ENTOMOLOGICAL SOCIETY OF CANADA

Bulletin

Vol. 8 MARCH 1976 No. 1

of the Entomological Society of Canada

Bulletin

Vol. 8, No. 1, March, 1976

THIS ISSUE

P.E. Morrison — Editor (Society Publications)

B.J.R. Philogène — Editor (Bulletin)

Cover Design: M.A. Sydor

Published by the
Entomological Society of Canada
1320 Carling Avenue, Ottawa

of the Entomological Society of Canada

Bulletin Vol. 8, No. 1, March, 1976

EDITORIAL

Readers of the Bulletin must have been left hungry with the December 1975 issue. It is unfortunate that the postal strike, withdrawal of material by the 1976 Annual Meeting Program Committee and delays in obtaining envelopes prevented Doug Eidt from finishing his tenure as editor on a more satisfying note. The membership, I am sure, will understand. Thank you once more Doug, for these seven years of hard work and for establishing the Bulletin on sound bases.

The past two months have seen politicians and civil servants involved in Science policy being questioned more aggressively on the present decline of support for research in general. President Cooper, at his installation in August 1975 deplored the trend of governments to downgrade science and to allow the proliferation of an immense bureaucracy (Bull. Sept. 1975). During a panel discussion on "Science and the State" in Ottawa on January 31, 1976, Dr. G. Herzberg, our 1971 Nobel Prize winner in Chemistry said: "The bureaucrats think a system that works well in getting a building built can be successful in something creative like scientific research." A few days later Mr. Drury did not have reassuring words for scientific researchers when he met with university professors to discuss the current and future funding of research by the federal government. The minister said he was sympathetic but science must play its part in the country's fight against inflation. "I am not sure we should try and keep up to the standards of the U.S. I am not sure we want to be first in every field."

Many of us entomologists have been students of the insects' strategy for survival. We may have to spend more time on the entomologists' strategy for survival. Start by reading page 19 of this issue.

The attention of the membership is also drawn to the upcoming Annual Meeting of the Society (page 20). The deadline for submitted papers and special interest groups has been extended to May 1, 1976. Please make a special effort to attend and participate.

ARE INSECTS PERFECT?

Address of Professor G.G.E. Scudder, Department of Zoology, University of British Columbia, Vancouver, B.C., when he received the Gold Medal Award for Outstanding Achievement of the Entomological Society of Canada. University of Saskatchewan, Saskatoon, August 1975.

This question can be posed from a number of viewpoints. For example, the macrolepidopterist collector probably would demand that his insects were perfect – perfect specimens. If they were not he would not dream of adding them to his collection of perfectly set insects.

A good number of insects, particularly certain butterflies have of course been perfect – perfect collector's items. Best known of these perhaps are the *Morpho* of South America which have been collected for specimens and jewellery to such an extent that they are now in danger of extinction. The same applies to certain species of *Ornithoptera* or Birds-wing in Papua, New Guinea.

From a different viewpoint, the housewife – or homemaker to use modern terminology – no doubt regards many insects as perfect – perfect pests! Some applied entomologists similarly might consider many of their objects of concern rather perfect – perfect that is in their ability to survive and surmount all attempts to eradicate them. Further, many insect parasites are perfect – perfect parasites and hence, in spite of the desires and manipulations of biological control experts, they do not and will not normally totally eliminate their host populations, as noted by Darwin (Stauffer, 1975).

While no doubt there are many other views of insects as perfect, my interest, and the aspect I would like to consider here, is the perfection of insects from the morphological and evolutionary point of view. I wish to ask the question: Are insects perfect from the functionally adaptive evolutionary point of view? Are they structurally perfect? In other words, has every part of them a function and are these parts functionally perfect?

Lamarck of course believed that the basis of development in all the animal and plant world was a drive towards perfection: the ideas of necessity and a drive towards perfection were prominant in his theories (Shepard, 1973). However, following Darwin, we now believe that it is the continuing process of natural selection that is the mechanism which leads to the evolution of efficient adaptations: animals and plants have neither a need nor a will. It is the "heavenly power" of Neo-Darwinian natural selection, to use the words of Crowson (1975) that is said to account for every aspect of an animal's structure and life. Indeed, the well-known research on industrial melanism in the Peppered Moth (*Biston betularia*) (see Kettlewell, 1959) shows not only Darwin's Demon (natural selection) in action, but more importantly for our topic, the process of adaptation and morphological perfection.

Cannon (1958) has pointed out that the Neo-Darwinian view of evolution by natural selection "implies that every character must be of selective value to the organism possessing it. In order that the character should be established it must have been selected by nature as giving some benefit to the particular type of organism." If we think about the many examples of insect protective coloration, protective resemblance, aposematism, mimicry and so on, and the experimental testing of some of these (e.g. de Ruiter, 1952, 1956; Brower, 1969), we can see such benefit and we can from these bring adaptive morphology and perfection clearly into focus.

On the plant side, the many structural adaptations for pollination and dispersal show that the concept of perfection is not restricted to insects. If we refer to the particular adaptations in pitcher plants, Venus fly traps and other insectivorous plants, we can see that their adaptations and perfections are often of direct impact on insects.

Perhaps a classic example of functional adaptation and perfection in a whole co-ordinated structural complex is the particular specializations in the legs of bees for the collection and amalgamation of pollen. Here we see obvious adaptation and perfection with mutual benefit to both plants and insects.

Now we can add to these examples, the many well-known cases in which a functional significance has been shown for apparent trivial structures and characters. For example, Blest (1957) has demonstrated experimentally, the functional importance of the precise markings on the eye spots in Lepidoptera: it is no accident that they look exactly like eyes. Holling (1964) has shown that the exact angle subtended by the femur and tibia, and the angle of the spines on these segments of the raptorial forelegs of mantids is all important in their prey capturing ability: the spines are not at any odd angle. Then Zwölfer (1975) has shown that the particular shape and length of the rostral portion of the head of female *Larinus* weevils is perfected for drilling holes then tamping eggs into flower heads of differing size: the differing length and shapes are no accident.

I am sure everyone can add many examples to this list and hopefully obtain a clear impression of what we mean by morphological perfection. However, just in case there are some who still find the concept a difficult one, let me refer to some examples from the literature of bioengineering and biomechanics, wherein living systems are examined in terms of the engineer and designer. The many interdisciplinary analogous comparisons have been profitable, not only in aiding man's technology, but also in giving us an appreciation of nature's perfection.

For example, there is the insect cuticle which is a laminated composite material, well-known in engineering and used where high strength and stiffness to weight ratios are required (Barth, 1973). This cuticle has, of course, a plywood construction, and we are all familiar these days with the properties of plywood. Not only that, but elsewhere in the same insect, we may find areas of resilin. Resilin as you know is unique in that it has an elastic efficiency of over 90 per cent as it is used in the flight system, and shows no flow even after prolonged deformation (Weis-Fogh, 1960): "it is the most perfect rubber known" (Neville, 1975). Vincent and Prentice (1973) and Vincent (1975) have shown that in the female locust during oviposition, the intersegmental abdominal membranes can stretch 30x their length, but they normally stretch only 15x the length and so in fact have a safety factor of 2, exactly the figure adopted by engineers as the safety factor in their work.

Moving to something quite different, there is then the principle of close packing of elements to be seen in the compound eye of insects. Many years ago, D'Arcy Thompson (1942) like many before him, pointed out the hexagonal shape that is indicative of efficient close packing. Perhaps this is not too surprising in the eye because it could be brought about simply as a result of pressure between neighbouring elements. However, such an explanation cannot be applied to the comb of bees' and wasps' nests, for here the insects actually construct hexagonal cells from the beginning of nest building: this is morphological perfection with an extra dimension.

Finally, if we turn to aeronautical technology, we see that living systems perfected this long before man. For example, the precise shape and aerodynamic properties of the sycamore seed have only been really appreciated after the advent of the technology associated with helicopter blade design. Applying helicopter engineering analysis, Norberg (1973) has shown the perfection of samaras with their special structural features that govern autorotation and self-stability. Norberg (1972) has used a similar analysis to suggest that the pterostigma of insect wings act as inertial regulators in wing pitch. Further, Nachtigall (1974) has shown that the aerodynamic properties and design of certain insect wings have been perfected to such an extent that they are superior to the design of manmade fixed wing aircraft in a number of respects, and are the envy of the variable-wing plane designers.

These and the many other studies on animals (for example, Bowman (1961, 1963) on the beaks of Galapagos finches) that could be discussed if time permitted, have led to a concept of morphological perfection in living organisms. In general, it seems that we should regard all structural features of an organism as adaptive and perfect.

Cain (1964) has said that the idea of adaptation and perfection is an immediately intelligible one, and "its generality of application does not surprise us, although the delicacy of construction of so many devices and the complexity of behaviour shown in their utilization have been a source of astonishment and delight" since the time of Aristotle. The harmony between the characteristics of living things and the nature of their environment never fails to amaze us (Shepard, 1973).

The above suggests that in animals, including insects, all adapted structures are built according to optimum designs (Dullemeijer, 1974), and that even slight deviation from this ideal can greatly diminish the usefulness of a structural feature. Animals perform rather well, and it can be argued that every part of them has a function and each species seems as perfect as it can be.

On the other hand, it is often difficult to discover what a particular part or structure is for. There are a great number of features of insects that come to mind, the function of which is not always obvious or indeed, vaguely understood. For example, what is the exact functional significance of the varied way in which the mandibular and maxillary stylets interlock in different Hemiptera? What is the functional significance of the various arrangements of the gonangulum in the insect ovipositor? What is the functional significance of every bristle on a fly or sculpturation on a beetle elytron? It is certain that in some instances we can perceive of a possible function. For example, in the Papua, New Guinea genus of weevils *Gymnopholus*, Gressitt (1966) has found that many lowland species have a smooth and clean elytral surface, whereas several species belonging to the subgenus *Symniopholus* that live in the high montane moss forests have a sculptured surface. Since those species with a sculptured surface are often cryptically camouflaged owing to a dense growth of mostly Cryptogamic plants, it is suggested that the irregular surface is functionally adaptive and serves to aid the establishment of the 12 families of plants involved, plus the associated fauna. Clearly, such an explanation may be true for these *Gymnopholus*, but it cannot apply to all beetles.

What is the function for instance of the pronotal and elytral tubercles in this same genus *Gymnopholus* and many other insects? What is the function for every single spine on the body of such bizarre forms as the giant stick insect *Extatosoma*? What about the shape of the many genera of Membracidae? What is the functional reason for the structural differences in insect genitalia? We do not know, for it is clear that in most insect genitalia there is no lock and key mechanism (Scudder, 1971).

No manner of conjecture seems to explain these particular structures, shapes and ornamentations, but they are certainly not there merely for the convenience of the taxonomist!

Cain (1964) states "that if we personally cannot see any adaptive or functional ignificance of some feature, this is far more likely to be due to our own abysmal gnorance than to the feature being truly non-adaptive, selectively neutral or function-ess." Cain (*loc. cit.*) continues "Every fresh piece of work that bears on function at all hows us again and again functional significance where we might not have expected it and ighlights our vast ignorance about almost all living things." Yet, Dobzhansky (1956) tates "when one considers traits in which species of insects or other organisms often iffer, the supposition that all or even most of them are directly useful to their possessors tretches too much one's credulity."

Now here we come to the real dilemma of evolutionary morphological perfec-ion. Clearly, EITHER every feature has an adaptive or functional significance and we are bysmally ignorant, OR many features of insects are non-adaptive, selectively neutral or unctionless. If the latter is correct then our concepts and theories on evolution and the volutionary process are in need of revision.

To say that features might be non-adaptive, selectively neutral or functionless is ot acceptable to the majority of Neo-Darwinian evolutionists, but we should keep in nind the quotation from Dobzhansky, one of the leading evolutionists of our time. ertainly, the Fisher school considers non-adaptive evolution to be negligible (van Valen, 960). However, it is well to remember that a great deal of evolutionary dogma is now oming under attack. It is also of some interest to note that Darwin (1859) in "The Origin of Species" did accept neutral characters, for in his discussion of what he called 'polymorphic genera" he states that we see "variations in points of structure which are of o service or disservice to the species, and which consequently have not been seized on nd rendered definite by natural selection."

Evolutionary imperfection is in fact possible (Cain, 1964; van Valen, 1960). enetic drift, secular change, genetic inertia, compensation and developmental restraints re possible sources (Cain, 1964). However, it is not enough to make vague reference to hese phenomena and leave it at that. We must look into the problem further.

As Frazzetta (1975) has commented, the "spectacular examples of adaptation eadily seen in nature have had some bad effects on the mentalities of many biologists." ince most parts are seen as useful, it is argued that all is useful and it is left at that, vithout going into the details that trouble other biologists. There is a clear need for more esearch on the functional significance of structures and the evolution of morpholigies, nd it is no more desperately needed than in the insects.

Listening to certain biologists these days, you can often get the impression that f the research does not involve physiology, biochemistry, genetics, development or the ike, it is not worth doing. I wish to suggest that there is much worthwhile to be done in nsect morphology. Furthermore, when we know the insects better from the functional oint of view and know more about their lives and evolution, I am sure we will find them erfect – perfect experimental subjects for the physiologists, biochemists, geneticists and levelopmental biologists.

It is as well to remember that in the pre-Darwinian era, most of the intriguing uestions in biology were first brought to light by study of structure. I suggest that it is his continuing study of structure, particularly from the comparative and functional point f view that will continue to pose some of the most important questions in biology and iological evolution.

Mr. President, fellow entomologists, botanists and phytopathologists, I would ike to suggest that there is still a long way we can go by asking: Are insects perfect?

REFERENCES

Barth, F.G., 1973, Microfiber reinforcement of an Arthropod cuticle. Laminated composite material in Biology. Z. Zellforsch. 144: 409-433.

Blest, A.D., 1957, The function of eyespot patterns in the Lepidoptera. Behaviour 11: 209-256.

Bowman, R.I., 1961, Morphological differentiation and adaptation in the Galapagos finches. Univ. Calif. Publ. Zool. 58: 1-302.

Bowman, R.I., 1963, Evolutionary patterns in Darwin's finches. Occ. Pap. Calif. Acad. Sci. 44: 107-140.

Brower, L.P., 1969, Ecological chemistry. Sci. Amer. 220 (2): 22-29.

Cain, A.J., 1964, The perfection of animals. Viewpoints in Biology 3: 36-63.

Cannon, H.G., 1958, The Evolution of Living Things. Manchester University Press, Manchester.

Crowson, R.A., 1975, Anti-Drawinism among the molecular biologists. Nature, Lond. 154: 464.

Darwin, C., 1859, On the Origin of Species by means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life. 1st edition. Murray, London.

Dobzhansky, Th., 1956, What is an adaptive trait. Amer. Nat. 90: 337-347.

Dullemeijer, P., 1974, Concepts and approaches in animal morphology. Van Gorcum & Comp. B.V., Assen, The Netherlands.

Frazzetta, T.H., 1975, Complex adaptations in evolving populations. Sinauer Associates, Inc., Sunderland, Mass.

Gressitt, J.L., 1966, Epizoic symbiosis: the Papuan weevil genus *Gymnopholus* (Leptopiinae) symbiotic with Cryptogamic plants, Oribatid mites, Rotifers and Nematodes. Pacif. Ins. 8: 221-280.

Holling, C.S., 1964, The analysis of complex population processes. Can. Ent. 96: 335-347.

Kettlewell, H.B.D., 1959, Darwin's missing evidence. Sci. Amer. 200 (3): 48-53.

Nachtigall, W., 1974, Insects in flight; a glimpse behind the scenes in biophysical research. McGraw-Hill, New York.

Neville, A.C., 1975, Biology of the Arthropod cuticle. Springer-Verlag, Berlin.

Norberg, R.A., 1972, The pterostigma of insect wings an inertial regulator of wing pitch. J. comp. Physiol. 81: 9-22.

Norberg, R.A., 1973, Autorotation, self-stability, and structure of single-winged fruits and seeds (samaras) with comparative remarks on animal flight. Biol. Rev. 48: 561-596.

Ruiter, L. de, 1952, Some experiments on the camouflage of stick caterpillars. Behaviour 4: 222-232.

Ruiter, L. de, 1956, Countershading in caterpillars. An analysis of its adaptive significance. Arch. néerl. Zool. 11: 285-342.

Scudder, G.G.E., 1971, Comparative morphology of insect genitalia. Ann. Rev. Ent. 16: 379-406.

Shepard, P., 1973, The Tender Carnivore and the Sacred Game. Charles Schibner's Sons, New York.

Stauffer, R.C. (ed), 1975, Charles Darwin's Natural Selection. Being the Second Part of His Big Species Book written from 1856 to 1858. Cambridge University Press, New York.

Thompson, D'Arcy W., 1942, On Growth and Form. Cambridge University Press, Cambridge.

van Valen, L., 1960, Nonadaptive aspects of evolution. Amer. Nat. 94: 305-308.

Vincent, J.F.V., 1975, Locust oviposition: stress softening of the extensible intersegmental membranes. Proc. R. Soc. Lond. (A) 188: 189-201.

Vincent, J.F.V. and Prentice, J.H., 1973, Rheological properties of the extensible intersegmental membrane of the adult female locust. J. Mat. Sci. 8: 624-630.

Weis-Fogh, T., 1960, A rubberlike protein in insect cuticle. J. Exp. Biol. 37: 889-907.

Zwölfer, H., 1975, Rüsselkäfer und ihre Umwelt – ein Kapitel Ökologie. Stuttgarter Beitr. Naturkunde (C) 3: 19-31.

SECRETARY

Dr. George H. Gerber was appointed Secretary f the Society in September 1975. George is a Research cientist at the Agriculture Canada Research Station, Vinnipeg. He is strongly interested in the affairs of the ociety and brings to his new post experience gained hile serving as Regional Director, E.S.M., during 974-75.

REPORT OF THE NOMINATING COMMITTEE, 1975-76

The Chairman was able to meet separately with the other committee members and further discussions were handled by correspondence and telephone. The Nominating Committee is very pleased to put forward the following candidates for the 1976 elections of the Society.

For President-elect: H.F. Madsen
W.G. Wellington

For Directors-at-large: G.E. Ball
R.F. DeBoo
J.A. Oakley

Additional nominations from the membership were invited through an announcement published in the December, 1975 issue of the Bulletin.

THE CRIDDLES OF AWEME

The first entomology laboratory in Western Canada was established by Norman riddle, on the family farm, at Aweme, Manitoba. A granddaughter of the original settlers f 1882 has written a book, based on the personal diaries of her grandfather, Percy riddle, English gentleman turned immigrant farmer. It includes biographical chapters on e various members of the family, outstanding among them being Norman Criddle, dest son and well-known Canadian naturalist. Further information on this publication ay be obtained from Miss Alma Criddle, 19-303 Furby St., Winnipeg, Manioba R3C 2A8.

BOOK REVIEWS

A Catalog of the Diptera of the Oriental Region. Volume 1. Suborder Nematocera. Compiled and edited by Mercedes D. Delfinado and D. Elmo Hardy. 1973. The University Press of Hawaii, Honolulu. 618 pp. $18.50.

This work was, I believe, begun as a catalogue of the Diptera of the Philippine Is. only. The editors are to be congratulated on their decision to extend it to cover the whole of the Oriental Region (defined here, for practical purposes, as tropical Asia from Pakistan west to Weber's Line, including Nepal, Assam, southern China and the Ryukyu Is.). The last catalogue of Diptera of this region was that of van der Wulp in 1896. He listed 230 species of Nematocers (from a slightly wider area, including New Guinea); the present work lists 6,226 species. It is interesting that in both works Tipulidae make up over half the total (137 vs. 3,198). The families of medical importance also show enormous increases – Culicidae from 32 to 806, Simuliidae from 1 to 94, Psychodidae s.l. from 0 to 313, Ceratopogonidae from 3 to 521. These figures indicate the value of the present work to taxonomists, zoogeographers, and, since most disease vectors among the Diptera are in the suborder Nematocera, to medical entomologists.

With rather recent publication of a Nearctic catalogue, the almost complete publication of a Neotropical catalogue, and the advanced preparation of an Ethiopian catalogue, this work may stimulate the production of catalogues of the Diptera of the two areas yet untreated – the Palararctic and the Australasian. Alternatively world catalogue of some or all families may result.

The present volume is meticulously edited, clearly arranged, well bound and available at a reasonable price. I look forward to the appearance of the remaining two volumes of the series.

I have noted the omission of a few species in the Mycetophilidae. Perhaps these, and others, should there be any, could be gathered together and made readily available as were two lots of additions and corrections to the Nearctic catalogue.

J.R. Vockeroth

• • • • • • • • • •

The Muscidae of California exclusive of Subfamilies Muscinae and Stomoxydinae. H.C. Huckett. Bull. Calif. Ins. Surv. 18: 1-148, 59 figs., 74 maps. 1975. $8.50.

It is a pleasure to see the completion of the treatment in this series of one of the largest, most abundant and most conspicuous of the families of Diptera. The small but economically important subfamilies Muscinae and Stomoxydinae were treated by B.E. Eldridge and M.T. James in an earlier part. The present work gives keys, distributional data (often illustrated by maps), comparative notes when necessary, and much biological data for 243 species and/or subspecies of the remaining six subfamilies. Twenty-five other species which may occur in California are included in the keys – this is a commendable addition, all too often omitted in regional treatments. Dr. Huckett has contributed more to knowledge of Nearctic Muscidae than any other worker in this century but is at present alone, or nearly so, among students of this fauna. I sincerely hope this work will stimulate, among younger Dipterists, a renewed interest in this large family of superficially similar but biologically very diverse and very interesting species.

J.R. Vockeroth

The Stratiomyioidea (Diptera) of Fennoscandia and Denmark. R. Rozkošný. Fauna Entomologica Scandinavica, Vol. 1, 151 pp., 456 illustrations. Scandinavian Science Press Ltd., Gadstrup, Denmark. 1973. Agent, E.W. Classey Ltd., Hampton, Middlesex. Danish kronor 58.

It is a pleasure to be asked to review the first volume of a faunal handbook series when it is as outstanding as the present work. If subsequent volumes are as detailed and comprehensive (there will be several hundred in all) and if they reach or even approach the quality of this one the series will certainly be the finest of its kind yet to appear. There will be perhaps two reasons for this. The fauna of Fennoscandia and Denmark is (with the exception of that of Great Britain) undoubtedly the best known in the world, and no less important, competent foreign specialists have been invited to prepare some of the volumes.

The present work treats three species of Solvidae and 47 of Stratiomyidae; larvae of all species of the former, and of no less than 33 species of the latter, are also keyed, described and illustrated. Such a comprehensive study of the larvae should do much to stimulate the discovery and description of unknown European forms.

A brief but reasonably thorough introduction discusses previous work on the group in the region, important morphological characters of adults and larvae, and biology. The descriptions of the species treat only a few of the most important distinguishing characters, with the exception of the male terminalia, which are figured and described in detail. The descriptions are, however, almost certainly sufficiently extensive to allow additional species to be easily recognized as such. Perhaps the most valuable feature of the work is the profuse and extremely clear illustrations – 456 for 50 species. Most are of larval structure, abdominal patterns and male terminalia, but other useful adult characters are figured when necessary. Ten drawings of whole specimens should be of particular value to those unfamiliar with the group.

I was surprised to see that in several genera (e.g. *Stratiomys*, *Odontomyia*), where the Nearctic species have usually and not always satisfactorily been distinguished mostly on colour characters, the Fennoscandian species show striking differences in the male terminalia. Complexes of closely related Nearctic species may not be similarly separable, but the possibility should be investigated.

Two sets of characters which might have been at least occasionally useful are not mentioned. These are the structure of the ovipositor and the distribution of wing microtrichia. I have not examined the ovipositors but would be surprised if they were not useful at some level; Kraft and Cook made some use of them in their study of Nearctic Pachygastrinae. The wing microtrichia are certainly valuable. M.T. James has made good use of them in recent revisions of several genera, and I have noted at least moderate differences in European species of *Oxycera* and *Chloromyia*. Two very similar Nearctic species of the former genus are most easily separated by this means, as are several species of *Euparyphus*.

I hope that one comparison with the finest series of handbooks previously produced will not be considered overly critical, any more than Trollope's comment in his Autobiography that he considered Pride and Prejudice the greatest English novel until the publication of Henry Esmond could be considered a denigration of Miss Austen's talent. The previous series is of course the British Handbooks – those I have used extensively are invariably among the most valuable aids to a study of the world fauna of the groups concerned. The present work, however, includes an outline of world distribution of some of the genera and of all of the species of the region. I consider this a very valuable addition. It shows that of the 47 species of Stratiomyidae occurring in northwestern Europe (13 of these are recorded north of the Arctic Circle) only five are presently known to be Holarctic; in most families the percentage of Holarctic species is much higher. Three of these species (two of *Microchrysa* one of *Sargus*) have larvae in dung or

decaying plant material and have very probably been introduced into North America by human agency. One, *Nemotelus nigrinus* Fallén, occurring in swamps and on moors, and with unknown larvae, is almost certainly naturally Holarctic. The author is to be commended for establishing the synonymy of *Berkshiria albistylum* Johnson and *Pseudowallacea hungarica* Kertesz, which is both unexpected and inexplicable on the basis of known distribution, habits, and apparent abundance of the species. It is unfortunate, however, that the synonymy was not more clearly indicated for the benefit of recording journals – perhaps future volumes will indicate nomenclatorial changes in a more conspicuous manner. I am surprised, however, that the apparent synonymy of the Nearctic *Oxycera centralis* Lw. and the Palaearctic *O. freyi* Lindner (=*O. centralis* Frey *nec* Lw.) is not mentioned. Specimens of *centralis* Lw. agree well with the author's figures of thorax, abdomen and male terminalia of *freyi*; I would, however, prefer to compare the wing microtrichia of the two forms before formally proposing synonymy.

A few minor discrepancies between keys and descriptions have been noted. In the key *Beris vallata* (Forst.) is said to have the abdominal pubescence black; the description correctly indicates that this applies only to the male. In the key *Oxycera freyi* is said to have the scutellum wholly yellow; it is described, and illustrated, as having the scutellum brown with a pale spot.

It would be a pity to end a review of such an outstanding work on a negative note. The format, paper, printing and binding are beyond reproach.

J.R. Vockeroth
Biosystematics Research Institute
Agriculture Canada
Ottawa

• • • • • • • • •

Mites Injurious to Economic Plants. Lee R. Jeppson, Hartford H. Keifer, and Edward W. Baker. 1975. University of California Press, Berkeley, Los Angeles, London. xxiv + 614 pp., + 64 pp. of black & white photographs. Price $30.00.

This book is intended as a digest of worldwide information on mites injurious to plants used for food, fiber, and aesthetic purposes. It is designed for use by basic and applied researchers, students, agricultural advisors, growers, and pest control operators. The first 6 of the 13 chapters provide a background on the classification, morphology, and biology of mites; on the population ecology, chemical control, and biological enemies of phytophagous mites; and on mites as vectors of plant diseases.

The introductory chapter is inadequate and obsolete. Much of the modern literature is not considered, for example, the series of outstanding, long-known works by Grandjean, Zachvatkin, and van der Hammen on the morphology, phylogeny and classification of mites. Chapters 2 and 6 are well presented, though naturally somewhat overlapping in content. There are relatively numerous typographical errors and several lapses, e.g., the Pyemotidae placed in the Eupodoidea, and *Balaustium* in the Anystidae.

Chapters 7 through 13 attempt to compile, with varying degrees of completeness, the world's knowledge on each of the acarine families containing economically important phytophagous mites and on the great majority of species known to injure economic plants. The genera of the Tetranychidae, Tenuipalpidae, and Eriophyoidea are keyed. The information for each mite species comprises general distribution and host preferences, nature of the plant injury produced by the mite, biology and life history, control methods, and distinguishing morphological characters. The last of these is of limited use, and keys to the included species would have been more practical.

Chapter 7, on Tetranychidae, presents a classification and key to genera that are essentially seven years old. The key includes only 42 of the 50 genera described through 1972; more understandably, it excludes 10 more genera described in 1973-74. It gives the wrong author for three generic names, the wrong name for two genera, and includes several other errors. No reference is made to a series of recent, challenging works by Mitrofanov and colleagues, dating back to 1968. The prelarval instar of spider mites, known since 1948, is not mentioned.

Chapter 8 is a very useful digest on injurious species of spider mites. Some inconsistencies are: *Petrobia* is characterized to have dorsal setae not set on tubercles, yet in one of the two subgenera these setae are on tubercles; larvae of *Petrobia apicalis* are said to produce silk and disperse by ballooning, yet it is stated earlier that no members of the Bryobiinae do this; species of the subgenus *Reckiella* are said to feed on monocotyledonous plants, but *R. gossypii* and *R. mcgregori* feed primarily on dicots. A few more of the useful guides to tetranychids for various parts of the world should have been cited, e.g., Baker and Pritchard, 1962 for Central America, and Thewke and Enns, 1970 for Missouri. Unfortunately, the major contribution of Meyer, 1974, with a more complete key to the world genera, was too recent to consider. Chapter 8 ends with three lists of species treated in previous major works (English only). For the largest, by Pritchard and Baker, 1955, only 86 of the 135 species treated and keyed are listed, and some of the most economically important are omitted, e.g., *Tetranychus canadensis*, *T. mcdanieli*, *T. pacificus*, and *T. Schoenei*.

Chapter 9, on Tenuipalpidae, is less serviceable than those on Tetranychidae. No general, labelled figure is provided showing the nomenclature of the setae and other structures used taxonomically. The key excludes three genera described from 1959 to 1972, and the text disregards a series of useful biological and taxonomic works published by various specialists abroad during the same period (e.g., Collyer, Meyer and Ryke, Chaudhri, Pegazzano and Castagnoli). The classificatory concepts of Mitrofanov, 1973, who proposed about 15 more genera, was apparently too recent to consider. Patterns in host specificity, more definite among the genera of Tenuipalpidae than in the Tetranychidae, are not discussed. A couple of species of *Pentamerismus*, known as pests of conifers, are not included.

In chapter 10, on Tarsonemidae, the most recent reference is 1966, and important biological and taxonomic contributions by Schaarschmidt, 1959, Beer and Nucifora, 1965, Karl, 1965, and a series of papers by Suski, 1965-1972, among others, are not mentioned. The generic concepts of Beer and Nucifora are used, though this work is not cited. A defence of attempts to classify the Tarsonemidae, based on male characters, is unreasonable and fails to recognize that the taxonomic problems in this group are similar to those in related families. The section on bionomics is also antiquated, and misleading in referring to pupae and nymphs, to only slightly eversible cheliceral stylets, and to feeding restricted to plants. The brief diagnoses for genera and species are inadequate, particularly for the adult female. *Hemitarsonemus tepidariorum*, a well-known pest of ferns, is not included.

Chapter 11 treats several families of lesser economic importance. The Pyemotidae logically should have been considered with the related Tarsonemidae, and the two families are not mutually distinguished sufficiently in either chapter. References to a "thumb" with the claw on tarsus I, to a "femurgenu" having one to three setae in the same species, and to the "tergum of the Hysterosoma III", exemplify the imprecision of terminology and statements in this section. The description of Penthaleidae would not distinguish it from Eurodidae, or even Rhagidiidae. Twice on p. 319, *Penthaleus major* is indicated to lack the third nymphal instar, which is mentioned on p. 320. On p. 322, four to five nymphal stages are claimed for *Halotydeus destructor*. On p. 324, *Caloglyphus* is used rather than *Sancassania* which has been recognized as the correct name for 15 years.

The book ends on a stronger note, with chapters 12 and 13 being useful reviews of the Eriophyoidea by Mr. Keifer. In 12, however, the treatment is once again provincial, with inadequate consideration given to the ideas of Farkas, Boczek, and particularly Shevchenko. Here was a good opportunity to bring Schevchenko's (1970) intriguing speculations on the function of eriophyoid structures to a wide, English-speaking audience. For example, the function of opisthosomal microtubercles suggested by Schevchenko is more probable than that given in the text. Keifer's thoughts on the loss of legs III and IV, and on not recognizing one of the immature instars as the larva, are inadequately documented and do not pertain to similar trends evident in related families of prostigmatic mites. Morphological differences between eriophyoid and tetranychoid mites are overemphasized. The homology of structures is obscured by the continued use of imprecise, outdated terms in the Eriophyoidea, e.g., "lateral foretibial spur" for one solenidion, and "claw" for another. Speculations on repeated, independent reacquisition of the gall-living habit are stated definitively, but are premature until the eriophyoid taxa are given a rigorous phylogenetic analysis. The reader's interest in the wealth of other useful information given in chapter 12 may become dulled by unnecessary verbosity and repetition.

Chapter 13 is a very good review of most of the economically important species of Eriophyoidea. However, only brief mention is made of *Nalepella*, which contains several species of economic importance in North America and Europe, according to several authors not cited in this book (e.g., Boczek, 1962, Löyttyniemi, 1969, and Marshall and Lindquist, 1972). The exciting potential of using eriophyoids as beneficial biological control agents of weeds was reported too recently (1974) for discussion. But references to another beneficial value of eriophyoids, as an alternative source of food for some predatory mites used in the integrated control of spider mites, should have been included (e.g., Collyer, 1964, and Hoyt, 1969).

Appendix 3 contains synoptic keys to the genera and higher taxa of Eriophyoidea, by R.A. Newkirk and H.H. Keifer. These authors digress on p. 562 to justify their previous, contested actions regarding type-species of generic names, ostensibly to follow the International Code. Elsewhere, but not so obviously (p. 591), they attempt to defend why they *don't* follow the Code with respect to use of family names and their authors. This reminds one of Keifer's own criticism, earlier in the book (p. 331), about Nalepa's inconsistent use of the Code. The keys, to approximately 114 genera, are not easy to use, even for a specialist. Couplets 3 and 4 to the subfamilies of Eriophyidae, and 2 to the genera of Cecidophyinae are examples of difficult alternatives; there are others.

The quality of text figures is generally satisfactory; a few are not well oriented, and some are too enlarged. Capital letters on the figures are switched to lower case in the captions. Some captions are inaccurately descriptive (e.g., p. 134). Among the plates at the back of the book, the photos of mite injury are very helpful. The quality of about 20% of the others is so poor that they should have been excluded.

The book was unfortunately announced prematurely in several American entomological journals as consisting of 528 pages and selling for $20. It was issued nine months later (on October 21st), with its greater size and price. The limited usefulness of the book may not justify the price for some individuals.

In summary, the positive reference value and great deal of effort put into chapters 2 to 8, 12 and 13 are offset by outdated accounting for non-North American work, by use of imprecise or outmoded terminology, by impractical identification aids to the species, and by some uneconomical organization of narrative and figures. The book is, therefore, recommended with reservation as a supplementary reference, but not as a standard text, in agricultural acarology.

Evert E. Lindquist

Mites of Moths and Butterflies. Asher E. Treat. 1975 (issued December 15th). Cornell University Press, Ithaca and London. 362 pp. Price $35.

This book is the first comprehensive treatment of the mites associated with Lepidoptera. It is intended for use primarily by amateur and professional lepidopterists, but also by acarologists, parasitologists, and others interested in acarine associations with other animals. Although its coverage is worldwide, much of the collection records and most of the observations on living mite-moth relationships are by the author, who is the leading authority on this subject.

In three introductory chapters, Prof. Treat presents a history of early discoveries; discusses equipment and methods for collecting, observing, and handling mites; and reviews the structure, development, and classification of mites in general. He then deals with the mesostigmatic mites in chapters 4 through 8, according to whether they are vagrants, transients, stowaways, or more specialized bilateral or unilateral occupants of the tympanic recesses, or "ears", of moths. He discusses the parasitengone prostigmatic mites in chapters 9 and 10, other families of Prostigmata in chapter 11, and astigmatic mites in the final chapter. In all, nearly 100 species of mites, recorded as associates of nearly 400 species of lepidopterans, are briefly characterized and most illustrated. Information is given on their geographic distribution, location on hosts, and, when available, biology and behavior in association with their hosts. Three appendices provide keys for the tentative recognition of both living mites as seen under a stereomiscroscope and for slide-mounted mites as seen under a compound light microscope, and lists of both lepidopteran host species with the mite species recorded from each, and acarine species with the hosts known for each.

Chapter 2, on equipment and methods, is excellent; in it, Glyptal should be added as a preferred sealing compound for preparations in Hoyer's medium (see Travis 1968). The emphasis on making observations of living material, and on keeping careful records of all data is laudable. Chapter 3, on mites in general, is well done, though brief; its major shortcoming is an overemphasis on a generalized mesostigmatic mite body plan, which does not apply wholly to the acariform orders of mites. Because of this, some basic terms and characteristics of Acariformes are not mentioned (e.g., sejugal furrow, prodorsum, solenidia, prelarval instar), nor is it clear that other structures of Mesostigmata are not common to Acariformes (e.g., corniculi, deutosternum, sternal shield).

In the characterizations of different mites in chapters 4 through 12, the following minor corrections and additions could be made for a subsequent edition of the book. The movable chela has four or more teeth in nymphal and female *Dendrolaelaps* (p. 74), and is not unidentate as shown in fig. 24c. The chelicerae in Macrochelidae characteristically have a prolonged, brushlike appendage (see fig. 26e). For the Phytoseiidae (pp. 77-83), Chant et al. (1971, 1974) more recently have applied the same setal notation for the body dorsum as is used for the Ascidae in chapter 5. On p. 90, *Blattisocius* mites are closely related to *Lasioseius* rather than to *Proctolaelaps*, and ameroseiids resemble phytoseiids more than they do ascids. The authors of family-group names in the Erythraeidae, according to the International Code of Zoological Nomenclature, should be Erythraeinae Robineau-Desvoidy, 1828 (p. 193); Balaustiinae Grandjean, 1947 (p. 194); and Leptinae Billberg, 1820 (p. 217). Another term for "urstigma" (p. 227) is "Claparède's organ", but not "uropore" which is another term for the anal opening mentioned in the next sentence (these structures are correctly labelled in fig. 119). On p. 269, the family-group name Pygmephoridae should have Cross, 1965 as author, according to the Code; and the different number of segments on leg I of pygmephorid versus pyemotid mites applies to adult females only. On p. 283 and elsewhere, *Caloglyphus* is used rather than *Sancassania* which, as a senior synonym, was brought into correct usage by Samsinak in 1960. The accepted common name of *Acarus siro* is the "grain mite" (p. 287), whereas "cheese mite" applies to *Tyrolichus casei* Ouds. All vertical setae are characteristically absent on the propodosoma in *Dermatophagoides* (p. 293). The author

casts justified doubts on the currently accepted identity of several species of mites, e.g., *Proctolaelaps cossi* (Dugès) and *Trombidium holosericeum* (L.). To these should be added *Proctolaelaps pygmaeus* (Müller), whose identity with *P. hypudaei* (Ouds.) on p. 138 is far from certain.

Prof. Treat effectively scatters throughout the book intriguing, unanswered questions, particularly on the dynamic interrelationships between mites and lepidopterans, that cannot help but stimulate readers to want to take a crack at answering some of them. This, of course, is the unspoken end of which the book is to serve a means. The author's fascination with this subject is expressed appealingly at the end of nearly every chapter; for example, chapter 9 ends with: "It would be hard to name a group of animals so abundant and accessible, so attractive and so full of behavioral interest, that is as little known and understood as are the erythraeids, particuarly those of the New World."

Some readers may find a few passages of this book rather anecdotal; but I fully concur with Prof. Treat's last statement in chapter 4: "So little is known about any moth or butterfly mite that experience with even the commonest can be illuminating, and it would be a pity indeed if the current supercilious contempt for 'anecdotal biology' should keep anyone from turning on the light." The author's imaginative descriptions of microcosms are at their best in his guiding the reader "through the sculptured caverns of the insect's ear", complete with map.

Prof. Treat uses footnotes liberally to add absorbing sidelights to topics. He even imparts interest to scientific names of mite genera and species by giving their meanings and derivations. Perhaps he is correct, on p. 288, that the name *Thyreophagus* refers to the feeding of these mites upon sclerotized tissues or shields; but *thyreos* may refer alternately to a characteristic of males of this genus, which differ from females in having a large oblong shield on the hysterosomal dorsum.

Some readers may object to the amount of raw collection data interspersed throughout the book. In some cases, these are given in separate paragraphs in smaller type. The author opines that, at present, the information gained from every mite found on a lepidopteran should be made a part of the record available to specialists, and that only through the accumulation of such records can associations be appraised. One cannot help but agree.

The text throughout is remarkably free of mechanical errors; only about 10 typographical errors were noted; one figure (23b) is upside-down. Several figures are partly inaccurate: 66d shows an apparently multidentate movable chela that is actually tridentate; the first forsolateral hysterosomal seta is omitted on the left side of fig. 123; the capitate "pseudostigmatic organ" is omitted in fig. 130. The quality of the text figures is generally good, even though about half of them are reproduced from works by other specialists; of these, only a few are overly reduced. The price of the book is rather high considering its size and all figures but 5 (four halftones, one colored frontispiece) being line drawings. However, the book is being offered at a 20% discount, on prepaid individual orders only, through Cornell University Press, 124 Roberts Place, Ithaca, N.Y. 14850.

Prof. Treat urges lepidopterists and others to contribute to this subject. His book is the first major step, and I am optimistic that it will stimulate others to follow suit. It is a pleasure to recommend this book, without reservation, not only to lepidopterists and acarologists but to a broader spectrum of biologists, ecologists, and naturalists interested in microcosmic worlds. Prof. Treat has indeed imparted the magic of the microscope, as he uses it, to this book, ". . . not that it makes little creatures larger, but that it makes a large one smaller."

Evert E. Lindquist
Biosystematics Research Institute
Agriculture Canada, Ottawa

The Swallowtail Butterflies of East Africa (Lepidoptera, Papilionidae). R.H. Carcasson. 1960. Reprinted in 1975 by E.W. Classey Ltd., Park Road, Farington, Oxon, SN7 7DR, England. 30 pp., 11 pls., paper cover, $4.32.

This book, originally written for the East Africa Natural History Society, is an identification guide to 43 of the 80 species of Swallowtails of Africa.

The book includes a short introduction, a key to species based on structural characters, an account of each species, and plates with line drawings of males and where different, females and subspecies. Unfortunately, the text for each species and subspecies is very brief, usually including only a short note on distribution and on the diagnostic characters of the adults. The inclusion of more information on life histories, habits and habitats, topics skimmed over in other identification guides on the region, would have enhanced the book and given it more appeal to lepidopterists from other areas.

J.D. Lafontaine

• • • • • • • • • •

Key for the field identification of apterous and alate cereal aphids with photographic illustrations. Ministry of Agriculture, Fisheries and Foods, Plant Pathology Laboratory, Hatching Green, Harpenden. Published by the Ministry of Agriculture, Fisheries and Food (Publications), Tolcarne Drive, Middlesex HA5 2DT, 1974. $2.10.

This useful edition is a unique assemblage of coloured photographs and line drawings that supplement a field key to the identification of 8 cereal-infesting aphids. It consists of 11 thick plastic-coated sheets (22 x 13.5 cm) held together with a coil binding. For field use, it has the advantage of being waterproof and flexible. Its size makes it useful as a backing for note taking, but it is too large to carry in a shirt pocket.

Anyone who uses the information provided by this booklet should be able to identify cereal aphids in the field. On two facing pages there is a key prepared by R.N.B. Prior. It consists of 14 alternatives using features that can be seen by the naked eye or with a pocket lens; e.g. colour of body and appendages, length of siphunculi and cauda, and shape of body. The key is followed by a coloured photograph of each species made from transparencies taken by J.R. Morrison. Opposite each photograph is a drawing of each species. The key features are indicated on the drawing, which is an outline replica of the coloured figure. Both the photographs and figures are excellent.

In couplet 10 (9) of the key there appears to be a slight error. Part of it reads "with dark area behind a well marked apical flange". I believe this should read "with dark area ahead . . . ".

In 1973, a key for the field identification of the common aphids on sorghum and grains in Texas was published by the Texas A & M University. Like the British key it makes use of colour and other features that can be seen at least with a pocket lens, but the paper on which it is printed is not as durable as the plastic.

The British Ministry intends to develop similar field guides to other groups of insects should this one prove useful. In New Brunswick and Maine such an illustrated key to potato aphids has been used for many years by potato extension specialists and survey teams. At this time, my plans to produce this, also in a plastic edition, have been delayed because of its cost.

Field guides that can be used easily by the non-specialist are indispensable to survey teams and are in great demand. I hope that this useful British guide to cereal aphids will be followed soon by others of equal calibre.

M.E. MacGillivray
Agriculture Canada
Fredericton, N.B.

The Odonata of Canada and Alaska Volume Three, by Edmund M. Walker, Professor Emeritus of Zoology, University of Toronto, Honorary Curator of Zoology, Royal Ontario Museum, and Philip S. Corbet, Professor of Biology, University of Waterloo, Waterloo, Ontario. XVI + 307 pp., 45 pls. University of Toronto Press, June 14, 1975. Price $25.00.

The present volume marks the completion of a three-volume faunistic monograph of the dragonflies of Canada and Alaska. Volumes One and Two, with Professor Edmund M. Walker as author, were published in 1953 and 1958, respectively. Volume One deals with the suborder Zygoptera and Volume Two with four families of the Suborder Anisoptera (Aeschnidae, Petaluridae, Gomphidae and Cordulesgastridae). Volume Three, co-authored by Professor Walker and Professor Philip S. Corbet, covers the remaining three families of the Anisoptera (Macromiidae, Corduliidae and Libellulidae) which collectively form the Superfamily Libelluloidea.

As explained in a "Foreword" by Dr. Glenn B. Wiggins, Professor Walker, when forced by illness to give up his own work on Volume Three, had the good fortune to enlist the aid of Professor Corbet who agreed to undertake its completion. As the volume now at hand bears witness, students of Odonata have profited greatly by this happy arrangement. Unquestionably, it was no easy task for Professor Corbet to bring together the large body of information gathered over many years by Professor Walker, add to it the findings of other workers, plus his own, and to collate the whole, as he has done, into a format and style so in harmony with that of the two preceding volumes.

In a Preface and Introduction to the book, Professor Corbet makes acknowledgments and clarifies the sources of the information that is included. Illustrations of wing venation (especially as they apply to the Libelluloidea) are provided, with venational terminology according to the Tillyard-Fraser system which was followed by Professor Walker in Volume Two. Certain morphological terms and measurements are also discussed, especially as they relate to the descriptions that follow.

The systematic account, which is the main portion of the volume, begins with a definition of the Superfamily Libelluloidea and keys to its three component families: Macromiidae (2 genera, 4 species), Corduliidae (7 genera, 28 species) and Libellulidae (11 genera, 44 species). Within each family there are keys, for both nymphs and adults, to the genera and species, with detailed descriptions of each, supplemented by numerous illustrations and notes, the latter giving much new information on habitats, distribution, adult and nymphal behavior, variations, seasonal occurrence and abundance. Everywhere, information of this sort, much of it drawn directly from their own field experience, attests the authors' conviction of the importance of such data in the definition of species. Readers, and especially those who are collectors, will find in the "Field Notes" accompanying each species a wealth of information to aid them in their own activities. A noteworthy feature of the volume is the fact that of the 76 species included, nymphs of all but eight are known and described therein. For the complete monograph it is also noted that of the 46 genera that comprise the Canadian dragonfly fauna no genus remains unknown in the nymphal stage.

Volume three accounts for approximately one-third the total (193) number of species included in the monograph. Among the 20 genera with which it deals, 10 are represented by single species and two others by two species each. The four largest genera are *Somatochlora*, *Sympetrum*, *Libellula* and *Leucorrhinia*, represented by 18, 13, 10 and 7 species, respectively. The accounts of three of these genera are especially noteworthy: *Somatochlora*, which was monographed by Professor Walker just fifty years ago, because it is one of the largest of the Canadian genera of dragonflies and at the same time is entirely Holarctic and predominantly Canadian; and *Sympetrum* and *Leucorrhinia* because new information and illustrations have provided an improved classification of the species in these two genera, and in the former a new arrangement in which the species are divided into three "sections" on the basis of venational and genitalic characters.

In this volume no new nominal taxa are proposed and there is no new specific synonymy. Other changes are minimal. *Sympetrum madidum* is referred to *Tanetrum* which is treated as a subgenus of *Sympetrum*, following some recent authors. Where variation within a species is observed it is carefully documented with measurements or other data which may be associated with altitudinal or geographic distribution of the species, egs. *Epitheca princeps*, *E. cynosura*, *Somatochlora albicincta*.

The volume concludes with lists of Addenda and Corrigenda for volumes One and Two, an extensive Bibliography, and indices by Subect, Author, and Odonata.

This work maintains the same high standard of quality set by the two preceding volumes. Like them it is a scholarly and authoritative account written however in a fashion that should appeal to all who have more than a passing acquaintance with the Odonata. It is, of course, indispensable to all students of Nearctic Odonata, and it should prove of great interest and value to a wide range of other workers who are concerned with many matters relating to the freshwater environment.

G. Stuart Walley

• • • • • • • • •

The World of the Honeybee, by Colin G. Butler. Rev. ed. 1974. 226 pp. + 42 pl. Published by the New Naturalist Collins, St. James Place, London.

This is a valuable reference book for entomologists, biologists, beekeepers and students of natural history. In this revision (last revision 1962) he had incorporated new and revised theories, drawing rather heavily on his own research, that of Dr. K. von Frisch and other European research workers for facts. The book covers most of the topics associated with the honey bee, the major ones being origin and distribution of various species, pheromomes, queen substance, division of labor, food foraging behaviour, the dance language and other forms of communication. He also dwells on the many mysteries of the honeybee, that are gradually being interpreted, e.g. swarming, colony organization, measurement of "distance", floral attraction, and various senses viz. time, taste, smell, color vision and "hearing", but where unanimity between researchers is often lacking.

Numerous high quality photographs enhance the explanations in the text which makes this book interesting even to the lay reader. Although an index of authors is given, a complete list of references would have been more meaningful to those scientists wishing to delve further into a particular subject.

P. Pankiw
Agriculture Canada
Beaverlodge, Alta.

• • • • • • • • • •

"Sometimes, the results of small research seem so obvious that one wonders whether they deserve to be considered as part of science and technology. They do. Somebody has to think, to experiment, to evaluate results, and somebody must spread the news.

Unfortunately, while there are thousands of journals devoted to the publication of big research projects, there are very few indeed devoted to small research. Big research interests readers who can afford journals in the first place, and who are more likely to buy assorted supplies and equipment than readers concerned with small research projects. The trouble with small research is . . . well, that it is small. Can you imagine someone publishing (or advertizing in) *The Annals of Small Research*?"

from *ceres*, FAO, March-April 1975

Schedl, Karl E. 1974. Bibliografia mundial sobre Scolytidae e Platypodidae. Junta de Investigações Científicas do Ultramar, Lisboa. Vol. I° XIX and 490 pp. Vol. II, 485 pp. Price $200. U.S.

It is most likely that printed scientific bibliographies will be replaced in the future by computer banks with terminals in major libraries and research laboratories. Both the economics of the publishing industry and the expansion and specialization of research dictate such a course. Thus, the present bibliography of the bark and wood boring beetles of the world may well be among the last of its kind. It is a distinguished work, as would be expected of its author, Dr. Karl E. Schedl, formerly professor at Vienna University and the author of *Scolytidae* und *Platypodidae Afrikas* (1962). But it too illustrates the current problem with all bibliographies. It is best on the early entries, and its closing date of 1968 (with a few entries to 1970) precluded the burgeoning literature on pheromones with radical implications in pest control, systematics, and biology-behavior studies of these two families. The necessary sequels will be either in electronic systems or regional works such as the bibliography on secondary attraction of North American scolytids by *Borden* and *Stokkink* (1971).

Dr. Schedl has continued the bibliographies of bark beetles published by Klein and Tredl in 1911 in the journal *Entomologische Blätter* (which contains more than 1,800 references) and by Klein in 1939 in *Stettiner Entomologische Zeitung* (which has more than 4,000 references). The present two volumes contain over 13,000 references. Dr. Schedl is uniquely equipped for this task by his industrious, indefatigable, truly international studies of over 53 years, which are represented here by at least 280 entries from 1922 to 1970 in publications from the Philippines to Moçambique, besides all the standard journals. Like his bibliography, Dr. Schedl is also probably the last of a kind – the entomologist who could take whole wordwide families for his speciality.

The system used here is explained in a Portuguese-language introduction (which unfortunately has no summary in another language), i.e. alphabetical author listing, then chronological arrangement of entries. The titles are given in the original, and most of the "rarer" languages are translated into German, French, or English; titles in non-Latin alphabets are translated, and not translitered, with notation of the text language. Explanatory notes are in German or English. A final section includes anonymous entries from 1811. The list of abbreviations for sources used covers 85 pages. There are some unpublished reports and theses, particularly from North America, and some multigraphed material from FAO.

The only serious drawback of this work is the lack of a subject index, which should have been made to the generic if not the specific level and included at least broad geographical categories. This need could be filled by the separate publication of a subject index.

Such a comprehensive work could not be without errors. There are the inevitable misprints, though surprisingly few. In the first volume on p. 103, there is reference to a non-existent article in Bio-Science 1967. On p. 131 W.D. Bedard is given as author in place of L. Bedell. On p. 159 several works by J.H. Borden are omitted. On p. 190 the title "Oleoresin production in the resistance of ponderosa pine to bark beetles" of R.Z. Callaham's thesis is not given. There are no entries from the work of A.S. Isaev in Krasnoyarsk. In the second volume, on p. 119 the author, Josef Nosek, is not given for eight references, which thus appear to belong to D.M. Norris. And there are other errors and omission of this sort.

In summary, although it is too expensive for the average private collection, the work certainly belongs in the entomological section of serious reference and research libraries.

J.A. Rudinsky
Oregon State University
Corvallis, Oregon 97331

HEDLEY GORDON JAMES
1902-1975

Hedley Gordon James died at Belleville on June 4, 1975, after a brief illness.

Hedley was born in Brighton, England, and emigrated to Canada at an early age. He graduated with his B.A. degree from McMaster University in 1930 and was employed that year at the Dominion Parasite Laboratory, Belleville. While at Belleville, he earned his M.A. from the University of Toronto in 1934.

During his 37 years at Belleville, his working career took him into many fields but no matter what problem was attacked, the results achieved by his quiet and competent way were of the highest quality. He was a recognized authority in the taxonomy of Collembola, the biological control of the corn borer, and in the ecology and distribution of the praying mantis. In the latter part of his career he devoted his studies to the ecology and natural enemies of mosquitoes, black flies, and tabanids. Hedley was the author or co-author of 37 scientific papers and numerous reports.

His wide interest was not confined to his work. He was active in his local church and the community. He held most of the executive positions in the Quinte Field Naturalists. He was an accomplished photographer and his Christmas cards depicting some local scene were always a delight. He was musically inclined and played the violin in the Eastern Ontario Concert Orchestra.

Hedley's keen mind, indefatigable spirit, and his interest in the outdoors and the secrets of nature did not dim after his retirement. He continued to write papers, to compile check lists of the Quinte fauna and flora and to photograph insects and flowers right to the last. The field of ecology in general and entomology in particular has lost a dedicated friend and worker.

Murray G. Maw
Agriculture Canada
Regina, Sask.

SCIENCE POLICY

The Science Policy Committee seeks direction from the membership as to the current issues in Science Policy that the Entomological Society of Canada should be considering. For example, what do you consider are the most critical issues in entomology at present? Which ones do you think should receive priority attention? Can you make suggestions as to how you think the Society should take action? If you think that a study group should be set up to report on a specific topic, will you volunteer to serve on the group? Can you suggest the names of informed people on the topic who might be willing to serve? Your cooperation and ideas are essential if the Society is to continue to be effective in its endeavours to influence science policy makers.

Please send replies to E.G. Munroe or A. Hudson, Biosystematics Research Institute, K.W. Neatby Building, Carling Avenue, Ottawa K1A 0C6.

FINAL NOTICE

ANNUAL MEETING

Entomological Society of Canada

Entomological Society of Ontario

24-27 October, 1976
Hotel Toronto
Toronto, Ontario, Canada

Feature Symposium, 25 October

Pests, Policies, and Progress – Is Canada Going to the Insects?

Submitted Papers, 26, 27 October

Contributors must complete and submit the adjacent form to Dr. R. Trottier, not later than 1 May 1976.

Special Interest Groups

Informal conferences on the following specialized topics are being organized: insect physiology, pest management, medical entomology, insect behaviour, and toxicology. Members interested in participating, please send the Special Interest Group tear sheet to Dr. R. Trottier not later than 1 May 1976.

Photo Salon

Contact Miss June Herbert, Agriculture Canada Research Station, Kentville, Nova Scotia. Watch for June 1976 issue.

Board of Directors' Meetings and Annual General Meetings are scheduled on 23, 24, 26 and 27 October.

ANNUAL MEETING

At our meeting this year the first day will feature Symposia dealing with the importance of entomology to people and the manpower in entomology required to meet Canada's demands. The pro_ram is developed as follows:

9:00 a.m.-12:00 a.m.

Symposium. **Pests, Policies and Progress: Is Canada Going to the Insects?**

Chairman: Dr. M.E. MacGillivray, President Elect, Entomological Society of Canada

1. The Importance of Entomological Research – International

   Dr. E.H. Smith, Head, Department of Entomology and Limnology, Cornell University

2. The Importance of Entomological Research – National

   In Agriculture – Dr. C.R. Harris, Research Institute, Agriculture Canada, London, Ontario

   In Forestry – Dr. G.L. Baskerville, Faculty of Forestry, University of New Brunswick

   In Health – Speaker to be announced

1:30 p.m.-5:00 p.m.

Manpower in Entomology

Chairman: Dr. G.S. Cooper, President, Entomological Society of Canada

1. Professional Manpower Requirements for Entomologists in Canada

   Dr. F.L. McEwen, Department of Environmental Biology, University of Guelph

2. Panel Discussion (10 minutes per participant)

   The following have been invited:

   Hon. E. Whelan, Minister of Agriculture
   Hon. R. Le Blanc, Minister of Fisheries and Forestry
   Hon. F. Miller, Minister of Health (Ontario)
   Mr. C. Craig, Past President, Canadian Agricultural Chemicals Association
   Mr. J. McGuigan, Director, Ontario Federation of Agriculture
   President, Ontario Fruit and Vegetable Growers' Association
   President, Canadian Forest Products Association

   Rapporteur: Dr. F. Maine, M.P.

5:30 p.m.-7:00 p.m.

Informal discussion, Wine and Cheese Party

RADIO-SENSITIVE ENTOMOLOGIST RETIRES

Dr. W.F. Baldwin, past president of the ESC, retired recently from his position as head of the Biology branch at Chalk River Nuclear Laboratories, after 20 years of service with Atomic Energy of Canada. Dr. Baldwin was born in St. Thomas, Ontario in 1913. He received his B.S.A. from Ontario Agricultural College, Guelph, his M.A. from the University of Western Ontario, majoring in Entomology, and his Ph.D. in biology from the University of Toronto. He worked for four years as an agricultural assistant at the CDA station in Belleville, enlisted in the Canadian Army in 1943, and rejoined CDA in 1945. Ten years later, Dr. Baldwin moved to Chalk River.

His early work with AECL consisted of studies of x-ray effects on insects, including the particularly high resistance of these organisms to killing by radiation. Another highly significant aspect of Dr. Baldwin's work was an investigation of the effectiveness of different doses of radiation in producing mutations, especially using the hereditary changes in eye colours induced in a parasitic wasp by irradiation. Such work has had important implications in setting safety standards for radiation protection.

Dr. Baldwin also developed methods for radioactive tagging of insects to study their spread, with a view to control. Of particular interest is his work in Venezuela, since 1961, and later in Argentina, where these methods were applied to problems of combatting the insect carrier of Chagas' disease. In 1966-67, he spent a year in Greece with the International Atomic Energy Agency and the Greek Ministry of Agriculture, studying methods of control of the live fruit fly. In Canada, he has investigated the mobility of black fly populations, and has advised on the programs carried out to reduce their numbers.

The 1971-72 president of the ESC has served on international and national boards and committees such as a task group of the International Commission on Radiological Protection on ionizing radiations with respect to mutations, the Advisory Committee in Entomology of the Defence Research Board and as chairman of the Science Policy Committee of the ESC.

Dr. Baldwin lives at 17 Cabot Place, Deep River, Ontario.

MURRAY FALLIS TOO . . .

A long-time member of our Society, **Murray Fallis**, retired in July from the Department of Parasitology, University of Toronto, with the rank of Emeritus Professor. During the first four months of the year he had been an Erskine Fellow at the University of Canterbury, Christchurch, New Zealand. While there he discovered, with associates at the university, a new species of *Leucocytozoon* in penguins and demonstrated its development in three species of simuliidae, one of which is new. Dr. Fallis is torn between a leisurely continuation of research on simuliids and blood protozoa and a similar pace on a farm outside of Toronto.

LABORATORY COLONIES OF INSECTS AND OTHER ARTHROPODS IN CANADA

A revised list (June, 1975) is now available for distribution. This will not be published as a supplement to the *Bulletin* but will be available to any member who requests one.

Please write: J.S. Kelleher, Research Program Services, Research Branch, Agriculture Canada, Ottawa, Ontario K1A 0C6.

MEMOIRS OF THE ENTOMOLOGICAL SOCIETY OF CANADA

No. 96 Revision of the genera *Paraphlepsius* Baker and *Pendarus* Ball (Rhynchota: Homoptera: Cicadellidae). 129 pp. illus. K.G.A. Hamilton.

Issued 9 December, 1975

INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE ANNOUNCEMENT

Required six months' notice is given of the possible use of plenary powers by the International Commission on Zoological Nomenclature in connection with the following names listed by case number: (see Bull. Zool. Nom. 32, part 3, 22nd September, 1975).

1003. *Chaitophorus* Koch, 1854 (Insecta, Hemiptera): designation of type species.

2060. *Xiphidium glaberrimum* Burmeister, 1838 and *Orchelimum cuticulare* Audinet-Serville, 1838 (Orthoptera); suppression; designation of *Orchelimum vulgare* Harris, 1841 as type-species of *Orchelimum* Audinet-Serville, 1838.

2089. *Hiltermannicythere* Bassiouni, 1970 (Crustacea, Ostracoda): designation of type-species.

2096. *Gecarcinus hirtipes* Lamarck, 1818 (Crustacea: Decapoda): proposed suppression.

2098. *Monstrilla intermedia* Kriczagin, 1877 (Copepoda, Monstrilloida): proposed suppression.

2107. *Polydrusus* Germar, 1817 (Insecta, Coleoptera): designation of type-species.

2109. *Notozus* Förster, 1853 (Insecta, Hymenoptera, Chrysididae): designation of type-species; *Elampus* Spinola, 1806: proposed suppression.

Comments should be sent in duplicate, citing case number, to the Secretary, International Commission on Zoological Nomenclature, c/o British Museum (Natural History), Cromwell Road, London, S.W. 7 5BD, England. Those received early enough will be published in the Bulletin of Zoological Nomenclature.

R.V. Melville
Secretary to the International Commission on Zoological Nomenclature

INTERNATIONAL REGISTER OF COMPUTER PROJECTS IN SYSTEMATICS

Sponsored By

The International Association For Plant Taxonomy, and
The Society of Systematic Zoology

CALL FOR INFORMATION ON PROJECTS, PROGRAMS AND DATA FILES

The above two international associations are the prime sponsors of an International Register of Computer Projects In Systematics. For the purpose of the Register, systematics includes taxonomy, biosystematics, evolution, and biogeography of all biological taxa. The Register also welcomes information about nonbiological data files of use to systematics, systematic information on computerized data files about living organisms, preserved organisms, experimental data, literature files, etc. We also welcome information on well-written and documented computer program packages (other than basic statistics) that are of value for systematic research and/or teaching. If you or a colleague use computers in systematics (or definitely plan to), please *write* to the Chairman of the Register, and *request* as many copies of the Register Questionnaire as you have separate projects or program packages. The Register will be computerized and available for customized search requests by September 1976. As demand warrants it, published summaries will also appear. This Register will be compatible with a similar Register for all of biology that Crovello is organizing for the American Institute of Biological Sciences.

Please address all suggestions, requests for information, and for Register Questionnaires, to: Theodore J. Crovello, Chairman, International Register, Department of Biology, University of Notre Dame, Notre Dame, Indiana 46556, U.S.A.

WANTED – AMATEUR ENTOMOLOGISTS

It is hoped that amateur entomology is not affected by the factors that have led to a decline in the number of professional entomologists in Canada. The Entomological Society of Ontario would like to encourage amateur entomologists and have more contact with them. To start, we must compile a list of names and addresses. We would like to know about anyone in Canada who, as an amateur, is interested in collecting insects, studying their habits, or photographing them. Amateur entomologists have a wide field to investigate and explore, and a much larger range of species to deal with than the economic entomologists.

These amateur entomologists will be contacted and it is proposed to circulate a newsletter introducing them to each other, to enternology society meetings, and possibly listing publications that would be of interest.

The success of this venture depends on the number of names and addresses that can be obtained. Please think about this, talk about it, enquire of your associates, then send me a list. This can be a two-way interaction. Last summer I gave a teenager information on where to buy Schmitt boxes, but he told me all about hairstreak butterflies in the area.

Robert J. McClanahan
Agriculture Canada
Research Station
Harrow, Ontario N0R 1G0

RECRUITMENT DRIVE: BUG A FRIEND

The decision of the Entomological Society of Canada to withdraw from the Biological Council of Canada means that the Governing Board has the added responsibility of effectively representing the membership in the development of relevant science policy in Canada. In order to do this successfully the Board must have the active support of all persons associated with Entomology. The membership committee is therefore asking all members to accept their share of the responsibility by taking time to recruit one new member for the Society.

Please address all enquiries to: Dr. Jeremy McNeil, Chairman, Membership Committee, Departement de biologie, Université Laval, Quebec G1K 7P4.

FORTHCOMING MEETINGS

The 1976 Spencer Memorial Lecture at the University of British Columbia will be held in the Biological Sciences building at 8:00 p.m. on Wednesday, March 31. The speaker will be Professor C.M. Williams of Harvard University. His topic is "Hormones, Genes and Metamorphosis".

Ninth Annual Northeastern Forest Insect Work Conference, 7-8 April, 1976, Sheraton Motor Inn, Electronic Parkway, Liverpool, N.Y. 13088.

Rapeseed Insects – Another Workshop On Insect Pests of Rape, similar to the very successful original meeting held at Saskatoon in January, 1974 has been set up by entomologists of Alberta Agriculture. Hugh Philip, Head of the Entomology Section of the Plant Industry Lab has set the dates for the workshop at April 13, 14 and 15, 1976 in the O.S. Longman Building, Edmonton.

"Analysis of Ecological Systems". 3rd Annual Biological Sciences Colloquium. The Ohio State University, 30 April-1 May, 1976. For more information write: Colloquium, College of Biological Sciences, Ohio State University, 484 W. 12th Ave., Columbus, Ohio 43210.

An International Field Workshop on Aquatic Invertebrates with Special Emphasis on the Hydracarina, or Water Mites, 31 May-12 June, 1976. Dr. Robert M. Crowell, St. Lawrence University, Canton, N.Y. 13617.

Canadian Botanical Association/Association Botanique Canadienne Annual Meeting 1976/Congrès Annuel, June 6 juin-June 10 juin, Bishop's University, Lennoxville, Quebec. Further information: A.N. Langford, Bishop's University.

A joint meeting of the Society of Invertebrate Pathology and the International Colloquium on Invertebrate Pathology will be held August 20-September 3, 1976, at Queen's University, Kingston, Ontario. The programme will consist of symposia, workshop, and submitted papers. Symposia topics include: Viruses of Invertebrates; The Application of Tissue Culture Techniques to Invertebrate Pathology; Epizooitiology of Invertebrate Diseases; Defense Mechanisms in Invertebrates; Biological Control. Registration information from: Dr. Peter Faulkner, Department of Microbiology and Immunology, Queen's University, Kingston, Ontario K7L 3N6.

SCIENTIFIC NOTES ACCEPTED BY THE CANADIAN ENTOMOLOGIST

Do you have something short, sweet, and important to the entomological world? If so, why not send it to The Canadian Entomologist which is now accepting Scientific Notes for publication? A Scientific Note should be no longer than three manuscript pages, double-spaced, with no more than one plate. The Notes will be assigned to the last few pages of an issue and printed consecutively, so that reprints might contain parts of the preceding and following papers.

EMPLOYMENT

POSITIONS WANTED

Ph.D. Oklahoma State University 1976, with major interest in Pest Management desires suitable position. Available immediately. Reference No. 46-2-76.

Ph.D. University of Sherbrooke 1975, presently PDF at CRFL, with special interests in ecology of forest insects, biological control, population dynamics, desires position in research and/or teaching. Please quote Reference No. 43-1-76.

Ph.D. desires research position related to insect toxicology or environmental toxicology. Experience: 8 years research in insect toxicology and related biochemical aspects, 1 year industrial advanced pesticide screening, 5 years and presently research related to various environmental problems.

Please direct all inquiries and correspondence to: A.G. Robinson, Chairman, Employment Committee, Entomological Society of Canada, Department of Entomology, University of Manitoba, Winnipeg R3T 2N2.

Do not direct inquiries to the Bulletin.

POSITIONS AVAILABLE

PDF position available in project on study of the behavioral aspects of blood and sugar hunger in mosquitoes of known nutritional status. If interested please write to Dr. Arden O. Lea, Department of Entomology, The University of Georgia, Athens, Georgia 30602.

BIOSYSTEMATIST. Position for an entomologist with demonstrated interest in systematics of parasitic Hymenoptera. Effective July 1, 1976. Ph.D. in entomology required. Appointment at level of Asst. Professor of Entomology and Asst. Entomologist in Expt. Sta. 11-mo. appt., ca. 90% research, 10% teaching. Activities include development of an independent research program in field of interest, supervision of an established museum of parasitic Hymenoptera in the Division of Biological Control, and teaching a course in insect morphology. Applications accepted until April 30, 1976. Submit curriculum vitae, transcripts, reprints, thesis summary, and names and addresses of five referees to John D. Pinto, Biosystematist Search Committee, Dept. of Entomology, Univ. of California, Riverside, Ca. 92502. The Univ. of California is an equal opportunity, affirmative action employer. Applications from women and members of minority groups are encouraged.

PERSONALIA

J.A. Downes has been appointed to the Editorial Committee of the Annual Review of Entomology. The Editorial Committee meets once a year, usually in the fall, to discuss the contents of the volume that will appear some two years later. Suggestions as to subjects and authors for consideration by the Committee will be welcomed.

Joe D. Shorthouse has been appointed Assistant Professor of Biology at Laurentian University, Sudbury, Ontario. He will be responsible for courses in general entomology, applied entomology, and insect ecology.

Dr. Richard J. Sauer, Associate Professor of Entomology at Michigan State University, has been appointed Acting Associate Director of the Michigan Agricultural Experiment Station effective October 15, 1975. He recently returned from a one year sabbatical leave with the Cooperative State Research Service, USDA, in Washington, D.C.

GRADUATE DEGREES

N.C. English. M.Sc. University of Manitoba
Thesis: A three generation study of effects of ingestion of the pesticides Abate and Sencor on Japanese Quail.
Advisor – G.M. Findlay. Craig is presently employed with Gulf Oil, Edmonton.

Husband and wife team from Thailand:

Somsak Tauthong. M.Sc. University of Manitoba
Thesis: Persistence on structural surfaces of residues of organophosphorous and pyrethroid insecticides against five species of stored-product insects.
Advisor – F.L. Watters.

Pensook Tauthong. Ph.D. University of Manitoba
Thesis: The biology and systematics of *Aedes campestris* Dyar and Knab (Diptera: Culicidae) and related species in Manitoba and Saskatchewan.
Advisor – R.A. Brust.

COMMONWEALTH INSTITUTE OF BIOLOGICAL CONTROL DIRECTOR

Applications are invited for the post of Director of CIBC.

The applicant selected will need to be of considerable standing in the field of biological control, with wide practical experience, and accustomed to dealing at a high level with governmental and international agencies. Considerable travel involved in any area of the world.

Salary in range £10,857-£11,499 p.a.

Application forms may be obtained from the Secretary, Commonwealth Agricultural Bureaux, Farnham House, Farnham Royal, Slough SL2 3BN, to whom they should be submitted *by 30 April 1976*.

REGIONAL SOCIETY OFFICERS

ALBERTA

President: Dr. W.A. Nelson

Vice-President: Dr. B. Heming

Director of Affiliated Society to E.S.C.: Dr. W.A. Charnetski

Secretary-Treasurer: Dr. H.F. Cerezke, Environment Canada, Canadian Forestry Service 5320-122 St., Edmonton, Alberta T6H 3S5

MANITOBA

President: Mr. L. Nairn

President-Elect: Dr. H.G. Wylie

Past President: Mr. G.L. Ayre

Secretary: Dr. J.E. Guthrie P.O. Box 41, Pinawa, Manitoba R0E 1L0

Treasurer: Mr. W.L. Askew

Regional Director: Dr. R.A. Brust

Editor, Manitoba Entomologist: Dr. P.H. Westdal

SASKATCHEWAN

President: Mr. M.G. Maw

President-Elect: Dr. S. Gage

Secretary-Treasurer: Mr. P.G. Kroeger

Regional Director: Dr. P.W. Riegert

Research Station, Agriculture Canada, 107 Science Crescent
Saskatoon, Saskatchewan S7N 0X2

The **Bulletin** is your medium for publishing and receiving news and opinions. It is the principal medium by which the ESC keeps you informed. Contributions should further the Society's objects "to study, advance, and promote entomology". They need not relate to ESC members or affairs but should be of interest to Canadian entomologists.

CALL FOR REVIEWERS

If you are willing to review papers for The Canadian Entomologist and/or books received by E.S.C., please fill out the following forms, clip, and send. Good reviewing is a vital part of the publishing done by our society. Your help would be appreciated.

Yes, I am willing to review *papers* for The Canadian Entomologist.

Name: _____

Address: _____

Areas of Interest: _____

Please send to: Dr. Paul Morrison, Editor
The Canadian Entomologist
Department of Biology
University of Waterloo
Waterloo, Ontario N2L 3G1

Yes, I am willing to review *books* received by E.S.C.

Name: _____

Address: _____

Areas of Interest: _____

Please send to: Dr. Susan McIver
Chairman, Publications Committee
Department of Microbiology and Parasitology
FitzGerald Building
University of Toronto
Toronto, Ontario M5S 1A1

SUBMITTED PAPER REPLY FORM

(Deadline – 1 May 1976)

RETURN TO: Dr. Robert Trottier
Research Station, Agriculture Canada
P.O. Box 185
Vineland, Ontario L0R 2E0

Author's Name (Please Type): _____

Institution and Address: _____

_____

_____

_____

_____

PLEASE TURN OVER

SPECIAL INTEREST GROUPS REPLY FORM

(Deadline – 1 May 1976)

RETURN TO: Dr. Robert Trottier
Research Station, Agriculture Canada
P.O. Box 185
Vineland, Ontario L0R 2E0

Participant's Name: _____

Participant's Address: _____

_____

_____

_____

Title of Group: _____

SUBMITTED PAPER REPLY FORM (Con'td)

Title of Paper (not to exceed 15 words): _____

_____

_____

_____

To be read by: _____

Projection equipment required: 2x2 ☐, 16 mm movie ☐
(Other sizes and glass mounts not acceptable.)

PLEASE TURN OVER

SPECIAL INTEREST GROUPS REPLY FORM (Con'td)

Insect Physiology

Medical Entomology

Pest Management

Insect Behaviour

Toxicology

PLEASE TURN OVER

CONTRIBUTIONS

Contributions and correspondence should be sent to: B.J.R. Philogène, Bulletin of the Entomological Society of Canada, Department of Biology, University of Ottawa, Ottawa, Ontario K1N 6N5.

BUSINESS INQUIRIES AND BOOKS FOR REVIEW

Inquiries about subscriptions and back issues, and books for review should be sent to the Entomological Society of Canada, 1320 Carling Ave., Ottawa, Ontario K1Z 7K9.

DEADLINE

The deadline for the next issue, Vol. 8, No. 2 for June 1976 is 15 May. The approximate date of mailing will be 15 June.

AFFILIATED SOCIETY OFFICERS FOR 1976-77

BRITISH COLUMBIA

President: Dr. H.S. Gerber President-Elect: Dr. A. Turnbull
Director of Affiliated Society to E.S.C.: Dr. J.P.M. Mackauer
Representative on E.S.C. Honorary Membership Committee: Dr. R.D. McMullen
Secretary-Treasurer: Dr. B.D. Frazer Research Station, Agriculture Canada
6660 N.W. Marine Drive VANCOUVER, B.C. V6T 1X2

SOCIETE ENTOMOLOGIQUE DU QUEBEC

Président: Louis C. O'Neil Vice-président: Roger Garneau
Trésorier: André Cloutier Archiviste: J.-M Perron
Représentant auprès de la S.E.C.: René Martineau Substitut: Jeremy McNeil
Editeur des Annales: J.-G. Pilon
Secrètaire: Michel Letendre Complexe Scientifique (D-1-37) 2700 rue Einstein
Ste-Foy, P.Q. G1P 3W8.

ACADIAN ENTOMOLOGICAL SOCIETY

President: Edward Kettela Vice President: Murray Neilson
Regional Director: until November 1976 J.B. Dimond
November 1976 A.W. MacPhee
Secretary-Treasurer: Margaret Cameron Maritimes Forest Research Centre P.O.
Box 4000, Fredericton, N.B.

AFFILIATED SOCIETY OFFICERS FOR 1976

ONTARIO

President: Dr. R.J. McClanahan Director of Affiliated Society to E.S.C.:
Treasurer: Dr. D.H. Pengelly Dr. W.Y. Watson
Representative on E.S.C. Honorary Membership Committee: Dr. R.J. McClanahan
Secretary: Dr. M.V. Smith Department of Environmental Biology University of
Guelph GUELPH, Ontario N1G 2W1