmers. By lectures at Institute meetings and exhibits of injurious and beneficial insects he has performed a real service to the agricultural community. Previous to his present position Mr. Willing held the position of Chief Inspector of Weeds for the Department of Agriculture in Saskatchewan, and combined with the botanical work such entomological propaganda as he was able, all enquiries respecting the control of insect pests being referred to him.

In the Province of Alberta there existed some years ago the North-West Entomological Society, which had for one of its objects the dissemination among the agriculturists of information relating to the control of insect pests, and its President, Mr. P. B. Gregson, of Waghorn, was particularly active in this aspect of the Society's work. I do not think the society exists at the present time, although there are several entomologists in the province, of whom Mr. F. H. Wolley-Dod is well known on account of his work in Nootnidae. The Provincial Department of Agriculture of Alberta has not taken any steps in the direction of educational or other work regarding the control of insect pests.

No action has been taken by the Provincial Government of Prince Edward Island regarding entomological w[illegible]

In briefly touching upon the various phases of the progress of applied entomology in the provinces nothing has been said concerning a number of agencies not entomological, all of which have helped in the general development of entomological work among the agriculturists. Such agencies are the Farmers' Institute meetings, agricultural fairs, demonstration orchards, district representatives, the more recent "Better Farming" special trains; all of these varied activities, through the zeal of those who have charge, have and will have in an increasing measure a potent influence in developing our science.

No one is more conscious of the rambling nature of the foregoing account than its writer, but if the description appears to lack co-ordination, like the solitary efforts of those who have been the pioneers in our work in Canada, you cannot fail to observe the single motive which runs through all the efforts—an unquenchable desire to place scientific knowledge at the disposal of those who will profit by its application to the advantage of the country at large. Entomologists are sometimes wont to resolve themselves into two main classes: the systematists, who collect and classify, and the economic entomologists, who study how to control species affecting man in his varied activities. Occasionally I have heard the former section speak somewhat disparagingly, even scornfully of those who apply their knowledge to every day life; on the other hand, a reversal of such opinions is sometimes heard. We need not concern ourselves with the opinions of those who collect insects as they would stamps or china, but I would remind those systematists who are inclined to hold aloof from the practical application of their science that to the work of economic entomologists they owe almost entirely that large measure of respect with which entomologists and entomological work is now regarded by the general public. The prevention and eradication of diseases carried by insects and the control of insects which have devastated our forests and crops and de-

populated whole districts is regarded as work indispensable to national development. Such work has led people to appreciate the value of entomological work to humanity at large, and incidentally to recognize that there is no ground for the assumption that a man with a net is to be pitied, or, as in one instance that came to my knowledge, confined to the local gaol as insane. Applied entomology is, as its name applies, science with practice. It was preceded by the study of the science for its own sake, and such a study must necessarily furnish the basis for all entomological work that is to be of practical value. The pioneers of applied entomology in Canada were all men who loved the science of entomology primarily for its own sake, and not on account of the practical value of the knowledge they gained regarding insects. When they were able to put their knowledge to a practical purpose and to take up its application they did so with untiring zeal. This is the lesson taught by a study of the subject of my address, and in directing your careful attention to it I would urge the necessity of our emulating the example of the founders of applied entomology in Canada. Let it be our constant endeavor in developing the work of our society and of our work in Canada to recognize the need of, and endeavor at all times to secure the closest co-operation between the man who collects and studies our insects for the mere pleasure of gaining the wonderful and unequalled insight into nature that it gives and the man whose studies lie in the laboratory and in the field and forest. With such co-operation there can be no doubt as to the place which entomology in Canada will occupy.

Dr. Bethune: We have all, I am sure, listened with the greatest possible interest to the admirable address which Dr. Hewitt has just given us. It is certainly the most complete and exhaustive history of the rise and progress of economic entomology which has yet been prepared in this country, and I think we all must feel that we owe a very hearty vote of thanks to Dr. Hewitt for his successful efforts in this respect. Dr. Hewitt has come in at the end of the first period of history in this respect, and we may look to him with the greatest confidence to carry on and develop to a far greater extent than we who belong to the earlier period ever dreamed of, this work of economic entomology in Canada, and to mature the systematic side as well. The two cannot exist satisfactorily away from each other, and there must be this co-ordination to which he has referred in order that we may have success in both directions and in the important field of economic entomology.

Dr. Fyles: We have all listened, I am sure, with the greatest pleasure to the able and stimulating address that Dr. Hewitt has given us, and we all feel, I am sure, that the Government has the right man in the right place. It is indeed a great thing to have a man who brings it before us in such an able way, and urges men to carry on works which are now being undertaken to develop practical entomology as Dr. Hewitt has done. I am sure we all feel that he is entitled to our warmest thanks, and while we feel this, at the same time it is a great pleasure to us to see our friend Dr. Bethune, our old President, the Editor of our paper for so long a time, present amongst us and occupying the chair, and while we are sorry that several old friends have passed away, as some of our dear friends have lately done, it is a source of rejoicing that we still have Dr. Bethune amongst us. Long may he continue his services to the Entomological Society of Ontario. We are glad to see younger men coming up and doing the work in such an able way as so many of the younger men are carrying on the work in distant parts of the country for the general good. I beg to second the

vote of thanks that Dr. Bethune has proposed to Dr. Hewitt, and hope that he may long continue his work with his able assistant Mr. Gibson. If you go to the new apartments of the Department of Entomology in Ottawa, and go upstairs in one of the towering buildings which men are putting up in these days, you will find large rooms there devoted to our favourite science, and there you will find Dr. Hewitt and Mr. Gibson ready to afford you all information in their power and to show you very valuable collections that are there gathered.

THE PRESIDENT: I thank you all for your very cordial and most encouraging reception of my paper and for Dr. Bethune's and Dr. Fyles' encouraging words, and I only hope, as I endeavoured to show in my paper, that it is upon the wonderful example of our founders, particularly that of Dr. Bethune, that we are basing our efforts, and hope as best we can to follow that example in the development and progress of our work in Canada.