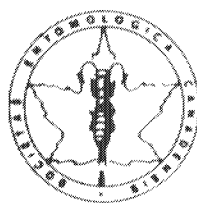


FEB 11 1986

ENTOMOLOGICAL SOCIETY OF CANADA

Bulletin



SOCIÉTÉ ENTOMOLOGIQUE DU CANADA

Vol. 17

December-décembre

No. 4



Entomological Society of Canada
Société Entomologique du Canada

Bulletin

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R. B. Aiken: Bulletin Editor

Cover Design: M. A. Sydor

Published by:
The Entomological Society of Canada,
1320 Carling Avenue, Ottawa, Ontario K1Z 7K9

THE PRESIDENT'S REPORT

35th Annual Meeting of the Entomological Society of Canada, Ottawa, Ontario, September, 1985

It is my pleasure to report to you on behalf of the Governing Board on the 35th year of operation of the Entomological Society of Canada. As in previous years the Society has been very active, has faced problems, and has made considerable progress. Owing to restrictions on time I will comment only on the highlights; other important actions of the Board and accomplishments of the various committees have been, or will be, reported in *The Bulletin*.

Before the report on societal business I would like to share with you some personal thoughts.

In this day of rapid proliferation of scientific knowledge with its resultant requirement that the individual scientist must become more and more of a specialist, the need for teamwork is imperative for progress to occur. Please note that I am stressing teamwork amongst a group of *specialists*, rather than one person attempting to encompass so much that his or her knowledge in one area is diluted to a useless level.

There are three general areas that require teamwork upon which I wish to comment. The first is *within the discipline of entomology* and concerns the interactive state between applied and basic research. Clearly the quality of applied science, in whatever discipline, can only be as good as the quality of the basic science there is to apply. As a society we can be proud that our membership includes people doing world class work at all points along the spectrum from very basic to very applied.

As the rate of discovery in basic science increases, so will the rate of application. To use only one example, 20 some years ago Watson and Crick recognized the double helix nature of the DNA molecule and with the subsequent revolution in genetics, today new plants and animals are being created. Presently we are on the doorstep of biotechnology in insects. The equivalent leap of "from double helix to new plants" in insect biotechnology *will occur* in much less than 20 years. An example of that leap might be — a drastic reduction in the use of insecticides through genetic change of feeding preferences of harmful insects or through manipulation of receptor sites for neurotransmitters — the imagination is the limit. As this rate of application of basic work increases, the need for teamwork among basic and applied entomologists will increase also.

The second area that requires increasing teamwork is the *interaction of entomologists with other disciplines*. The example that comes most readily to my mind is the concept of integrated pest management — entomologists, toxicologists, pathologists and whoever else is needed, working together to solve a problem. In a completely different setting an insect neurobiologist may concomitantly liaise profitably with a molecular geneticist, a computer scientist and a biophysicist. While retaining our core of expertise as entomologists we must be ever alert for opportunities to gain from other disciplines in expanding our horizons and in solving entomological problems.

The third area that requires teamwork is at the *level of professional societies*. In a time of severe financial restraint for science created by a government that also sees fit to cut Science Council by 50% we, as biologists and indeed as scientists, are going to need all the teamwork with other professional societies that we can muster to make even a squeak of our collective voices heard. The Entomological Society of Canada is capable of not only being a good team member, but of playing a significant leadership role. The *esprit de corps*, efficiency of organization, political awareness and initiative to undertake large and novel endeavors as a Society results in the E.S.C. serving as a model in many regards to other biological societies in this country. To avoid selling ourselves short, as well as biology in general, we must participate enthusiastically in such organizations as the Biological Council of Canada and the Association for the Advancement of Science in Canada, as well as to continue to express our concerns, as a Society and as individuals, to the makers of government policy.

Problems Addressed by the Society

Members of the original Steering Committee for the 18th International Congress of Entomology to be held on the U.B.C. campus, July 3-9, 1988 have agreed to serve on the Organizing Committee. The Society has confidence that G. E. Scudder, Chairperson, J. N. McNeil, I. M. Smith, S. R. Loschiavo, G. E. Ball and K. G. Davey will organize an excellent Congress. The Board of Governors recommends that the 1988 Annual Meeting of the E.S.C. be held in conjunction with the Congress.

The E.S.C. participated in the Canadian Congress of Biology sponsored by the Biological Council of Canada at London, Ontario, June 23-28, 1985. G. B. Wiggins was the E.S.C. representative to the Congress Steering Committee. He and W. G. Friend organized two societal symposia, "The Biological Survey of Canada: Terrestrial Arthropods" and "Pheromones: Their Role in Insect Behavior Control". A. D. Tomlin was responsible for local arrangements and developed an excellent pamphlet on the E.S.C. which was distributed at the Congress and can be used for promotional activities for several years to come. The loan given by the E.S.C. to the B.C.C. for 'up-front' operating funds was returned at the Congress. The attendance of E.S.C. members was low. As suggested in 1984 by the Executive, the Board of Governors evaluated the success of having two major meetings in the same year and recommends that in the future the Society participate in only one. In particular the Board recommends that the E.S.C. hold its 40th Annual Meeting in conjunction with the Second Canadian Congress of Biology scheduled for August 1990 at Laval University.

The 1986 Annual Meeting will be hosted by the Entomological Society of Manitoba. Neill Holliday is the Meeting Chairperson with George Gerber and John Conroy in charge of the scientific program and local arrangements, respectively. The 1987 Annual Meeting will be hosted by the E.S.B.C. in Penticton, September 28-30, 1987.

I wrote to Thomas Siddon, Minister of State for Science and Technology emphasizing the critical state of funding for basic science in this country and the absolute necessity for maintaining a vigorous core of such endeavor. First Vice President, Harold Madsen, and I expressed the concern of the E.S.C. about program cuts in the Canadian Wildlife Service to Suzanne Blais-Grenier, former Minister of the Environment. I sent a letter on behalf of the Society to Prime Minister Mulroney concerning the severe cut in funds for the Museum of Natural History.

The proposal, "The Economics of Insect Control in Wheat, Canola and Corn in Canada" was funded by Agriculture Canada. The study team and the Scientific Committee met in January 1985 to draft the terms of reference for the study, to determine the roles of the team and committee, and to develop plans for collecting, analysing and preparing data of the study for publication. I am pleased to report that steady progress is being made on this project.

The Scientific Committee of the Biological Survey of Canada chaired by G.G.E. Scudder and with Secretariat H. V. Danks met October 25-26, 1984 and April 25-26, 1985. This high profile group continues to attract attention and recognition and to pursue its excellent work. Progress was reported on a wide variety of projects including preparation of illustrated keys to the families of arthropods in Canada and of a publication characterizing the insect fauna of the Yukon, continuation of faunistic studies of grasslands, springs, soils and wetlands. Of particular interest the Biological Survey Committee urged me to write to Kenneth Hare, Chairperson, Canadian Climate Planning Board, drawing to his attention the biological and agricultural implication of rising levels of atmospheric carbon dioxide. The Planning Board agreed to co-sponsor with the E.S.C. a workshop on this topic. As the topic involves all living organisms, not just insects, the B.C.C. was approached to determine if that organization would be willing to sponsor the workshop. At the B.C.C. Congress in London Ralph Nursall, President of B.C.C. agreed to contact the constituent societies concerning their interest in such a workshop.

As a member of the executive of B.C.C. I advised the Society of the following items:

- a) Pursuant to the publication of a directory of Canadian field research stations, a B.C.C. committee prepared the document, "A Policy for Biological Field Research Stations in Canada." The policy is intended to serve those who use research stations and those who make decisions about their future, in particular NSERC whose infrastructure grants have proved vital to the survival of some facilities.
- b) Robin South and Louis Lapierre retired as President and Secretary respectively. Ralph Nursall is the new President and Clarence Madosingh, the secretary. John McNeill was elected Vice President.
- c) D. C. Eidt was the E.S.C. representative on a B.C.C. committee chaired by Taylor Steeves that prepared "A Commentary" on the report, "Canada's Threatened Forest", published by Science Council. The Commentary endorses the Science Council's statement and further recommends immediate increase in resources for forest management and research activity.
- d) The 1985 B.C.C. Gold Medal is awarded to David F. Mettrick, University of Toronto.

Internal Matters

The Executive, Governing Board and the Committees dealt with a variety of items best described as internal matters. Details may be found in committee reports soon to be published in The Bulletin. Here are a few of the highlights.

This past year saw the completion of two common names lists of insects of Canada. The First, "Nomenclature insectorum canadensium" was commissioned by the Quebec Society

for the Protection of Plants and prepared by Paul Benoit. It is an update of the 1975 list called "French Names of Insects in Canada". W. Y. Watson, Chairperson of the E.S.C. Insect Common Names and Cultures Committees submitted the completed list of "English Common Names of Insects and Other Pests". The E.S.C. and the Q.S.P.P. are exploring ways in which to publish the two lists together.

Under the chairmanship of First Vice President H. F. Madsen, the Science Policy Committee met on April 22, 1985. The Microbial Insecticides Study Committee chaired by O. N. Morris has completed the report and is now reviewing it. Final submission is anticipated by the end of the year. The Board thanks the committee members for their efforts.

A report on Biological Control of Insect Pests and Noxious Weeds was received from John Laing. The report recommended that an expert committee on the subject be established. The Science Policy Committee and the E.S.C. Executive asked Bob Jacques to make a representation for the establishment of such a committee at an Agriculture Canada Pest Management workshop held in May 1985. The Society has been informed recently that Agriculture Canada intends on establishing an Expert Committee on Biological Control.

Stuart Hill reported the results of a survey conducted at the 1984 E.S.C. Annual Meeting designed to identify and assess those things that need to be done to ensure the healthy development of entomology. The results will appear in The Bulletin.

Barbara Patterson was appointed Managing Editor in December 1984 and as anticipated has been doing a superb job. The Scientific Editor, Stephen Smith, and the Assistant Editor, Roger Downer resigned as of July 31, 1985. On behalf of the Society I thanked them for their greatly appreciated service. D. A. Craig agreed to chair the Search Committee to find a new scientific and Assistant Scientific Editors. I am pleased to report that Dr. A. B. Ewen has accepted the position as Scientific Editor and he will be assisted by two Assistant Scientific Editors Dr. M. Mukerje and Dr. C. H. Craig.

After several months of leave of absence, Helen Liu resigned as Editor of The Bulletin. Ron Aiken is the new Editor. B. K. Mitchell will continue in the capacity of Assistant Editor for The Bulletin.

The Finance Committee reported that:

- a) a file of information for use by an Acting Treasurer in an emergency has been compiled and placed in the Societies office;
- b) a microcomputer system has been installed in the Societies office;
- c) monies for improvement of the scientific program to regional societies should be raised from \$1,000 to \$1,500, that general seed monies advanced by the E.S.C. should be raised from \$1,500 to \$2,500, and that regional societies should be encouraged to donate any unspent monies to the E.S.C. Scholarship Fund.
- d) A proposal by Elsevier Publishing Company to publish The Canadian Entomologist be rejected because the negative aspects of the proposal far exceeded the positive ones.

The Society continued its program of recognizing outstanding contributions to entomology. The 1985 Gold Medal was awarded to Dr. R. Sinha, Agriculture Canada, Winnipeg and the C. Gordon Hewitt Award to Dr. M. L. Winston, Simon Fraser University.

The end of this address will bring me almost to the end of my term as President. I want to express my gratitude to the Society for the opportunity to have served as President. The scientific and political endeavors of this Society, as well as the congenial forum it provides for personal contact with fellow entomologists, have always elicited from me a willingness to "pitch in and help with the task at hand".

I wish to express my gratitude to those who have served with me on the Executive Council, the Board of Governors, and the various Board committees. Special acknowledgement must be given to Joe Shemanchuk who assumed the duties of Secretary as of January 1985.

On behalf of the Board I wish to thank Stephen Smith and Roger Downer for their service as Scientific and Assistant Scientific Editors, respectively, and to welcome Al Ewen as the new Scientific Editor and Mukul Mukerje and Harvey Craig as Assistant Editors. To Barbara Patterson, Managing Editor, I extend the appreciation of the Society for learning her job so well, so fast and for functioning so competently during the transition between editors. I also express appreciation to Helen Liu for her service as Editor of The Bulletin and to Bev Mitchell, Assistant Editor of The Bulletin, for temporarily assuming the duties of Editor. More personally I must thank my secretary, Carole Gagnon, who gave excellent assistance during a rigorous period which not only marked my term as President but also my first year as the Chair of the Department of Environmental Biology, University of Guelph.

I extend on behalf of the membership appreciation to an individual who has and will continue to give outstanding service to the Society. After 25 years, E. C. Becker has tendered his resignation as Treasurer. As one phase of life finishes for Ed, another one begins. This year he was elected Second Vice President which means he will be President and our official representative at the 18th International Congress in 1988.

GOLD MEDALIST'S ADDRESS

Creativity, Communication and Career

by
R. N. Sinha*

I am touched by the honor that you have conferred on me — the 1985 gold medal for outstanding achievement in Canadian entomology. It is indeed most satisfying to receive this from my professional colleagues in my adopted country, Canada. To me Canada has always been a vital, progressive, tolerant, and humane country. Through the Research Station in Winnipeg, the Research Branch of Agriculture Canada of this country has provided me with one of the best research environments that I could have found anywhere in the world. I am grateful to my colleagues at the Winnipeg Research Station and to my wife for making my research career in entomology an exciting and fulfilling experience.

Thirty-five years ago I decided to make entomology my chosen profession. Much has happened since then. I have moved from country to country, but continued studying and working in entomology. The deeper I probed into the subject, the more I marvelled at the diversity, complexity and challenges entomology offers to a serious student entering this field. Entomological investigation is no less challenging today than it was 35 years ago. With thousands of new insect species yet to be discovered, with many more hypotheses, theories and principles in evolutionary biology, ecology, biochemistry and biotechnology to be tested on insect subjects, the possibilities for further exploration seem limitless in entomology.

This morning I shall talk on several themes: quality in scientific research, creativity, communication and career development. A small part of our research on stored grain ecosystems, will be described briefly as an example to demonstrate how I have used some of these themes and found meaningful results.

Quality

Quality is degree of excellence, superiority in kind. Because all scientific findings are relative, the concept of high quality research, by definition, has to be a subjective one. An absolute judgement, even on a piece of high quality research would be hard to defend. A creative and well-disciplined researcher has his or her own concept of quality which is usually independent of peer judgement. The process of crystallizing a concept may vary from person to person. But, in essence, it goes something like this: the scientist has a new idea. He or she then checks whether this idea is valid and workable or not by using scientific methods that include rigorous tests of reproducibility, and evaluation for determining its relevance and correspondence to other scientific facts. If the idea holds, when put through these tests, a scientific discovery is made. Such a discovery, however, may or may not be high quality research.

Creativity

All high quality research has two components in common: creativity as evidenced by high degree of novelty, and unquestionable evidence of reproducibility. I feel that good universities and research establishments can train and help a scientist to achieve the second component but may not be as good in providing the creativity component. Creativity is the ability of bringing something new into being. The creative act is an "encounter", as the psychologist, Rollo May, defined, this act occurs with or without voluntary effort. In the final analysis, new concepts are formulated, and a chain of heretofore unknown facts are observed, usually by those imaginative researchers who have a high degree of creativity. Their findings often become the significant landmarks in science. Nowadays, few discoveries involve a truly novel finding, independent of other earlier scientists's input. Generally, novelties arise from previously unobserved association of already known facts. Thus the "novelty creation" component of high quality research comes from the creative ability of a perceptive scientist. Such a scientist, like an artist, re-combines many isolated observations on a large canvas and paints a picture representing the integrated whole — a well-validated, significantly new idea. Showing his exasperation at those scientists who record endless trivial scientific observations, Albert Einstein once wrote "I have little patience with scientists who take a board of wood, look for its thinnest part, and drill a great number of holes where drilling is easy."

*Agriculture Canada Research Station, 195 Dafoe Road, Winnipeg, Manitoba R3T 2M9

Career Development

Such a viewpoint expressed by a great scientist creates a serious dilemma for a young scientist particularly during the first five or ten years of his or her career. Not all scientists can become a "T-shaped" scientist during the difficult first decade of their research career. It is easier to have either breadth (many papers) or depth (one or two in-depth papers), than both. Fresh from university or from his or her post-doctoral stint, even the most idealistic and energetic scientist is suddenly subjected to intense pressure to publish many research papers quickly or accept slow promotion, economic insecurity, or both. Faced with this difficult choice in a fiercely competitive world some scientists compromise quality and begin "drilling a large number of holes where drilling is easy"; some of the "purist type" cease publishing for the first several years and wait until the "right" kind of data in the "right" quantity are collected according to their own quality concept and thus risk sound career development and accompanying financial loss and insecurity; and yet another group just gives up and does not publish at all and becomes the lifelong "cynical scientists" who are perpetually frustrated with the "system". There may be a way out of this dilemma. Rather than taking a negative approach, the young scientist should face the reality ("publish or perish") head on, and publish in depth (the vertical part of T, the "laser approach"), short papers without compromising his or her quality standard. One way it can be done is by visualizing a broad, imaginative, multi-faceted research objective which would take years to fulfill completely. As an analogy, one may first imagine a magnificent building with floors, roofs, windows, doors and patios and other details. The next step would be to begin building blocks, or parts at a time, somewhat like the way social insects, bees and ants, work on their habitats. Excellent productivity demonstrating high personal quality standards of the scientist can thus be achieved in a relatively short time if this type of career strategy is followed. A few years down the road the scientist can attempt to interlink the well-produced blocks, or synthesize data blocks together, write an in-depth comprehensive paper and thereby proceed towards building a harmoniously styled, robust building, and thereby creating for himself or herself a highly productive and meaningful career.

In developing a research career one faces many hurdles, such as lack of funds, resources and adequate collegial support. Communicating the research results could also be a source of great frustration. Communication is an integral part of high quality research and one's ability to communicate research results plays an extremely important part both in scientific discovery and the scientist's career development. Nevertheless, communication is and will always be a "means" not an "end" in the research enterprise. In our zeal to make a manuscript letter-perfect we sometimes forget this fact. Great scientists are usually good communicators, but their work unlike that of great writers, is remembered for the degree of novelty and soundness of the content of their discovery, not for the writing style. Over the years I have often wondered how far one should go in polishing a manuscript and at what price. My feeling is that peer groups have overdone it, at least in some of our Canadian research establishments. It is not that endless writing, rewriting and bickering over words and punctuation will not in many cases improve the quality of the communication but what it would do to a young and sensitive and yet highly creative researcher. The process being intimidating, it is unlikely to dissuade some of these talented scientists from gambling with original and radically different new ideas. It would be safer to be conservative and to work on those workable ideas that could be easily communicated with least resistance from peer groups and journal reviewers. As I read some of the stereotyped papers (not necessarily useless) in entomological journals, I often wonder whether this conservative approach to problem selection is becoming common in Canadian entomology. However desirable this training may be, the lengthy process of learning the technique of making every piece of one's research work easy to read may not necessarily make good discoveries and high quality research. Creativity should not take second place to communication. Complex matters in sciences can only be simplified so much.

Perhaps, experienced entomologists could do more by making things a little easier for the creative but inexperienced scientists to express their original ideas candidly with an acceptable level of communication. We must also encourage them to gamble with radically new concepts and show patience and understanding when some of these do not work. Why not make risk taking with exciting new concepts and ideas less costly for them? I think the future dividends for taking this approach would be worthwhile.

Stored-grain ecosystem research

Much of my research over the last 27 years involved analyzing man-made stored-grain ecosystems often using unconventional techniques. The work was often undertaken with a multi-disciplinary team of entomologists, mycologists, agricultural engineers, chemists and statisticians. Our aim has been to predict incipient spoilage in stored grain by understanding

the pathways of decay caused by insects, mites and microflora and develop integrated pest management strategies to safeguard the nation's billion plus dollar grain stocks. Different parts of this broad project have been worked out through a series of small and large, short-term and long-term subprojects involving research in the laboratory and in farm granaries. Findings from several research subprojects have been summarized from time to time and new concepts formulated. I will now briefly outline the conceptual basis for this approach and provide an example in which the insect community played a dominant role in the stored grain ecosystem.

Storage of grain generally reflects a dynamic state although the term storage implies a static state. Cereal grain is a living entity having all the properties of a living organism and therefore cannot be treated as an inanimate object. Although alive, the stored seed may not manifest some of its metabolic activities mainly because it remains in a dormant state in the storage ecosystem. The organisms that attack or become associated with grain are also alive and interact at irregular intervals with one another. Understanding both the nature and interactions of these organisms is crucial to knowing the process and pathways of deterioration of stored grain. Management of grain storage systems to fulfill man's long-range interest becomes effective only when the mechanism of the decay process is fully understood and manipulated.

Although alive, fresh, or both at the time of initial storage, all stored grains gradually decay and lose quality. The aim of proper management of stored food is to slow down or temporarily arrest this process. Decay is a functional characteristic of the stored grain ecosystem; it is not an isolated event involving only one or two biotic and abiotic agents. In the past, most grain storage management strategies have emphasized one or two of the decay-causing organisms. For example, one group of storage managers has often worked on the bacteriological aspect of food spoilage while ignoring mycological, entomological or acarological aspects. It is not that flour beetles are less important or relevant than coliform bacteria or *Salmonella*, but as a food substrate passes from a niche with one moisture-temperature-time combination to another, one group of harmful organisms becomes more important than others that have dominated the food scene earlier. The challenge for the storage manager is to maintain an "holistic" view of the decay process of a particular food substrate as it moves from one phase to another.

Our group is concerned mainly at the community and ecosystem levels of organization and judge an ecosystem on the basis of its level of maturity. Maturity relates to the structure, function and energy flow within an ecosystem. In an undisturbed ecosystem, maturity increases with time. An ecosystem can be relatively stable and can be designated as the "more mature" type with considerable species diversity and involved foodwebs with many successions, such as grasslands or deciduous forests. Stability implies persistence when disturbed and lack of fluctuations in populations. An ecosystem can also be designated as the "less mature" type if it has a simple foodweb, a low species diversity and only a few successional changes such as abundant agricultural lands. An individual species lacks a high degree of specialization and many of its populations succumb to abiotic population control forces. Although populations can rebuild their numbers quickly, climatic stress can prevent communities within such ecosystems from progressing towards a higher level of maturity.

Insects which can attack relatively dry stored grain (about 10% moisture content) at 15-42°C in all parts of the world are one of the most successful groups of organisms in an immature ecosystem such as bulk stored grain. Having originated in the tropical or subtropical parts of the world, most storage insect species do not hibernate, and persist in cooler parts of the world only by finding and creating their favorable environment, either within bulk grain or in a granary. Interrelations among biotic and abiotic variables in insect-infested ecosystems are shown from the following case study.

The impact of insect infestation on certain biotic and abiotic variables of ten wheat bulk ecosystems exposed to the extreme climates of the Canadian Prairie was studied during 1969 and 1970. In addition to an insect-free ecosystem (control), one set of bulks was artificially infested with the rusty grain beetle, *Cryptolestes ferrugineus* (Stephens) and sawtoothed grain beetle, *Oryzaephilus surinamensis* (L.) and the other set with the grain weevil, *Sitophilus granarius* (L.) and the red flour beetle, *Tribolium castaneum* (Herbst). Changes in temperature, moisture, viability of the grain, grain weight, dust weight, species of microorganisms and insects, fat acidity value, and uric acid content were measured monthly and analyzed separately by conventional descriptive and multivariate statistical methods (principal component and canonical correlation analyses). During the sixties and seventies we conducted many controlled laboratory studies which explained direct, one-to-one, cause-and-effect relationships between pairs of 20-35 species of insects, mites, fungi, actinomycete and bacteria associated with decaying stored grain. Thus we were able to interpret correlations obtained from both descriptive and multivariate analyses and associate these with biochemi-

cal and other grain spoilage variables. Eventually a clear picture of the pathways of biological and chemical deterioration of the grain in the systems emerged. In the control system, the fungus *Alternaria alternata* decreased, and *Aspergillus versicolor* and *Penicillium* spp. increased, bringing about a moderate rise in the fat acidity of the grain and a slight drop in the grain weight. In the second system, *Cryptolestes* and *Oryzaephilus* attacked few sound kernels, but polluted the environment with excreta and remains, and accelerated the deteriorative processes observed in the "control system". In the third ecosystem, *Sitophilus* and *Tribolium* thrived, adding new pathways which involved creation of large amounts of frass, invasion of *Streptomyces* and bacteria, and further acceleration of the deteriorative processes.

This study showed that time and the physical environment (especially temperature) dominate both the insect-free, and the insect-infested systems, particularly the one infested with *Cryptolestes* and *Oryzaephilus*, which was influenced by changes in microflora and free fatty acid levels. These insects, however, polluted the wheat by excreting uric acid. The system infested with *Sitophilus* and *Tribolium* was affected by metabolic moisture created by the insects, addition of this moisture to the system accelerated development of mycotoxin-producing fungi (*Aspergillus*, *Penicillium*), *Streptomyces* and bacterial populations. The main conclusion from this ecosystem analysis was that within a favorable range of moisture conditions, temperature sets the limits for survival and multiplication of the stored-product insects in most of the common 10-60 tonne granaries in the Canadian Prairie Provinces. After decades of laboratory and farm granary research we have found that the unstable, often short lived, man-made, stored grain ecosystem contains an unusual assortment of highly prolific and opportunistic animal and plant species that are difficult to control.

Stored grain ecosystem, even though a closed system, usually has an abundant food supply and structural protection (both through the granary building material and bulk grain) from the direct effect of the climate. The length of time the system will remain intact and undisturbed would determine the success or failure of the pest species in the stored grain habitat. The time element which keeps the stored grain ecosystems from becoming mature can also be carefully manipulated by knowing all the links, checks-and-balances within the ecosystem. An understanding of factors affecting the ecosystem enables the storage manager to protect the stored food under various conditions of storage with a minimal loss in quality and quantity.

Thus stored product entomology has been a challenging field of endeavour for me. I have been able to formulate some basic concepts and see them applied to solve practical problems in the Canadian grain industry. In the process, I had my fling with the multiple challenge of creativity, communication and career.

THE HERITAGE LECTURE

Some Aspects of a Limited History of Northern Insect Studies

by P. W. Riegert

A few of the most intriguing and compelling questions asked of entomologists were: "What insects inhabit northern Canada? Are they present right up to the North Pole? What kind of insects are they?" Fortunately, or unfortunately, every explorer or invader of our northern lands had a ready answer: "Biting flies". Thus it seemed quite natural that most clung to the old adage: "If it aint broke, don't fix it!" If all you are going to find in the north are the mosquitoes and blackflies, why bother?

Well some people have taken the bother to find out; their actions were not always intentionally entomological but rarely were insects ignored when strangers visited our shores. The first explorers were Norsemen from Greenland in the years 1000 to 1200 who explored the high arctic opposite their homeland. Then the good ship *Discovery* carrying Bylot and Baffin roamed through the northern channels in 1616. In neither instance do we know what insects they encountered but it is certain that they were aware of the presence of biting flies.

Then came the Sir John Franklin Expedition of 1825-1827. J. Richardson, the surgeon and naturalist, collected an impressive list of insects that included 10 orders, 152 families, and 447 species. Hard on the heels of that expedition came Captain John Ross in search of the North-West Passage. This was in 1829-1832. He collected near Spence Bay, N.W.T. When Ross failed to return, having succumbed to the rigors of the arctic, Captain George Black was commissioned to go out and find him. Here again the ships' surgeon and naturalist, Richard King, collected some insects on that voyage of 1833-1835, but little is known of them. From 1850 to 1855 Captain R. Collinson also searched for the North-West Passage but got caught in the ice and was marooned near Cambridge Bay where he also did some insect collecting. The Rev. W. Kirby travelled the northern districts from York Factory to Fort Simpson in 1858-1861. While doing so he collected insects and, presumably, some souls!

At about the same time, 1859-1862, Robert Kennicott, who was employed by the Smithsonian Institute, collected insects in what was then known as British America and Russian America. While Kirby and Kennicott were in the north-west, A. S. Packard collected insect specimens in Labrador. Here Moravian missionaries had collected insects as early as the beginning of the 18th century; many of their specimens were sent to and identified by such pioneer entomologists as Fabricius and Huebner.

Then followed a concerted drive by the Geological Survey of Canada to find out more about the natural history of northern Canada. We have Robert Bell, J. B. Tyrell, and his brother J. W. Tyrell, to thank for the many insect specimens collected during the years 1884-1893. These collections were made in the many districts of north-western Canada including Fort Chipewyan, Fort Churchill, and Baker Lake. In 1899 D. T. Hanbury made a notable trek across northern Canada from Winnipeg to Great Slave Lake; reversed his route in 1901 and got to Chesterfield from whence, after wintering with the Inuit at Baker lake, he went to Coppermine in 1902 and then back to Edmonton. Insects collected on the way comprised mainly Lepidoptera and added to our meagre information concerning the distribution of butterflies in the sub-arctic.

In 1913-1918 a real effort was made to collect insects; this by the Canadian Arctic Expedition commanded by Vilhjalmur Stefansson. The success of that venture can be judged by the eleven reports compiled by C. Gordon Hewitt, then Dominion Entomologist, and others, all dealing with various orders and species of insects collected by Frits Johannsen.

A few years later, in 1921-1924, some 350 specimens of 71 species in 11 orders were collected in the arctic by the Danish 5th Thule Expedition to Arctic North America. This was the last of the big expeditions into arctic Canada of which entomology was an integral component. Many incursions were made by individuals during the 1920's and 1930's, notably those of J. D. Soper in 1927 to Baffin Island; G. M. Sutton in 1927 to Southampton Island; O. Bryant in 1929-1930 to Aklavik; I. H. Cox in 1931 to Akpatuk Island in the Hudson Strait; J. M. Wordie in 1934 to eastern Baffin Island; A. V. Harper in 1934 to Churchill; W. J. Brown in 1934 to Baffin Island; and T. N. Freeman in 1937 to Great Bear Lake.

The preceding voyages, expeditions, and individual incursions into arctic Canada are by no means the exclusive ones made into the northern unknown. They merely highlight the attempts made by scientifically-inclined people to assuage their curiosity and enlighten their entomological inclinations. Further information and references to early arctic entomology may be found in Hugh Danks' excellent presentation: "Arctic Arthropods."

World War II interposed itself on the world scene and all general activity was funnelled into other channels; there was no room for expansive entomological endeavours. When hostilities in Europe and in the Pacific had ended, tensions still remained high, especially between the two super-powers, the U.S.S.R. and the U.S.A. It became evident that Canada's northern and polar regions could be of vital strategic interest. For the U.S.A. long-range air routes, whether supplying their own forces in Alaska, or giving aid to European Allies, led over Canadian territory. The Alaskan Highway provided a direct umbilical ground link between Alaska and its southern sub-continental parent. United States Army and Air Force installations had sprung up at Edmonton, Churchill, Gander, and many other places; their activities co-ordinated by the respective Defence Departments. All this served to show that Canada was indeed atwart a crossroad of the world.

Rumours and speculations of possible armed conflict between the two great nations led to the establishment of new military bases in Canada's far north. Also, new defence installations such as the Distant Early Warning (DEW) line of radar stations were strung out across the top of Canada. The sub-arctic and the arctic regions had suddenly become a bee-hive of human activity.

Canada's Defence Department established a Defence Research Board in 1947; a scientific department within the ministry to tackle scientific problems. The Board was interested in chemical and biological warfare as evidenced by the establishment of a research facility at Suffield, Alberta. Because one of the foremost biological agents that a soldier would face in the north was the biting fly, the Board immediately set out to learn more about insect life in the Canadian arctic.

A. C. Jones, Secretary of the Board, sought the advice of entomologists in the Canada Department of Agriculture, including the then Dominion Entomologist, H. G. Crawford; the Co-ordinator of Research in the Division of Entomology, R. Glen; and the Head of the Veterinary-Medical Entomology Unit, C. R. Twinn. Several notable academics: A. W. A. Brown, University of Western Ontario; F. P. Ide, University of Toronto; B. Hocking, University of Alberta; A. S. West, Queen's University; and several others, were also consulted. These scientists formed the Entomological Research Panel of the Defence Research Board. They charted the course that entomology would take in northern Canada.

The program of study that was developed by the Panel was the first major organized project of entomological research in northern Canada. The inaugural design of the program in 1947 comprised three phases as follows:

- a) *The Defence Research Northern Laboratory*, directed by W. E. Beckel, whose mandate was to develop successful rearing techniques for northern mosquitoes and to study the behaviour and systematics of certain *Aedes* species.
- b) *The Northern Biting Fly Project*, directed by C. R. Twinn; a program of research comprising studies of the life histories, habits, ecology, and control of biting flies.
- c) *The Northern Insect Survey*, directed by T. N. Freeman; a project that was to investigate the systematics, distribution, relative abundance and ecology of biting flies and other insects.

Permit me to elaborate further on the two latter aspects of this, the first comprehensive research program ever conceived and conducted by entomologists to study arctic insects.

The Northern Biting Fly Project

This was the principal project of the Defence Research Board. Because the United States Department of Defence had made significant contributions to North American defence, and had established military bases and early-warning radar units across the top of Alaska and Canada, its continued involvement in northern insect research was encouraged. Consequently entomological action was planned as a joint Northern Biting Fly Project involving the Canadian Division of Entomology on behalf of the Defence Research Board, and the United States Bureau of Entomology and Plant Quarantine on behalf of the U.S. Army Committee for Insect and Rodent Control, Office of the Surgeon General, United States Army.

The centre of operations was at Churchill, Manitoba. Here both the Canadian and American Defence Departments had military bases, whose facilities were made available to researchers. Personnel were housed in military barracks and some huts were made available and served as laboratories. Military equipment was also at their disposal, such as tracked vehicles (weasels), jeeps, and aircraft. The latter came complete with an operational crew.

For several years all personnel of the Project had to wear military uniforms and were identified by special shoulder flashes. They were given officer status, used officer facilities, and adhered to military rules regarding officers.

The American entomologists from the U.S.D.A. included W. C. McDuffie, H. F. Cross, C. N. Hussman, and J. B. Goldsmith. They participated for two years only, 1947 and 1948; thereafter the Project resumed as a solely Canadian effort. The Canadian entomologists included several specialists: A. W. A. Brown, who gave direction in aircraft application of



Northern biting fly project: combined Can. & U.S. teams at Ft. Churchill in — July 1947. Front row: R. W. Fisher, W. C. McDuffie, C. H. Twinn. Standing: Brian Hocking, J. B. Goldsmith, H. F. Cross, J. T. Sharp and C. Hussman CDA

chemicals for fly control; Brian Hocking, who was interested in blackflies and gave leadership to studies of their biology and the testing of larvicides; F. P. Ide, who supervised studies of weather and climate and the other meteorological factors that affect biting flies; and W. O. Haufe, who investigated the behaviour of biting insects, especially as it related to changing environmental conditions, and then attempted to forecast when their activity would be at a maximum.

Churchill was an ideal site for such investigations because it straddled the boreal and tundra zones where the lakes, bogs, swamp, muskeg, and streams offered ideal breeding grounds for incredible numbers of mosquitoes, blackflies, tabanids, and midges. Protective veils were the order of dress to prevent exsanguination and allergenic misery from the bites of clouds of mosquitoes that were constantly present. Even at midnight it was a relief to have an open fire and a smudge to ward off the stinging furies. Animals as well as man had to be protected, if not with veils and protective raiment, then with chemical protectants.

One of the experimental sites, with its temporary campsite, was located some 10 miles south of Churchill on Warkworth Creek. This was reached by riding a railway handcar or by "weasel". Alex Maltman, an ex-C.N.R. employee, was the camp boss; his wife was the cook. He delighted in telling the tenderfoot students about hotels and casinos located just off the track along a few of the side creeks. Gullible seasonal assistants soon found out that such places were sheer fantasy after they slid, stumbled, and slopped through swamp and muskeg while trying to find these northern "nightclubs", and suffered the relentless attacks of biting flies. At other times Maltman would yell at the students as they were travelling down the railway track on the speeder, to get off the track because the train was coming. To verify this he would point to the smoke in the distance, a sure sign of rail occupancy by a coal-burning steam engine that appeared to be bearing down on them. All hands would quickly remove the hand car from the tracks; they would wait patiently for the train to arrive and pass. Nothing came by. It was then the naive summer help realized that they had been duped; the "smoke" was an illusion of clouds of mosquitoes of such magnitude and density that it resembled actual smoke. Such densities of mosquitoes were commonplace at Churchill; truly an ideal place to study their biology.

Although Churchill was the centre of operations, the work was expanded in 1949 to include R.C.A.F. establishments in the North-West Air Command — whose headquarters were in Whitehorse, Yukon — at Fort St. John, Fort Nelson, Watson Lake, and Whitehorse. The Air Transport Command base at Goose Bay, Labrador, was also included in 1949 as a site of operations and continued to serve as an eastern headquarters until the Project terminated in 1955.



Northern biting fly project personnel: Churchill, 1951. Standing (L-R): Larry Burgess, Alex Maltman, Mrs. Maltman, Neil McLean, Ken Van Skyde, Herb Teskey, Wib Haufe, Bob Dunbar. Seated (L-R): Fred Ide, Brian Hoebing, Gordon Edmunds, Lou Pickering. Missing: Harold Welch, Don Herne.

The Division of Entomology, Canada Department of Agriculture had as many as 13 workers in the field in any one year, while the Defence Research Board employed as many as nine. Most of these workers were students, both undergraduates and post-graduate, available for summer employment only. Later some of them, like D. G. Peterson, W. O. Haufe, L. Burgess, and J. A. Shemanchuk became permanent members of the Division of Entomology. The Defence Research Board paid all expenses incurred by the Canadian group including the salaries of the summer students. Furthermore, grants to the Universities for entomological research in the north totalled more than \$250,000 over a 10-year period.

What had been accomplished? Entomologists had obtained an almost complete picture of the species complex of biting flies, their life histories and bionomics. Population densities were too high to be controlled effectively except in small areas for limited periods of time. Aerial spraying or ground treatments brought relief from mosquitoes for several weeks, from blackflies for a week, and from tabanids for only a few days. One example of good area control may be cited.

A circular area of about 200 square miles around Goose Bay airport was surveyed for blackfly breeding sites. Of the 163 streams and rivers in the area, 77 were treated with DDT from a helicopter (U.S.A.F.), 42 from the ground, seven from boats, and the Hamilton River was treated from a Dakota (C-47) aircraft (R.C.A.F.). It was a most arduous under-taking; more than 400 man hours being used for treatment alone. The work did point up the fact that blackflies could be eliminated for a season from the centre of a large treated area. Infiltration from outside the treated area slowly brought fresh pests; some species could readily migrate two miles. For those who did the work, who stumbled through willow and black spruce swamps, crawled through near-impenetrable alder thickets, or fell, slid, and splashed down rock-strewn gorges, clay banks, and bogs, it may have seemed a waste of time and a threat to life. However, for the armed forces at Goose Bay, the workers and travellers at the International Airport, and the crews of the iron-ore processors, relief from attack from the winged scourge was a most welcome experience.

To live in the arctic and subarctic, man had to rely on physical protective devices such as clothing and repellents. Of the more than 30 chemicals tested, either by direct application to exposed flesh, or by impregnating clothing, the old reliables such as DEET were still the best. The greatest problem to be overcome by many who tried to live in the north was not the physical presence of, and actual contact made by the biting flies. What was hardest to overcome was the psychological effect; the mere sight and sound of flying, biting flies. The presence of a "cloud" of insects and the high-pitched whine of their wing beat, would cause man to stop, to crouch as if in fear, to slap wildly, to squirm, and finally to run in mindless

confusion. The fact that this happened quite frequently indicated that in order to live with the insects man had to control himself, not his adversary. To have learned and documented this aspect of arctic entomology was, perhaps, of greater significance than all others that arose from studies of the Northern Biting Fly Project.

The Northern Insect Survey

As with the biting fly project the Defence Research Board was willing to participate in a survey of Canada's north, just to find out what insects were present. Most of the taxonomic and systematic work up to this time, had been performed by the Systematics Unit of the federal Department of Agriculture headed by J. H. McDunnough. He had retired in 1946 and the Unit leadership was undecided in 1947. The staff: W. J. Brown, T. N. Freeman, A. R. Brooks, O. Peck, G. E. Shewell, and S. Walley, were doing their best to carry on while the "upper management team" of K. W. Neatby and R. Glen went about finding a new Unit Head.

Tom Freeman was an experienced collector of insects; he was also partial to northern latitudes. He was willing to direct the Northern Insect Survey as proposed by the Defence Research Board and the Division of Entomology. To get the feel of it he flew into Churchill with the rest of the biting fly personnel in 1947 and collected in that vicinity for two months. Then final plans were made for the "big push". This joint program of research involved several administrative units: the Defence Research Board financed the Project, the Division of Entomology supplied the manpower, and the Armed Forces took care of transportation and shelter. This well-defined division of responsibility was an administrative jewel in its conception. Alas, as with family planning and motherhood, conception may be stimulating and mutually climactic, but delivery is usually a sobering, perhaps frenzied experience!

Survey parties — usually two men per party — were sent out into areas that were representative of major life zones, viz. the northern coniferous forest, the northern transition zone, and the barren lands or arctic tundra. This encompassed an area stretching from Nome, Alaska, to western Greenland, and north to Alert on Ellesmere Island some 470 miles from the North Pole. In the ensuing 14 years, 1948-1961, seventy-three field parties radiated out from Ottawa to collect insects over this huge territory.

They were young men, students at Canadian Universities. They not only had to be physically capable of withstanding the rigors of climate and the austerity of the terrain, but, hopefully, also capable of bearing the stress of isolation. The latter was of concern to Freeman and on occasion it became a nightmarish reality. However, despite a few harried exits from the north by home-sick youths, no serious accidents or illnesses occurred to mar the success of the program. It was probably due, in part, to the excellent briefings that were given to all collectors, to the painstaking care that Freeman took in compiling a "Manual of Arctic Survival and Useful Eskimo Words", and an "Instructive Guide for Northern Insect Survey Parties", that the program ran so smoothly and well.



T. N. Freeman, Ent. Res. Institute, Ottawa, 29 Dec. 1969.

The Defence Research Board withdrew its funding in 1962. The Entomology Research Institute continued the overall program as its own research endeavour entitled "Studies of Arctic insects". Most of this continued effort was conducted on Ellesmere Island at Camp Hazen on Hazen Lake in the high arctic (81° 49' N. lat., 71° 18' W. long.). Work parties were sent there until 1966; also to Alaska, Axel Heiberg Island, Melville Island, Greenland, Yellowknife, and Bay Chimo. The men involved in the operation were biologists; many remained to foster entomology in Canada, much of it of a systematic nature. Permit me to mention a few: David Hardwick, Dick Vockeroth, Guy Shewell, Bill Mason, Colin Curtiss, Ed LeRoux, Paul Bruggemann, Jack Martin, Antony Downes, Al Downe, Jim Chilcott, George Ball, Bruce Heming, Don Oliver, and 75 others who were just as worthy of mention.

These were the people who found 10,000 species of insects living south of the tree line in the transition and boreal forest life zones. They found only 1000 species in the tundra; still a surprising number in that often hostile land. Equally surprising was the discovery of species that occurred only in the barren lands and not further south. These were the men who logged thousands of hours of work to make known details of insect biologies, life histories, and distribution. This information is available in hundreds of scientific articles, in scholarly reports, and in scientific books. The insect specimens that were collected increased the holdings of the Canadian National Collection by some 100,000 to 150,000 specimens annually. Pinned specimens may near the two million mark at the present time. To the men of the Survey, to those who initiated the work, who planned it, and supervised it, we, as entomologists and Canadians owe a debt of gratitude and thanks for the scientific enlightenment they provided. Furthermore, as a Society and as Canadians we can be doubly proud that we have accomplished a herculean task of collecting and cataloging insects in the most forbidding terrain on earth, that of the Arctic Archipelago; and Canadians did it!

Each of the men who participated in the Survey has his own personal adventures to tell, viz. J. Brian Hartley confining his collecting activities to the west bank of a stream near Naknek, Alaska, so as not to encroach upon, or raise the ire of a big grizzly bear that was fishing on the east bank. Or there is Frank McAlpine frozen in his tracks when nearing the summit of a hill near Hazen Camp because a lone, huge, male muskox barred his way. Then there is Paul Bruggemann witnessing the "pirouetting dance of the arctic hare" when the latter is goaded into action by the blood hungry-mosquitoes seeking a meal from its ears.

Perhaps I can pay tribute to and acknowledge the endeavours, privations, and life's little touches, of all those who participated in the Survey, by adding these words that the "Bard of the Arctic", Robert Service, might understand and appreciate:

A bunch of the boys were whooping it up
 In the malamute Saloon;
 There was Tom, there was Jack, Bill and Antony too,
 They'd been there since yesterday noon.
 Their nets they had stashed, forsaken their tasks,
 They longed for the news from the south;
 Here's the tale they were told, for I know it came straight
 And direct from the "horses mouth".
 There are strange things done in the midnight sun
 Caused by visions of men who are bold;
 The arctic trails have their secret tales
 That makes your blood run cold.
 The Northern Lights have seen queer sights,
 But the strangest they ever did see;
 Was that night on the snow, at forty below,
 When two men met their destiny
 Tom Freeman decreed and George Holland agreed
 That Rampart House was the next site;
 To collect the fleas and the myriad of bees
 From the permafrost frozen up tight,
 The plane they were in had stalled in the thin
 And wintery air on the lake;
 So they trudged the three miles with nary a smile
 Towing scanty supplies in their wake.
 The house that they found was solid and sound
 It was built quite sturdy and sleek;
 They were safe from the cold but their food — I am told,
 Would run out in the course of a week.

"However, a boat from Dawson will float
To bring the supplies that you seek;
So just hang tight in there and do not despair
For a month you'll be "just up the creek".

So Martin and Loan made the house their new home,
Ate wild garlic and fished through the ice;
And the rice that they found in the house, was quite sound
But was liberally sprinkled by mice!
They survived their sojourn, so let us not mourn
Nor lament their ordeal in the north;
There were ninety of them, all brave and young men
Who dared to step out and go forth.

The Insect Survey wasn't done in a day,
But lasted twelve years — even more;
And the insects they found on that permafrost ground
Set a record that's ne'er set before.
Mosquitoes were bold — and so I am told,
They would sap all your blood in a trice;
So commend what was done in the midnight sun,
But it's hell to eat mouse-peppered rice!

(With apologies to, and help from Robert Service)

REPORTS FROM OFFICERS, TRUSTEES AND COMMITTEES

Annual Report of the Secretary for 1985

During the past year I have recorded the minutes of the Executive Council and the Governing Board, prepared agendas for these meetings as required to the Executive, Directors, and Trustees of the Society. I have maintained files of the Society, prepared the ballots for election; notified nominees of the election results and distributed minutes, reports, scholarship forms, and other information as requested; prepared notices of meetings and of Society affairs for the Bulletin; provided liaison between committees of the Society and the Governing Board and between the Society and Affiliate Societies. Much of the time spent on Society business involved taking care of correspondence and day-to-day affairs of the Society.

I would like to thank the Executive Council, Trustees, and Directors for their help and advice during the past year. I am particularly grateful to Dr. Glenn Wylie, Past-Secretary of the Society, for his assistance and advice while I took over my present duties.

J. A. Shemanchuk

Report of the Finance Committee for 1985

Members of the Finance Committee (FC) are: D. Barnes, E. C. Becker, V. M. Behan-Pelletier, H. V. Danks, J. R. McLean, A. C. Schmidt, H. J. Teskey.

The Committee met in Ottawa on February 21 and August 29, 1985. The following recommendations were presented to the Executive and Governing Board.

1. The FC recommended that someone with computer expertise should be hired part-time to help initiate the Society's microcomputer system and assist the Society's Administrative Assistant.
2. The FC recommended that support to Regional Societies for Annual meetings should be raised to \$4,000 (\$1,500 for improvement of the scientific programme, \$2,500 as general "seed money"), but that any funds surplus subsequent to the meeting be donated to the ESC Scholarship Fund.
3. The FC recommended that unaccountable expenses of Trustees should remain at the same level.
4. The FC recommended that a proposal, received by the Society, to publish the Canadian Entomologist commercially should be rejected, since it would, in particular, greatly increase membership and subscription charges.
5. The FC recommended against a reduction in page charges for the Canadian Entomologist, as any significant reduction would require a significant increase in membership and/or subscription charges.
6. The FC suggested that the Publications Committee might try to generate Society revenue by increasing paid advertising in the Bulletin.
7. The FC recommended that payment of membership fees for a given year should be required by January 1st of that year (not April 1st as currently set out in the by-laws), and that a \$5.00 surcharge should be applied to late payments.
8. The budget for 1986 (reviewed by the FC and recommended to the board) shows a deficit. This is due in part to a significant decrease in revenue from memberships and subscriptions. The FC recommended that this situation of declining enrollment should be carefully monitored.
9. The FC recommended that the chairmen of ESC Committees be urged to identify any funds required by their Committees and request them in advance of budget preparation.
10. The FC again recommended that action be taken to reduce the expenses of the ESC Governing Board, which are disproportionately high.

H. V. Danks

Report of the "Editor" for 1985

Steve Smith resigned as editor effective 31 July 1985. Since the middle of July or so, Barbara Patterson, our managing editor, and I have been trying to keep the ball rolling. Nineteen new manuscripts were received and sent to the appropriate associate editors. Also about 25 "old" manuscripts were processed; some were from the associate editors or Steve Smith (all of these had been refereed) and some were revised manuscripts from authors. I decided whether to accept the manuscripts, return them for major revision, or whether they were unacceptable. In one or two cases I returned them to the original referees for a second opinion. As of 18 September, all manuscripts received by Barbara have been dealt with in one way or another.

I especially appreciate the cooperation of the referees and the associate editors during this period; also Steve has been very co-operative. The rejection rate is about 20% (based on the first 77 manuscripts received this year, up to 10 May and before Steve resigned); 14 were rejected.

The *Canadian Entomologist* will contain between 1500 and 1600 pages in 1985, down a bit from that of 1984. The decrease in pages was not unexpected as we had a new managing editor. Two Memoirs were published (Holland's on fleas, 631 pp, and Smetana's on water beetles, 154 pp); there will be at least another one about the size of Smetana's and possibly a slightly smaller one published before the end of the year.

Barbara is catching on to the entomological lingo (she hopes she doesn't have to pronounce some of these words!!). Sufficient manuscripts are on hand for the rest of this year.

Edward C. Becker
Treasurer

Publications Committee Report for 1985

Membership of the Publications Committee during 1984/85 consisted of: C. D. Dondale, T. D. Galloway, G. C. D. Griffiths, D. Lafontaine, M. Mackauer (Chairman), A. Maire, and A. Thomson.

Changes in editorial positions

Ms. Barbara Patterson was appointed in December 1984 as the new Managing Editor of *The Canadian Entomologist*. She replaced Ms. Margaret McBride, who retired after 17 years of supervising the publication of the Society's journals and memoirs.

The Scientific Editor of *The Canadian Entomologist*, Dr. S. M. Smith, and the Assistant Scientific Editor, Dr. R. G. H. Downer, submitted their resignations in April 1985. The President has established a Search Committee (D. A. Craig, Chairman) which is responsible for identifying suitable candidates for the editorship.

Dr. R. D. McMullen's term as an Associate Editor ended on 15 October 1984. Dr. R. A. Fleming was appointed as a new Associate Editor in November 1984, with special responsibility for forest entomology.

Waivers of page charges

Three applications for a waiver of page charges were received, of which one request was granted (partial waiver for 33% of charges).

Book Reviews

A total of 17 book reviews and/or notices were published in the March and the June issues of vol. 17 (1985) of the *Bulletin*. Five reviews are currently in press and 14 are outstanding.

Policy development

A request for potential book reviewers was published in the *Bulletin* (vol. 17/2). The information obtained will be used to set up a data base listing the names and areas of expertise of available reviewers.

A new procedure for the consideration of applications for a waiver of page charges has been adopted on a trial basis. Requests will be considered after, rather than before, a manuscript has been reviewed and recommended for publication.

The Committee considered some changes of the Instructions to Authors, which had been proposed by the Scientific Editor. After consultations with a broad segment of the ESC membership, the Editor was requested not to implement the new Instructions until further review.

The Committee Chairman submitted an interim report on page charges at the mid-term meeting of the Executive Council, in April 1985. Page charges for *The Canadian Entomologist* are higher, in absolute terms as well as on a per-word basis, than those of comparable North American journals. Wherever possible, production costs should be trimmed. However, a reduction of page charges below current levels was not considered feasible at this time by the Finance Committee.

No action was taken on a request by the Board that the Committee develop guidelines for the use of the C. P. Alexander Fund. This issue, as well as others requiring editorial input, will be considered after the appointment of a new Scientific Editor.

M. Mackauer

Report of the Bulletin Editor for 1985

Since the Annual Meeting in St. Andrews last year, four issues of the Bulletin have been produced. In February, editorial duties were temporarily transferred from H. J. Liu to B. K. Mitchell, who was responsible for the June and September issues. The Bulletin carried the usual items relating to business and news of the Society. In addition, several members contributed guest editorials, articles, book reviews, letters, and notes for the personalia section. These contributions are appreciated and certainly increase the value of the Bulletin.

The transition of duties in mid-year went very smoothly; all concerned being most helpful. The Bulletin was particularly strong in book reviews this year. An additional article could have been used in each number. Members are encouraged to continue to use the Bulletin as an organ of communication.

B. K. Mitchell
Assistant Editor

Science Policy Committee Report for 1985

The Science Policy Committee held its annual meeting at the Embassy West Motor Hotel, Ottawa on April 22, 1985. Current projects were reviewed and contacts with government and other agencies were discussed. In addition, possible new initiatives were considered.

Prior to the meeting, we had contacted the Minister of the Environment relative to budget cuts, specifically the program of monitoring the effect of spruce budworm spray programs on wildlife. Some of the programs were subsequently restored. The government cuts in other programs, toxicology and student grants were also considered, but it did not seem productive to protest these cuts in the present policy of government restraints.

A copy of our Science Policy Meeting Minutes was sent to Dr. Terauds of A.I.C., there has been no response.

The Microbial Control Committee, chaired by O. N. Morris, has completed its report. We had hoped it would be published by the time of the Ottawa Annual Meeting, but editorial problems have delayed the report and the Committee has scheduled a meeting at our Annual Meeting to resolve the difficulties. A mailing list of those who should receive the report has been prepared.

Dr. Laing submitted a report to the Committee suggesting two solutions for the Biological Control Study. One, that Agriculture Canada establish a study group under the Integrated Pest Management Project and two, that the E.S.C. establish its own study group. The first approach was presented to an Agriculture Canada Pest Management workshop in early May by Dr. Bob Jaques. There was no response and a follow-up letter was sent to Dr. Trottier, Protection Coordinator, asking him to consider such a study group. There has been no response to this letter and it seems the ball is back in our laps.

Reports were received from Society representatives to B.C.C. (S. B. McIver) and A.A.S.C. (S. B. Hill).

Progress was made on a number of items in our Dossier of Neglected Areas of Entomological Research in Canada. Cold-hardiness in northern insects, taxonomy of larval insects, insect fauna of sphagnum bogs and the role of terrestrial arthropods in decomposition of plant litter have been accepted by the Biological Survey and can be removed from the dossier. The author of insect transmission of diseases and insect resistance was contacted for clarification of his proposals. His response will be of assistance to the 1986 Science Policy Committee in dealing with these items.

In our Dossier of Important Entomological Subjects in Need of Study in Canada, both Microbial control and Biological control have been discussed above. A letter was sent to Dr. J. E. McGowan, Assistant Deputy Minister, Food Production and Inspection Branch of Agriculture Canada relative to the Revision of the Pest Control Products Act to include microbials, pheromones and other nonchemical control methods. Dr. McGowan's reply indicates that revisions are underway and proceeding as rapidly as possible. The Committee suggests that no action be taken on this item but it be left on the books until the Act is revised. A letter was sent to the author of Accidentally Introduced Insects for clarification. His reply will assist the 1986 Science Policy Committee to deal with this subject. One new submission, Biotechnological Techniques was received.

Respectfully submitted

N. Angerilli

G. G. E. Scudder

O. N. Morris

P. J. Albert

G. Pritchard

H. F. Madsen, Chairperson

Scientific Committee of the Biological Survey of Canada (Terrestrial Arthropods): Report for 1985

1. Meetings were held in Ottawa on October 25-26, 1984 and April 25-26, 1985. S. A. Marshall joined the membership and J. A. Downes was added as a Founding Member of the Committee.
2. The Committee produced a document on the Expansion of the Biological Survey, and this was delivered to the Director of the National Museum of Natural Sciences.
3. The manuscript of a key to the families of Myriapoda of Canada was completed and sent out for external review. An Ecological Review of Insect Dormancy is nearly complete.
4. The Committee reviewed the problem of Survey publications and
 - (i) established an Editorial Subcommittee to consider appropriate rules and screening of manuscripts;
 - (ii) authorized the Scientific Committee's Publications Subcommittee to investigate and agree upon the method of publication; and
 - (iii) authorized the Publications Subcommittee to seek funds.
5. Publicity for Arctic Arthropods was discussed. Listing by Classey was suggested.
6. A paper on Environmental Impact Assessment was prepared.
7. Long term study of climate change was considered, and deemed to be a subject worthy of reference to a wider biological community; contact through BCC was suggested.
8. An Annual Report was delivered to the National Museum of Natural Sciences.
9. Additional copies of newsletters were published.
10. The Committee undertook a symposium at the Canadian Congress of Biology. This covered the aims, activities and achievements of the Survey.

G. G. E. Scudder

Report of the Fellowships Selection Committee for 1985

The following 5 individuals were recommended unanimously to be Fellows.

D. L. Wood
S. C. Jay
V. R. Vickery
J. V. Mathews, Jr.
H. R. Howden

J. A. Downes

Report of the Scholarship Committee for 1985

Nine applications for scholarships were received, one of which was disqualified because of tardiness. Committee members were impressed with the quality of the applicants and found the decisions difficult. The winners were Louis Provencher, Université du Québec à Montréal, supervisor — David Coderre; and Rosemarie De Clerck, University of Saskatchewan, supervisor — Taylor A. Steeves.

The value of the scholarships was raised from \$1000.00 to \$2000.00 each because of the support provided by members and the high return of investments. Interest from investments in 1984 was \$4,544 and from donations was \$2,076. The latter was a drop from \$4,211 in 1983. The balance in the Fund is now at \$45,022.

A new address list was obtained of chairmen of Biology or related Departments, which provides a much better distribution of notices. Also, a request was sent to all Deans of Graduate Schools to have the scholarship announcement included in their next calendar.

R. F. Shepherd

Report of the Heritage Committee for 1985

The following articles were assembled and submitted to the Public Archives of Canada for inclusion in the collective holdings of the Entomological Society of Canada:

1. Program, 10th Internat. Congr. Ent., Montreal, 1956.
2. Scientific Program, 10th Internat. Congr. Ent., Montreal, 1956.
3. Program, 11th Internat. Congr. Ent., Vienna, 1960.
4. Program, E.S.C. Ann. Meeting, Halifax, 1974.
5. Program, E.S.C. Ann. Meeting, Saskatoon, 1975.
6. Program, E.S.C. Ann. Meeting, St. Andrews, 1984.
7. Entomologists of Saskatchewan, booklet, 1983.
8. Abstracts of Papers, E.S.C. Ann. Meeting, Banff, 1981.
9. Insects on the Canadian Great Plains, reprint, Prairie Forum 9:327, 1984.
10. Prelim. Announcement, E.S.C. Ann. Meeting, Ottawa, 1985.
11. Prelim. Announcement, E.S.C. Ann. Meeting, St. Andrews, 1984.
12. Gold Medal Winner Brochure, K. G. Davey, 1984.
13. Dinner Menu, Ann. Meeting, St. Andrews, 1984.
14. Prelim. Announcement, C.C.B., London, Ont., 1985.

Early in 1985 logos of all seven regional Entomological Societies were procured and assembled, along with the E.S.C. logo, as a composite logo to enhance an E.S.C. Brochure. Four pages of information, relative to E.S.C. activities, were provided to A.D. Tomlin who then completed the brochure in time for distribution at the B.C.C. Congress, London, Ontario, June 23-29, 1985.

All articles and documents of incorporation of the E.S.C., for purposes of hosting the 10th Internat. Congr. of Entomology in Montreal, have been assembled and are ready for submission to the Archives.

All Minutes and relevant documents pertaining to the meetings of the E.S.C. for the years 1951 to 1970, have been assembled, sorted, and are ready for submission to the Archives.

Work is continuing on the sorting, and culling of similar documents that detail the activities of the E.S.C. for the years 1971 to 1978. All other documentation of the business of the E.S.C. will be retained by the Archives Committee and will be submitted to the Public Archives of Canada only after an elapsed period of seven years. Thus, the 1979 material will not be submitted until 1986.

P. W. Riegert

Report of the Nominating Committee for 1985

The Nominating Committee invited the individuals whose names appear below to stand for election in 1985, for the positions noted. In turn, these individuals have agreed to serve, and have so indicated in writing. A copy of this slate was sent to the Editor of the Bulletin on January 25, 1985, for publication in the March issue as notice to the members.

SLATE OF CANDIDATES

Second Vice-President:

Dr. K. G. Davey
Dr. S. B. Hill

Director-at-Large:

Dr. R. H. Gooding
Dr. L. S. Thompson
Dr. H. D. G. White

Fellowship Selection Committee:

Dr. D. C. Eidt
Dr. A. R. Forbes
Dr. D. G. Harcourt

Submitted by:
W. G. Evans
I. W. Varty
Ray F. Morris, Chairman

Report of the Elections Committee for 1985

The elections committee consisted of David Gibo, Ronald Aiken (sitting in for Mike Barrett) and myself. We met August 6, 1985 at Erindale College, Mississauga. This date was beyond the 3 days from completion of balloting specified in the committee guidelines; the delay was due to the committee chairman's absence in the field; I regret any inconvenience it may have caused.

We examined all ballots received up to and including July 15. Two ballots were judged spoiled.

Total ballots cast 382

Second Vice President: E. C. Becker

Directors-at-large: L. S. Thompson and R. H. Gooding

Fellowship Selection Committee: D. C. Eidt and D. G. Harcourt

The Elections Committee formally submits the above results and attests to their accuracy.

Glenn K. Morris

Report of the Employment Committee for 1985

The Employment Committee recommended in its 1984 Annual Report that preparations for publication of the 1985 edition of the Resumé Booklet include a survey of the recipients of the booklet. It was hoped that a survey would provide some measure of the effectiveness of the booklet, and that the results would encourage graduate student participation. Questionnaires were sent to 150 employers of entomologists asking if any of the participants in the resumé booklet had been hired or considered for an entomological position. Seventy-two questionnaires (48%) were returned. The results of the survey were included with requests for resumé sent to all student members of the Entomological Society of Canada. Approximately 150 students were contacted and 36 submitted resumé.

Responses from employers of entomologists indicated that participants in the booklet had been considered for an entomological position by 38 of the 72 responders, and that 6 positions were filled as a direct result of the availability of the resumé booklet. Four positions were filled within Agriculture Canada, and the remaining two from within Forest Pest Management. In addition, responders provided a wealth of valuable comments about the booklet. Government scientists praised the resumé booklet and the effort made by the Society in the area of employment. Agriculture Canada scientists were especially needy of the booklet because of an unawareness of all possible candidates for a position, which some believed was due to their isolation from the University mainstream of communication. The booklet was also used as a tool for counselling graduate students on the qualifications of others who might later compete with them.

Industry was much more critical of the booklet. Apparently, Ph.D.'s are overqualified for the majority of positions they have available, and M.Sc.'s have often turned down positions which they have been offered — usually quoting salary inadequacies. B.Sc.'s are the most important group in the industry, but few participate in the booklet, probably because most are not yet members of the Society and are therefore unaware of this avenue for employment. Also, B.Sc.'s were found to be difficult to contact in the months following their graduation. Apparently this group is highly transient.

Universities indicated that they do not require the booklet, since their professors maintain close contact with their equivalents in other institutions, and are usually aware of graduate students nearing completion of their degrees at the time a position becomes available.

It was assumed that the 78 recipients of the survey who failed to return the questionnaire were improperly targeted as potential employers of entomologists. Also, eight of those returning the questionnaire indicated that they did not have positions for entomologists.

In view of the survey results above, and the low student participation in the booklet again this year, the Employment Committee decided not to publish and distribute a 1985 edition of the Resumé Booklet. Instead letters were sent to past recipients of the booklet indicating that an Employment Committee booth would be set up at the next annual meeting and student resumé would be available.

The Employment Committee recommends that publication of the resumé booklet be discontinued. Instead, the committee could maintain a file of student resumé available upon request. The committee could also solicit lists of undergraduates, or undergraduate booklets currently produced by several Agriculture and Biology Departments of Canadian Universities. These, in turn, could be provided to industry.

R. W. Currie
S. M. Smith
B. D. Prystupa (Chairman)

Report of the Insect Losses Committee for 1985

The contract for the study on "The Economics of Insect Control in Wheat, Canola and Corn in Canada" was signed in November 1984. The Study Team (Culice and Stemeroff Co., Guelph, Ontario) started the study on 1 December 1984. The Study Team and Scientific Committee met in Winnipeg, Manitoba, on 29-30 January 1985 to draft the terms of reference to determine the role of the Scientific Committee and Study Team, and to develop plans for collecting, analyzing and preparing data for publication. The Study Team and Scientific

Committee will meet again on 22 September 1985 (Skyline Hotel, Ottawa) to review progress and to make plans for completion (completion date, 30 June 1986). The study seems to be on schedule.

The Governing Board should consider how the final report should be handled after it has been accepted by Agriculture Canada. To whom should the report be sent to insure widest circulation? Should the report be the basis for a Special Interest Group at the 1986 Annual Meeting of the E.S.C.?

George H. Gerber

Report of the Organizing Committee for the XVIII International Congress of Entomology

The Committee met at the University of Western Ontario, London on June 24, 1985 and will hold a further meeting during the Annual ESC meeting in Ottawa.

The Committee discussed the Section Organization for the Congress. A series of 14 Sections have been tentatively identified. These will be discussed in the light of suggestions being made by the members of the Committee of the International Congresses of Entomology.

It has been decided that there will be a limited number (about 3) major Congress Symposia. Probable topics are "Biotechnology", "Neurobiology" and "Insect Speciation". Other Congress Symposia will be organized within Sections.

All sections will have a Canadian and a non-Canadian co-convenor. Poster papers will be encouraged.

Plenary speakers, a fund raising committee, insurance and a preliminary budget were discussed. A final decision has not yet been made on a Congress Logo.

Air Canada and CP Air will be appointed as joint Official Carriers. Venue West will be contracted for Congress organization.

The BSC and ESC will be asked to consider an abstract of "Canada and its Insect Fauna" for distribution to registrants. The schedule for the Congress announcements and brochure distribution will be discussed in September.

G. G. E. Scudder, Chairman
Organizing Committee,
XVIII Congress

ARTICLE

No Room on The Prairies P. W. Riegert

Department of Biology
University of Regina

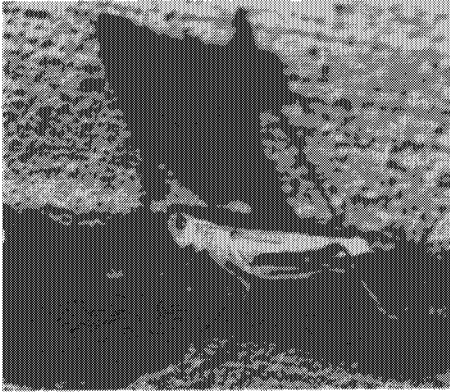


Figure 1



Figure 2

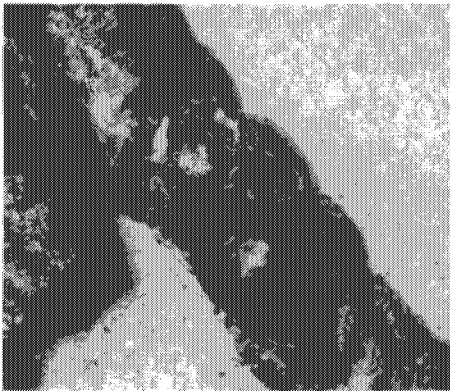


Figure 3

In 1985 the prairies of western Canada experienced one of the largest infestations of grasshoppers ever recorded. Population numbers ran high; invasion of urban centres became commonplace. Streets, paved parking lots and sidewalks were dotted with thousands of hopping and flying insects, all vying for breathing and living space with their human counterparts. For many female grasshoppers, each laden with a full complement of eggs, finding a suitable place in which to oviposit, presented quite a problem.

One enterprising female two-striped grasshopper (*Melanoplus bivittatus* Say), stranded on the concrete podium at the University of Regina, found a novel oviposition site. I found her busily engaged in "digging" a hole into a plastic tar-like expansion joint between two concrete slabs. An hours' work left her abdomen deeply embedded in the semi-solid mastic (Figure 1). Rhythmic pulsations of her abdomen indicated that oviposition was in progress. After a further 20 minutes, all became quiet and still.

Suddenly, as if she only then became aware of my presence, she started kicking and struggling. Alas, she was stuck tight in the hole she had made in the tar-like compound. I grasped her by the thorax and slowly pulled her upward. Her abdomen had indeed been glued to the sides of the tunnel, but now she was free though darkly stained with traces of tar adhering to her body (Figure 2).

I enlarged the top of the oviposition tunnel and peered downward. There at the bottom of the hole, about an inch from the surface, lay a heap of eggs (Figure 3). I estimated about a dozen had been laid. Carefully I closed the top of the hole leaving the eggs to rest where they had been laid. In spring I will investigate to find out how well these eggs survived the winter, hidden in a tomb of plastic tar.

If none of the eggs survive, perhaps it will indicate that here is a mechanism for urban grasshopper control, i.e. provide "goopy" expansion joints and tar-like mastic sheets that are attractive to ovipositing females. Perhaps such sites, perfumed with relevant grasshopper pheromones, may be of added benefit.

COMMITTEES OF THE ENTOMOLOGICAL SOCIETY OF CANADA

Proposed Members for 1985-86

Nominating

S. B. McIver (Chairperson)	(519) 824-4120	Guelph
W. G. Friend		Toronto
A. D. Tomlin		London

Elections

G. K. Morris (Chairperson)	(416) 828-5306	Mississauga
F. M. Barrett		Toronto
D. Gibo		Mississauga

Fellowship

J. H. Borden (Chairperson)	1986	Burnaby
W. G. Friend	1986	Toronto
S. R. Loschiavo	1987	Winnipeg
R. W. Stark	1987	Portland
D. G. Harcourt	1988	Ottawa
D. C. Eldt	1988	Fredericton

Achievement Awards

E. C. Becker (Chairperson)	Ottawa
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Annual Meeting

1986

N. Holliday (Chairperson)	Winnipeg
G. Gerber (Co-Chairperson — Program)	Winnipeg
J. Conroy (Co-Chairperson — Local Arrangements)	Winnipeg
J. Conroy (Regional Director — E. S. Manitoba)	Winnipeg

1987

N. Angerilli (Chairperson)	Summerland
R. D. McMullen (Co-Chairperson — Program)	Summerland
J. Cossentine (Co-Chairperson — Local Arrangements)	Summerland
R. A. Cannings (Regional Director — E.S. British Columbia)	Victoria

By-Laws, Rules and Regulations

G. Wylie (Chairperson)	Winnipeg
G. K. Bracken	Winnipeg
M. M. Galloway	Winnipeg

Employment

H. McAusland (Co-Chairperson)	Guelph
A. Luciani (Co-Chairperson)	Guelph

Finance

H. V. Danks (Chairperson)	1986	(613) 998-9262	Ottawa
D. Barnes	1986		Toronto
A. C. Schmidt	1986		Ottawa
H. J. Teskey	1986		Ottawa
V. Behan-Pelletier	1987		Ottawa
R. A. Cannings	1988		Victoria

Heritage

P. W. Riegert (Chairperson)	(306) 584-4224	Regina
A. M. Harper		Lethbridge
W. W. Judd		London

Insect Common Names and Cultures

E. M. Belton (Chairperson)	(604) 420-3181	Burnaby
A. G. Robinson (E. S. Manitoba)		Winnipeg
J. S. Kelleher		Ottawa
G. Gibson		Ottawa
G. B. Neill (E.S. Sask.)		Indian Head
J. Spence (E.S. Alta.)		Edmonton
P. D. Syme (E.S.O.)		Sault Ste. Marie
L. S. Thompson (Acad. E.S.)		Charlottetown
P. Benoit (E.S. Que.)		Quebec

Membership

R. G. H. Downer (Chairperson)	(519) 885-1211	Waterloo
R. E. Roughley (E.S. Man.)		Winnipeg
H. Wong (E.S. Alta.)		Edmonton
P. G. Mason (E.S. Sask.)		Saskatoon
J. Hollett (Acad. E.S.)		Truro
B. Roitberg (E.S. B.C.)		Vancouver
G. Knoshita (E.S.O.)		Toronto
pending (E.S. Que.)		

Public Education

G. Pritchard (Chairperson)	(403) 284-5261	Calgary
J. D. Shorthouse		Sudbury
D. F. Hilton		Lennoxville
J. Conroy (E.S. Man.)		Winnipeg
R. Cannings (E.S. B.C.)		Victoria
J. S. Kelleher (E.S.O.)		Ottawa
P. W. Riegert (E.S. Sask.)		Regina
D. L. Larson (Acad. E.S.)		Orono
P. P. Harper (E.S. Que.)		Montreal
D. A. Craig (E.S. Alta.)		Edmonton

Publications

M. Mackauer (Chairperson)	1987	(604) 291-4808	Burnaby
D. LaFontaine	1987		Ottawa
A. Thomson	1987		Victoria
A. Maire	1987		Trois Rivieres
G.C.D. Griffiths	1987		Edmonton
W. J. Turnock	1988		Winnipeg
D. R. Oliver	1988		Ottawa

Scholarships

R. F. Shepherd (Chairperson)	1987	(604) 388-3811	Victoria
S. C. Jay (E.S. Man.)			Winnipeg
L. Safranyik (E.S. B.C.)			Victoria
W. Charnetski (E.S. Alta.)			Lethbridge
L. Dyer (Acad. E.S.)			Fredericton
R. Elliott (E.S. Sask.)			Saskatoon
J. E. Laing (E.S.O.)			Guelph
pending (E.S. Que.)			

Science Policy

G. G. E. Scudder (Chairperson)	(604) 228-3168	Vancouver
P. J. Albert (BCC)		Montreal
S. B. Hill (AASC)		Ste. Anne de Bellevue
O. N. Morris		Winnipeg
N. P. D. Angerilli		Summerland
H. F. Madsen		Summerland
G. Pritchard (Public Education)		Calgary

Biological Council of Canada

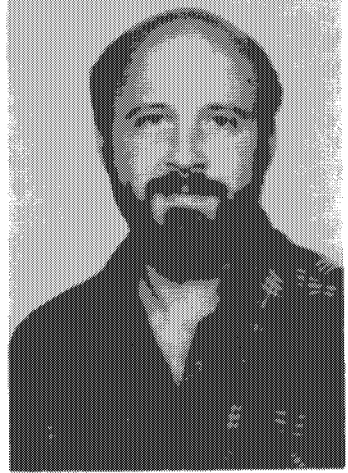
R. G. H. Downer	(519) 885-1211	Waterloo
P. J. Albert	(514) 879-5995	Montreal

*International Association on Water Pollution
Research and Control (CNC/IAWPRC)*

E. Scherer	(204) 949-5004/5	Winnipeg
AASC		
S. B. Hill	(514) 457-2000	Ste. Anne de Bellevue
COPSE		
H. V. Danks	(613) 998-9262	Ottawa
<i>Insect Losses — Phase 2</i>		
G. H. Gerber (Chairperson)	(204) 269-2100	Winnipeg
C. R. Ellis		Guelph
J. F. Doane		Saskatoon
E. C. Becker		Ottawa
<i>Study Team</i>		
M. Stemeroff		Guelph
D. J. Madder		Guelph
<i>Microbial Insecticides</i>		
O. N. Morris (Chairperson)	(204) 269-2100	Winnipeg
J. C. Cunningham		Saulte Ste. Marie
R. P. Jaques		Harrow
J. Finney		St. Johns
G. Kinoshita		Willowdale
<i>Biological Survey of Canada (Terrestrial Arthropods)</i>		
<i>Scientific Committee</i>		
G. G. E. Scudder (Chairperson)	(604) 228-3168	Vancouver
G. W. Argus (NMNS)		Ottawa
G. E. Ball		Edmonton
V. M. Behan-Pelletier		Ottawa
J. M. Campbell		Ottawa
R. A. Cannings		Victoria
K. G. Davey		Downsview
J. A. Downes		Ottawa
A. R. Emery (Director NMNS) or delegate		Ottawa
P. P. Harper		Montreal
D. K. McE. Kevan		Ste. Anne de Bellevue
D. J. Larson		St. Johns
D. M. Lehmkuhl		Saskatoon
J. V. Mathews		Ottawa
H. F. Madsen (President ESC)		Summerland
R. F. Morris		St. John's West
G. A. Mulligan (Director BRI) or delegate		Ottawa
D. M. Rosenberg		Winnipeg
I. M. Smith		Ottawa
G. B. Wiggins		Toronto
D. D. Williams		West Hill
<i>Secretariat</i>		
H. V. Danks	(613) 998-9262	Ottawa

PERSONALIA

Each year the five regional branches of the Entomological Society of America selects a graduate student for the John H. Comstock Award in recognition of their overall outstanding performance. The Eastern Branch recipient of the 1985 award is *Ken A. Pivnick*, a Ph.D. student at L'Université Laval. He received his B.Sc. (Hon.) degree in Zoology at the University of British Columbia in 1978 and is presently finishing his Ph.D. under the direction of Dr. Jeremy McNeil. His doctoral research is on reproductive strategies of the European skipper, *Thymelicus lineola* (Ochs.), and how they are influenced by weather conditions, which includes an investigation of sexual differences in thermoregulation and foraging patterns. During his graduate studies Ken was awarded post-graduate scholarships by the National Science and Engineering Research Council of Canada and the Quebec Fonds FCAC. He has accepted a Research Associate position at the National Research Council Plant Biotechnology Institute at Saskatoon for November, 1985.



THANKS FROM CORNELL

The Department of Entomology at Cornell University recently moved into a new six-story building which houses the faculty that were in Comstock and Caldwell Halls. Prior to the move we made every effort to transfer the Comstock name from our old building to our new facility. At first, this effort did not appear to be successful, and the department appealed to nationally and internationally recognized scientists to reinforce the logic of our request. I am pleased to say that the scientific community was generous in taking the time to write to support us. All of the letters pointed to the unique association between entomology, Cornell University, and the Comstocks. It is now my pleasure to announce that our efforts have been successful. Cornell's Board of Trustees agreed to name the new building in honor of John H. and Anna B. Comstock.

I am writing a letter of thanks to each one that was kind enough to send me a copy of his/her letter to the Cornell administration. If I have inadvertently missed anyone who wrote, please accept the department's gratitude for your help.

Maurice J. Tauber
Professor & Chairman
Department of Entomology
Comstock Hall
Cornell University

INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE

Reference: ITZN 11/5 A.N.(S.) 135

The Commission hereby gives six months notice of the possible use of its plenary powers in the following cases, published in the *Bulletin of Zoological Nomenclature*, volume 42, part 3 on 30 September 1985, and would welcome comments and advice on them from interested zoologists.

Correspondence should be addressed to the Executive Secretary if possible within six months of the date of publication of this notice.

Case No

- 2464 *Berytus* Fabricius, 1803 (Insecta, Heteroptera, Berytidae): proposed designation of a type species.
2490 *Thylacites* Germar, 1817; *Brachyderes* Schönherr, 1823; *Cycloderes* Sahlberg, 1823; and *Cycloderes* Schönherr, 1823 (Insecta, Coleoptera): proposal to maintain current usage.

Reference: ITZN 59

The following Opinions have been published by the International Commission on Zoological Nomenclature in the *Bulletin of Zoological Nomenclature*, volume 42, part 3 on 30 September 1985:

Opinion No

- 1331 (p. 230) SPHAERIIDAE Jeffreys, 1862 (1820) (Mollusca, Bivalvia) and MICROSPORIDAE Reichardt, 1976 (Insecta, Coleoptera): placed on the Official List.
1335 (p. 241) *Nepa cinerea* Linnaeus, 1758 (Insecta, Heteroptera): conserved.
1338 (p. 251) *Thrips rufus* Haliday, 1836 (Insecta, Thysanoptera): conserved for the type species of *Aptinothrips* Haliday, 1836.
1339 (p. 255) *Papilio fatima* Fabricius, 1793 (Insecta, Lepidoptera): ruled to be exempt from the application of the Principle of Homonymy.
1341 (p. 261) *Simulium amazonicum* Goeldi, 1905 (Insecta, Diptera): neotype designated.
1342 (p. 264) *Damalis planiceps* Fabricius, 1805 designated as type species of *Damalis* Fabricius, 1805 (Insecta, Diptera).

PUBLICATIONS

Book Reviews

Hummel, H. E., and T. A. Miller (Editors) 1984: *Techniques in Pheromone Research*. Springer Verlag, New York, XIV + 464 pp., (no price given). (Springer Series in Experimental Entomology.)

In the last five years or so, several fine reviews of semiochemical research have been published. It would seem that yet another book in this field would necessarily overlap in content with its predecessors to the point where the cost of acquiring it would exceed the benefits of owning a copy. However, as the title promises, *Techniques in Pheromone Research* addresses the methods by which the results of successful research in the semiochemical field have been obtained, rather than the results as such. For this reason alone, this book is a must for anyone interested in insect chemical ecology.

Generally, the book is a high quality publication. The editors have done an excellent job, and I could not detect any annoying printing errors in the text. The print is of high quality and easy to read, and the figures are well prepared. The coverage and range of topics in the book are excellent as well.

In many respects the book is unique. Much of the information is of a nature that one would not be able to pick up by reading the references alone. For example, Baker and Linn's "First Law of Wind Tunnels" would hardly appear in a publication. Similarly, Roelof's description of how to set up a simple but functional electroantennogram (EAG) apparatus, with all its advantages and limitations, would require personal communication in the absence of this book.

The book is also unique in that it would be equally useful to students and accomplished scientists. For example, there are three chapters on EAG use, ranging from the most basic to the most technologically advanced. Similarly, the range in disciplines covers everything from collecting, analyzing and identifying pheromones to an overview of semiochemical applications in the "real world", reflecting the chemistry-biology team work that has provided the most significant results in the field.

There are a few minor shortcomings in the book. The organization of the chapters could be better. The first chapter, by Hecker and Butenandt, is appropriate enough, giving a detailed historical account of the tremendous effort that led to the first discovery of a pheromone, that of the silkworm moth, *Bombyx mori*. The subsequent chapters lead you from bioassay techniques in the laboratory and in the field to EAG techniques, back to behavioral assays, to a series of chemically oriented chapters, and again appropriately ended by a survey of pheromone applications. It would seem that the chapters could have been arranged more logically.

The book is heavily biased toward work on Lepidoptera covering other orders rather superficially. A more serious deficiency in my mind is the lack of reference to statistical treatment of data collected by the techniques described. Only Cardé and Elkinton's chapter on field trapping makes any reference to the exact procedures used for data interpretation.

Nevertheless, in the overall assessment, *Techniques in Pheromone Research* has to rank as one of the most significant publications in the field of semiochemicals to date. The product, in this case, is well worth its price.

B. Staffan Lindgren
Phero Tech Inc.
Vancouver, B.C.

Allen, G., and A. Rada (editors). *The Role of Biological Control in Pest Management*. Proceedings of the International Symposium, International Organization for Biological Control, Western Hemisphere Regional Section, 16-20 November 1981, Santiago, Chile. University of Ottawa Press, Ottawa, Ontario 1984. x+ 173 pp., soft cover, Price: Can. \$15.00.

This book contains 25 articles presented at an International Symposium on Biological Control in Agriculture that was held in 1981 on the occasion of the inauguration of the Aguila Sur Experimental Station, in Chile. The articles represent an eclectic mixture of reports, beginning with a description of the facilities available at and the proposed use of Aguila Sur (A. Rada; G. E. Allen) and ending with a series of recommendations on biological control and

IPM for Chilean small and medium-size farms (J.U. Apablaza). The major finding of the Symposium, according to the executive summary, was that any pest control and pest management program must consider the separate and distinct roles and requirements of small, subsistence, and wealthy farmers. Having thus exhorted their readers, the contributors withdraw to the relative safety of organizational flowcharts and generalities. For example, there are chapters on the structure and research objectives of several international organizations including the International Organization for Biological Control (G. Mathys) and the Commonwealth Institute of Biological Control (F. D. Bennett); on the current status of biological control in Argentina (I. S. Crouzel), Canada (J. S. Kelleher), and the United States (G. E. Allen), and of integrated control programs in Europe (N. W. Hussey) as well as of programs directed against particular pests: fruit pests in the United States (R. N. Williams), pests of deciduous fruit trees in Chile (R. H. González), and pests of corn in the United States (D. D. Calvin and F. L. Poston) and in Canada (M. Hudon and I. Ogilvie). The possible role of biological control in IPM is briefly outlined in one chapter (F. L. Poston and S. M. Welch), while a further three chapters deal with general aspects of biological control: insect rearing (J. E. Laing), host plant resistance (B. J. R. Philogène), and use of pathogens (R. S. Ripa). The remaining 8 contributions are concerned with diverse aspects of rural development, agriculture and pest control in South America. Although these last articles are quite short, their authors manage to put into context the nature and the extent of agricultural pest problems and their sociological implications. The book suffers from a certain lack of organization and, more importantly, from an insufficient expositon of many of the topics. Thus, I can recommend the book to those wishing to maintain a complete library on biological control but not to the reader looking for a critical evaluation of the role of biological control in pest management, as proclaimed in the title.

M. Mackauer
Centre for Pest Management
Simon Fraser University
Burnaby, B.C.

Matthews, G. A. 1984. *Pest Management*. Longman, London and New York, viii + 231 pp. Hard cover, with illustrations, tables, references. Price: \$52.50. (Distributed in Canada by Academic Press Canada, 55 Barber Greene Road, Don Mills, Ontario, M3A 2A1.)

The book is organized into eight chapters that follow a decision process leading to pest control. This process is divided into successive steps: What is a pest? How many pests? Which method of control? Which chemical? What dosage? How is it applied? Is it effective? Pest management. The text is clearly written and easy to follow; it is supported by many illustrations, tables, and graphs.

The author emphasizes the role of chemical pesticides, although non-chemical control procedures are mentioned, including plant resistance, cultural and biological control methods, microbial pesticides, interference methods, pheromones, and sterile male releases. Four of the eight chapters are devoted exclusively to chemical pesticides, covering topics such as assaying methods, calibration of spray equipment, and applications under various conditions. Included in this part are step-by-step instructions for the statistical evaluation of dose-response data, experimental design, and, in the Appendix, a table of random numbers, conversion tables from imperial to metric measures, and a collection of useful equations for estimating pesticide concentrations and application rates.

A scant eight lines are devoted to integrated control, while selected aspects of pest management are considered on about 12 pages. The book's main message is that effective pest control is dependent on pesticides. Matthews emphasizes that pesticides must be used in such a manner that any harmful side-effects on beneficial and non-target organisms are reduced to a minimum. The main problem of pesticide usage is that it leads to resistance. These problems can be reduced or avoided through improved timing of pesticide applications and changes in spray techniques.

Although Matthews allows that "pest management is much more than simply integrating the use of two or more control strategies", he fails to make clear that pest management is based on ecological concepts of community structure and stability. Biological control and other non-chemical controls are regulated to a secondary position and are considered applicable only under limited conditions. *Pest Management* is narrower in scope than its title suggests. It lacks the multidisciplinary approach that characterizes pest management. Instead, the book conveys the subtle message that pest management consists of the safe application of pesticides. For these reasons, I can recommend the book only as an excellent

introduction to pesticide use, especially in agriculture, or as supplementary reading to *Introduction to Integrated Pest Management* by M. L. Flint and R. van den Bosch (Plenum Press, New York and London 1981).

M. Mackauer
Centre for Pest Management
Simon Fraser University,
Burnaby, B.C.
V5A 1S6

Taub, Robert, Miriam Rothschild and John Haddow 1983. *The Rothschild Collection of Fleas: The Ceratophyllidae*. i-xv; 1-288; 205 figs. 90 plates; 1 map showing Zoogeographical areas; 151 distribution maps; 11 tables; 24 maps of the British Isles. Published privately (distributed by Academic Press), £60.00, \$93.00.

I very much regret that my own publication on the Fleas of Canada, Alaska and Greenland was already in print before this publication appeared. The introductory chapter, by F.G.A.M. Smit, describes a number of new genera and subgenera that would have affected my work, if there had been time to alter my treatment of the Ceratophyllidae. This volume which is really No. 7 in the series, *The Rothschild Collection of Fleas*, by G. H. E. Hopkins and Miriam Rothschild, presents a monograph of the fleas of the World, based in large part on the mature views of the late Dr. Karl Jordan, the acknowledged master of Siphonapterology. The 205 beautiful drawings by F.G.A.M. Smit illustrate, with the 90 photographic plates by J. Navarro and Robert Traub, all the generic and subgeneric characters discussed in this volume.

As in other volumes in this series, the zoogeographical occurrence of ceratophyllid genera is shown, following Bartholomew, Eagle Clarke and Grimshaw (1911) with the addition of a Wallacean Region. This is followed by a series of 151 detailed maps showing the actual records of the species and subspecies of ceratophyllids, arranged alphabetically.

Next, a chapter on some hosts of ceratophyllid fleas, concludes that the family originated in the early Oligocene of the Nearctic Region, and co-evolved with squirrels. Only later did some become parasites of cricetid rodents and birds, while the Leptopsyllidae originated in the Palaearctic Region, and now are mainly associated with cricetine and microtine rodents.

A chapter on the medical importance of Ceratophyllidae, gives 23 factors that are critical in the transmission of infection, especially outbreaks of epidemics or epizootics. The author (Traub) concludes that ceratophyllid fleas are of little importance in the transmission of disease to humans, but they play an important role in maintaining cycles of infection in the reservoir hosts, especially rodents.

The distribution of British ceratophyllids is well treated (by M. Rothschild) by a series of 24 maps.

Altogether, the authors have presented an outstanding volume of papers and one that will stand for many years as the definitive work on the Ceratophyllidae.

G. P. Holland

Otte, D. 1985. *The North American Grasshoppers*. Volume 2. Acrididae: Oedipodinae. Harvard Univ. Press. 1985. vii + 366 pp., hard cover. U.S. \$60.00.

The coloured plates alone make this volume worth the price. There are 22 Plates which portray 171 lateral views of entire or nearly entire specimens, 187 illustrations of tegmen and wing patterns and colours with small coloured circles to indicate color variation, two illustrations of tegmen only, 72 views of patterns on the inner faces of hind femora plus two views of outer faces to show variation, and nine lateral views of head and thorax to show variation from the typical. These plates are extremely well done. Dr. Otte has maintained the high degree of excellence demonstrated in the first volume of the series. He has been careful to show colour variation within species, so that most species can be identified solely by reference to the Plates. Obviously some credit is due to the printer and publisher for rendering so exactly Dr. Otte's beautiful illustrations.

In addition to the plates, drawings and maps are placed strategically throughout the text, the drawings illustrating characters used in the keys, which are not seen in the lateral views on the Plates, and the maps clearly indicate the known distribution.

This series is the first which treats the Orthoptera (*sensu stricto*) from the Arctic to

Panama, including the West Indies. Most previous work stopped at the U.S.-Mexican border.

In addition to the body of the text, there are six appendices. The first, "Explanation of Characters", covers the various groups in the order in which they appear in the text, and describe the characteristic that is used in deriving the figures portraying the hypothetical phylogeny of each group. This is useful and convincing.

Appendix 2, "Signal Repertoire of Oedipodinae", is a summary of previous work by the author, plus previously unpublished information on the interactions between individuals of the same or the opposite sex of each species.

Appendix 3, "Epiphalli and Aedeagi of Palaearctic and Nearctic Species of Oedipodinae" consists of line drawings of dorsal views of the epiphalli and lateral views of the aedeagi of the Nearctic species and some species from the Palaearctic region which are included for comparison. They are not all drawn to the same scale. Male genitalia are not very useful for species distinction in this subfamily, and the author does not indicate variation of the structures within species.

Appendix 4, "Taxonomic Changes Made in this Volume" includes all new synonymy and generic reassignments.

Appendix 5, "The Genera of Oedipodinae" lists the genera, together with synonymy and the name of the type species for each generic name, including the synonyms.

Appendix 6, "The Species of Oedipodinae" lists the species and synonyms, type localities, generic reassignments and present locations of type specimen or specimens.

Appendix 7, "Pronunciation of Names" is a useful list of the generic names which indicates clearly the correct way to pronounce each name.

The index is divided into two parts, one for genera, the other for species.

The species in the subfamily are placed in seven named species groups, plus two genera which are unplaced and can be considered to comprise two additional groups. The groups indicate the interrelationships of genera more clearly than any previous author has done.

The author has made many changes: four generic names are synonymized; one genus is described as new; 47 species names are placed as junior synonyms; there are 27 new combinations due to species being transferred to other genera; 11 new species are described, and there are four cases of new status as four taxa, previously known as subspecies, have been raised to species status.

The author states that the genus *Locusta* is the oldest name [and for this reason I and others recognize the subfamily as Locustinae] but used Oedipodinae instead "because this name was so often misused, Dirsh (1975) decided to use *Oedipoda* Latreille as the basis of the subfamily name." I fail to understand why former misuse makes the correct use of a name inadvisable.

The author states that he "used subspecies names sparingly following the precepts of Hubbell (1954)", the 6th of which states that "Nothing should ever be named for the sake of naming it, but only in order that something may be said about it." I agree with Hubbell's precepts and also attempt to follow them, but I fail to see how they apply to readily recognizable subspecies named by other authors. In this work, nearly all subspecific names are placed in synonymy under the nominate name. I agree with Otte in some cases, such as the many "subspecific" names applied to some but not all populations of *Xanthippus corallipes*. Thirty-three years ago Strohecker (1952), referred to most of the names as "geographical correlations in certain environments" and stated further "*X. corallipes buckelli* Hebard (1928, p. 241), however, is a definite geographic race [subspecies] of the extreme northwestern part of the range of the species." I concur with Strohecker that *buckelli* should be regarded as a valid subspecies. It is easily distinguishable from other *X. corallipes*. There are other subspecies which are clearly defined, such as *streptus* Rehn as subspecies of *Circotettix carlinianus*. Otte recognizes subspecies in only two cases, one of which is *Trimerotropis verruculata verruculata* (Kirby) and *T.v. suffusa* Scudder — in which he states that he has followed my work. In fact, in the paper to which he referred I had followed comments by Hebard and by Otte. I have since been shown that subspecific status is incorrect and recognize these taxa as good species.

I do not agree with his synonymy of the subspecies of *T. maritima* (Harris). The two components of *T. maritima* are morphologically and geographically distinct as Otte clearly shows in Plate 15, fig. a, and on the map, page 188. There is no cline and no intermediates are known as the two components do not meet. I agree with his placement of *acta* as a synonym of *T. maritima maritima* (Harris) but *citrina* is valid for the subspecies which has been known as *T. maritima interior* E. M. Walker as *T. maritima citrina* Scudder.

I agree with Otte in his placement of *Aerochoreutes* in synonymy under *Circotettix* but, without additional study, I cannot at present, accept some of the other changes, such as the transfer of *campestris* McNeill from *Trimerotropis* to *Spharagemon*. I am not convinced that this change is valid. Many of the changes appear to be valid but some should be studied seriously before being generally accepted.

Dr. Otte has studied most, if not all, of the taxa in the field as well as in the museum. The result is a book which should stand as the major reference to the subfamily Locustinae in North and Central America. The cost of the book is high but every serious student of Orthoptera and every entomological library should have a copy.

V. R. Vickery
Curator, Lyman Entomological
Museum and Research Laboratory
and Professor of Entomology

Manson, D. C. M. 1984. *Fauna of New Zealand*; Number 4, Eriophyoidea except Eriophyinae (Arachnida: Acari); Number 5, Eriophyinae (Arachnida: Acari: Eriophyoidea). Science Information Publishing Centre, Dept. of Scientific and Industrial Research, Wellington, New Zealand. NZ \$10.50 (Number 4, 142 pp.), NZ \$9.00 (Number 5, 123 pp.).

To avoid a large, unwieldy volume, this work is presented in 2 parts. The first (No. 4) presents general aspects of a historical review of work done on eriophyoid mites in New Zealand and elsewhere, and on the morphology, classification, life cycle, and damage to host plants of these mites. It then provides keys, descriptions, and line figures to the families, subfamilies, genera, and species of New Zealand Eriophyoidea except for the large subfamily Eriophyinae, which is presented separately in the second part (No. 5). Together, the parts treat 109 species in 37 genera, of which 62 species are newly recorded for New Zealand; the latter include 54 new species and 14 new genera. Seventy-five percent of the species treated cause visible damage to their plant hosts. Many more species, particularly those which are not evident by their damage, doubtless await discovery.

The contents are deficient in several respects. In the morphological section and descriptions of taxa, obsolete, imprecise, or inaccurate terms, such as "abdomen", "rostrum", and "claw" (the latter, a solenidion with chemosensory function) continue to be used. References to modern major studies of eriophyoid mites in languages other than English are minimal, e.g., Nuzzaci's studies on internal anatomy and various of Shevchenko's studies, including one on the economically important *Aceria tulipae* being a species complex. Surprisingly, research by various workers in Australia, Poland, the U.S.S.R., and the United States, on beneficial uses of eriophyid mites in biological control of weeds and as alternate prey for predatory mites in integrated control of spider mites, is not mentioned. The somewhat oversimplified line drawings of the mite species could have been supplemented with photographs of the damage to host plants caused by the great majority of species.

The presentation's strength lies in its accessibility and usefulness as an identification guide. The keys and descriptions are clearly presented; a full-page plate of figures for each species, including protogyne and deutogyne when known, are included (122 such plates in all); the descriptions and figures of species are arranged alphabetically; and thumb-guides indicate the major sections (checklist, introduction, keys, descriptions, illustrations) for each part. The first part contains a cross-indexed host plant list, and the second part contains an index to all taxa of eriophyoid mites, for both parts; these would have been better presented together at the end of the second part.

In accord with a 1979 decision by the International Commission on Zoological Nomenclature, Mr. Manson has retained the long-established international usage of *Aceria*, *Eriophyes*, and *Phytoptus*. Further, he has designated *Phytoptus pyri* Pagenstecher as type-species of *Eriophyes*, in an effort to conserve the traditional concept of this genus. However, in harmony with the decision to retain the traditional usage of *Phytoptus*, he should have replaced the family name Sierraphytoptidae (=Nalepellidae) with the much older available name Phytoptidae.

These soft-bound volumes are attractively produced, with a text that is remarkably free of mechanical errors; "*Rhynchaphytoptus*" is mis-spelled in the figure captions, but is spelled correctly elsewhere. Mr. Manson is to be congratulated on providing the first useful and comprehensive guide to the genera and species of eriophyoid mites in New Zealand. One can only hope that this work may stimulate the publication of much needed guides to the eriophyoid faunas of other regions of the world, including Canada and the United States.

Evert E. Lindquist
Biosystematics Res. Inst.

Coulson, R. N. and J. A. Witter. 1984. *Forest Entomology*. John Wiley and Sons Inc. x+ 699 pp. \$45.

Foresters, professors and students will find this latest text in Forest Entomology a most useful overview of major insects affecting forests in North America. The subtitle of "Ecology and Management" is well supported by the balanced introduction to the complex issues in managing pest species in the forest. The authors are to be complemented on the clarity of their presentations, especially in Section II which introduces the principles and techniques of integrated (forest) pest management. No longer can the first forest entomologist languish in the world of insects alone. It is time to put the insects on the trees and to review the short term responses we tend to make in managing current infestations. We need to integrate our knowledge with that of the foresters who deal with all the complexities resulting from multiple resource management.

In the first of three sections, Coulson and Witter introduce the structure, function and classification of insects. This framework is most useful for dealing with the diversity of insects that are studied in Section III. The final chapter in this section is a courageous attempt to classify damage symptoms of forest insects. Section II develops the concept of integrated pest management (IPM) and while we could quibble with minor terminology, an issue also raised by the authors, the overall framework is provided in which insects, trees, impacts and resource values can be considered. The section begins with chapters on insect population dynamics and the population dynamics of forest trees. If you do not know what a genet is, now is your chance to find out. Various population modification tactics including chemical, biological and silvicultural controls are surveyed and the multiple-resource aspects of forest management are considered in the chapter on impact assessment. The chapter on monitoring populations and stands describes the activities of several U.S. agencies. Canadian readers will be disappointed to see that the world-renowned Forest and Insect Survey of the Canadian Forestry Service is not described. By the end of Section II it would be useful to review the chapter on IPM.

Section III has eight chapters on various feeding groups including: defoliating insects; sapsucking insects and mites; terminal, shoot, twig, and root insects; seed and cone insects; phloem boring insects; wood boring insects; gall makers; and finally, an interesting chapter on arthropod pests in recreational areas. Major examples from each feeding group are reviewed and a full bibliography is also provided at the end of each chapter to guide the interested reader to additional recent information.

The authors and editors are to be commended for the careful preparation of the text — it is concise, easy to read and pleasingly free of typographical errors. Line drawings have, in general, reproduced well but several of the half-tones reproduced from color originals are not so clear. A life size scale could have added to many of the insect photographs to help readers maintain a sense of proportion.

This book would be useful to foresters and students alike. Many professors could well consider this as a text for undergraduate and graduate courses. Teachers of forest entomology in Canada will need to make an extra effort to include local examples that are of regional importance, the FIDS survey as mentioned above and other provincial pest management organizations.

John McLean
Faculty of Forestry
University of British Columbia

Book Notices

Linsley, E. Gorton and John A. Chemsak. 1985. *The Cerambycidae of North America*, Part VII, No. 1: Taxonomy and Classification of the Subfamily Lamiinae, Tribes Parmenini through Acanthoderini. University of California Publications, Entomology 102. 258 pp., 57 figs.

This book is another part of Drs. Linsley and Chemsak 20+ year study of the Cerambycidae of America north of Mexico. This present work contains about half of the species in the subfamily Lamiinae and includes treatments of the tribes Parmenini, Monellemini, Monochamini, Mesosini, Dorchaschematini, Adetini, Apomecynini, Ataxini, Desmiphorini, Apodasynini, Estolini, Pogonocherini, Onciderini, Hippopsini, Anisocerini and Acanthoderini.

The authors provide a key to the tribes of Lamiinae, keys to all included genera and species, descriptions of all tribes, genera and species and summaries of synonymies, biology, distribution, host plants etc., for all species. Distribution maps are provided for a number of species. The text is further enhanced by the excellent habitus illustrations by Celeste Green, the artist that has provided most of the illustrations for this series.

The keys all work well and the text is easy to read. A few minor typographical errors were found but these do not detract in any way from the usefulness of the book.

D. E. Bright
Biosystematics Research Institute

Klimaszewski, Jan and D. Keith McE. Kevan. 1985. *"The brown lacewing flies of Canada and Alaska (Neuroptera: Hemerobiidae) Part 1. The genus Hemerobius Linnaeus: Systematics, Bionomics and Distribution"* Lyman Entomological Museum and Research Laboratory, Memoir No. 15 Ste. Anne de Bellevue, Québec. \$8.00.

This paper is the first of a series of papers on the Canadian and Alaskan hemerobiidae. It deals with the genus *Hemerobius*. No new species are described. One name is reinstated to full species rank and 13 lectotypes are designated. The author recognizes two subgenera and 13 valid species which are placed in seven species groups. The short discussion on the most important taxonomic characters and the numerous illustrations of the diagnostic features of the male genitalia and of the wing venation are excellent and useful for the identification of species. The poor quality of some illustrations is due to the printing process. For each species, the reader will find a complete synonymy, a diagnosis, a short description, a short account on the economic importance, the geographic distribution, and a list of the material examined.

This is an excellent contribution to the knowledge of the brown lacewings; it is essential to people interested in the systematics, bionomics, and distribution of these insects.

Dr. Laurent LeSage
Biosystematics Research Institute,

Hamon, A. B. and M. L. Williams. 1984. *The Soft Scales of Florida (Homoptera: Coccoidea: Coccidae)*. Contribution No. 600. Bureau of Entomology, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville. 194 pp.

This work on soft scales is not confined to Florida. In fact, it treats 49 species in 17 genera found in the southeastern United States. A key to the genera found in this region and keys to the species in each genus are provided. Much useful information is given for the species, including field descriptions, morphological descriptions, synonymies, taxonomic affinities, and remarks on the biology, distribution and economic importance. The line drawings and black and white photographs of the species are of high quality. An additional four plates of excellent color photographs provide useful field illustrations of some of the species. The distribution maps are very useful. A detailed map of the distribution of each species in Florida is given. This is accompanied by maps of the general distribution in the contiguous 48 states. An extensive host list of over 1500 plant names is provided. This work will be very useful to anyone interested in the soft scales of the eastern United States.

R. Footitt
Biosystematics Research Institute
Ottawa, Ont.

Eisenbeis, Gerhard, and Wilfried Wichard. 1985. *Atlas zur Biologie der Bodenarthropoden*. Gustav Fischer. Verlag, Stuttgart-Hohenheim, Wollgrasweg 49, Postfach 7201 43, D-7000, Stuttgart 70, Federal Republic of Germany (& New York): boards: xiv + 434 pp. Price DM 118.--.

This handsome quarto-size volume (with a foreward by Friedrich Schaller) begins with a short general account of the soil as an environment for arthropod life, and then goes on to deal systematically, in sections, with spiders, pseudoscorpions, harvestmen, mites, woodlice, centipedes, millipedes, pauropods, symphylans, diplurans, proturans, springtails, bristle-tails, silverfish, earwigs, cockroaches, crickets, bugs, antlions, beetles, ants, caddis-flies, moths, scorpion-flies and flies. It ends with a section on scanning electronmicroscopy, a very good bibliography and systematic and general indexes. The work is illustrated by more than 1100 high-quality scanning electronmicrographs on 192 plates, together with 219 excellent text-figures.

Although the title and preface do not so indicate, the book is produced for readers in central and northern Europe (whence come all the cited examples), so that certain important groups of soil-inhabiting arthropods which do not occur there are entirely omitted, most notably the termites. There is, however, ample information, much of it applicable to the whole of the northern Holarctic Region, to render the book of general, rather than geographically restricted value to all biologists having anything to do with soil arthropods. Each group is dealt with in terms of general morphology, biology, ecology and micromorphology with emphasis, where appropriate, on the role of certain micro-structures in what might be termed physiological ecology. It is with regard to this last aspect that the spectacular "art gallery" of scanning electronmicrographs, which dominates the book, is presented. The micrographs are not always necessitated by or fully correlated with the text, but the end result is an innovative and most stimulating addition to the literature on soil zoology. In this day and age, the price of the volume is quite reasonable.

D. Keith McE. Kevan

POSITION AVAILABLE

Integrated Pest Management Position

Applications are invited for a tenure-track position, at the Assistant or Associate Professor level in Integrated Pest Management in the Department of Environmental Biology, Ontario Agricultural College, University of Guelph. In making this appointment, the department wishes to initiate a new, non-thesis graduate program in integrated pest management leading to the degree of Master of Agriculture. The appointee will be expected to teach a graduate course in integrated pest management, coordinate the teaching for the new graduate degree program and develop a vigorous research program in integrated pest management. Excellent opportunities for research are provided through close cooperation with Agriculture Canada and the Ontario Ministries of Agriculture and Food, Environment and Natural Resources.

Applicants should have a Ph.D. and a minimum of two years of relevant experience in integrated pest management. The following areas of specialization will be considered: entomology, plant pathology, or weed science. Qualifications sought will be demonstrated excellence in teaching and research and the potential to develop and direct the graduate program in integrated pest management.

The position is available May 1, 1986, contingent upon the availability of funds. Salary will be commensurate with experience. Applications, including a complete curriculum vitae, academic transcripts, a statement of research interests, and the names of three references should be sent to:

Dr. S. B. McIver, Chairperson
Department of Environmental Biology
University of Guelph
Guelph, Ontario N1G 2W1

In accordance with Canadian immigration requirements, this advertisement is directed to Canadian citizens and permanent residents.

Closing date: December 31, 1985.

Entomology '86

1986 JOINT ANNUAL MEETING
ENTOMOLOGICAL SOCIETY OF CANADA: ENTOMOLOGICAL SOCIETY OF MANITOBA

6-8 OCTOBER — HOLIDAY INN SOUTH WINNIPEG

Second Notice Annual Meeting

Entomological Society of Canada
Entomological Society of Manitoba
6-8 October 1986
Holiday Inn South Winnipeg
Winnipeg, Manitoba

October 6:

- 09:00-10:00: — Opening Ceremonies
— E.S.C. Awards (Gold Medal and Hewitt Award)
— Gold Medal Address
- 10:30-12:30: — Heritage Lecture: "History, Development and Accomplishments of the Research Branch, Agriculture Canada — 100 Years of Progress", Dr. E. J. LeRoux, Ottawa
— Plenary Lecture: "New Generation Insecticides", Dr. J. E. Hollebhone, Ottawa
- 13:30-17:00 — Paper Sessions
— Special Interest Groups
- 18:00-20:00 Mixer

October 7:

- 08:30-12:30 Symposium: "Insect-Plant Relationships"
- (i) Dr. J. M. Scriber, Madison, Wisconsin,
"Foodplant suitability: behavioral, physiological, genetic, and ecological implications for insects.
 - (ii) Dr. J. H. Myers, Vancouver, B.C.,
"Effects of the quality of host plants on the selection of oviposition sites".
 - (iii) Dr. B. D. Roitberg, Burnaby, B.C.,
"Role of chemicals in host plant finding and acceptance".
 - (iv) Dr. D. R. Strong, Tallahassee, Florida,
"The enigmatic role of natural enemies among insects on plants".
- 13:30-15:00 — Paper Sessions
— Special Interest Groups
- 15:30-17:00 — Entomological Society of Canada Annual Meeting.
- 19:00- — Banquet
— Presentation of E.S.C. Fellowships and Criddle Award

October 8:

08:30-12:30 — Symposium: "Current Topics in Insect Physiology".

- (i) Dr. S. S. Tobe, Toronto, Ontario,
"The regulation of juvenile hormone biosynthesis in insects".
- (ii) Dr. A. N. Starratt, London, Ontario,
"Proctolin".
- (iii) Dr. R. G. H. Downer, Waterloo, Ontario,
"Octopamine as a target for insecticide development".
- (iv) Dr. E. Huebner, Winnipeg, Manitoba,
"Ovarian development and oogenesis in insects".

13:30-17:00 — Paper Sessions
— Special Interest Groups

12:30- — Entomological Society of Canada Governing Board Meeting

Special Interest Groups

Informal conferences on specialized topics will be arranged on request. Members interested in organizing and/or participating in a special interest group are asked to contact Dr. G. H. Gerber, Chairman, Scientific Program Committee, Research Station, Agriculture Canada, 195 Dafoe Road, Winnipeg, Manitoba, R3T 2M9 (A.C. 204-269-2100) not later than 1 May, 1986.

MEETINGS

Announcements

Northeastern Forest Pest Council and Northeastern Forest Insect Work Conference, at the Best Western Turf Inn, Albany, N.Y. on March 11-14, 1986.

CONTACT: Douglas C. Allen or Lawrence P. Abrahamson, SUNY College of Environmental Science and Forestry, Syracuse, N.Y. 13210.

Second Annual Workshop on the Identification of the Families of Hymenoptera at the Biosystematics Research Institute, Ottawa, on May 1-9, 1986. Cost \$300. Registration on a first come basis, limit 25 students.

CONTACT: Mike Sarazin, Hymenoptera Section, Biosystematics Research Institute, CEF, Ottawa, Ontario K1A 0C6.

34th Annual Meeting of the North American Benthological Society at the Kansas Union on the University of Kansas campus on May 20-23, 1986.

CONTACT: Leonard C. Ferrington, Jr., Kansas Biological Survey University of Kansas, Lawrence, Kansas 66045-2969.

Nato Advanced Research Workshop on Numerical Ecology at Roscoff (Brittany), France on June 2-12, 1986.

CONTACT: Dr. Pierre Legendre, Department de Sciences biologiques, Université de Montréal, C.P. 6128, Succursale A. Montréal, Québec H3C 3J7.

Deuxième Conférence Internationale des Entomologistes d'Expression Française, organisée par la Société d'Entomologie du Québec, du 15 au 18 juillet 1986, à l'Université du Québec à Trois Rivières. Conférences libres; plusieurs symposiums dont un sur les insectes d'importance agricole, un sur les insectes d'importance forestière, un sur le contrôle des culicidés et des simuliidés.

Président du Comité Organisateur: Dr. Jean-Pierre Bourassa, Département de chimie-biologie, Université du Québec à Trois-Rivières C.P. 500, Trois-Rivières, G9A 5H7.

Joint Annual Meeting of the Entomological Society of Canada and the Entomological Society of Manitoba, 6-8 October 1986, Holiday Inn South Winnipeg, Winnipeg, Manitoba.
CONTACT: Dr. N. J. Holliday, General Chairman, Department of Entomology, University of Manitoba, Winnipeg, Manitoba, R3T 2N2, or Dr. G. H. Gerber, Chairman, Scientific Program Committee, Research Station, Agriculture Canada, 195 Dafoe Road, Winnipeg, Manitoba, R3T 2M9.

XVI Pacific Science Congress at Seoul, Korea on 20-30 August, 1987.
CONTACT: Prof. Choon Ho Park, Secretary-General, Organizing Committee, XVI Pacific Science Congress, Seoul, 1987, K.P.O. Box 1008, Seoul 110, Korea.

XVIII International Congress of Entomology, at the University of British Columbia, Vancouver, B.C., on 3-9 July 1988.
CONTACT: Dr. G. G. E. Scudder, Secretary General, XVIII International Congress of Entomology, Department of Zoology, University of British Columbia, Vancouver, B.C. V6T 2A9. Telephone (604) 228-3168.

OBITUARY

George Pearson Holland (1911-1985)

George P. Holland, 74, died 10 November 1985 from exposure while on a hunting trip at his favorite lodge near Ottawa. George's research was devoted to studying fleas. The last of his many research papers was a monograph on the fleas of Canada, Alaska, and Greenland (published early in 1985). For many years George was the director of the Entomology (now Biosystematics) Research Institute, Agriculture Canada. He received several honors from the Society; he was a Gold Medalist, an Honorary member, and a Fellow. He served as President of the Society (1957-58). He was also a Fellow of the Royal Society of Canada. A complete obituary will be presented in a later issue of the Bulletin.

A George P. Holland Memorial Fund has been established by the CanaColl foundation; this fund is an integral part of the endowment fund. The interest from this fund will be used to promote research on the Canadian National Collection of insects and related arthropods. George was very instrumental in building this collection into one of the largest in the world. Tax deductible donations in memory to George may be sent to the CanaColl Foundation, K. W. Neatby Bldg., Rm. 4058, 1010 Carling Avenue, Ottawa, Ontario K1A 0C6. The Holland family will be notified of the donations.

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Contributions and correspondence regarding the Bulletin should be sent to: R. B. Aiken, Department of Biology, Mount Allison University, Sackville, N.B. E0C 3C0. Telephone (506) 364-2200. Inquiries about subscriptions and back issues should be sent to the Entomological Society of Canada, 1320 Carling Avenue, Ottawa, Ontario K1Z 7K9.

Bulletin Deadline

The deadline for the next issue, Vol. 18, no. 1 is Feb. 1, 1986

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