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**VOL. 22**

**September-septembre, 1990**

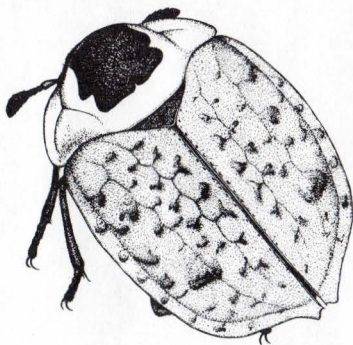
**No. 3**

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# **BULLETIN**



**ENTOMOLOGICAL SOCIETY OF CANADA  
LA SOCIÉTÉ D'ENTOMOLOGIE DU CANADA**

ENTOMOLOGICAL SOCIETY OF CANADA  
LA SOCIÉTÉ D'ENTOMOLOGIE DU CANADA  
**BULLETIN**

VOL 22 (3) - September/septembre, 1990

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La Société d'entomologie du Canada  
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## Editorial

### Q.E.D. - R.I.P.

In January, 1965, the late Brian Hocking launched a new entomological journal in Canada - *Quaestiones Entomologicae*. For 25 years, *Quaest. Ent.* has given us a decidedly eclectic mixture of papers in entomology and enriched the scientific landscape in this country. It has for most of its history been under the editorship of Brian Hocking (until his death in 1974) and George Ball. In 1990, *Quaest. Ent.* will die.

Why is it dying? In a word - money. Budget cuts at the University of Alberta have forced the loss of the Managing Editor position and with it the journal. This is a sad commentary on both the esteem with which science is held in this country and an even sadder commentary on the attitudes presently rife among university administrators.

I feel somewhat humbled to realize that I have been under a mistaken impression of what universities are supposed to be doing. I assumed they were to foster and encourage the acquisition, teaching and dissemination of knowledge. Silly me. It appears that those who run our universities are not too concerned with such matters if one of the few entomological journals published in Canada can be allowed to perish. I am not trying to specifically condemn the University of Alberta - the problem is epidemic. Sitting on my desk at Mount Allison University's annual library budget cut. This is the sixth year in a row that we have been asked to cut journals and thereby our students' access to scholarly work. Every year we are asked to trim the "excess". Excess? This is not unlike going to the doctor for an annual physical and excess organ removal. Pretty soon the notion of excess becomes more than a little problematic.

What can be done? For *Quaest. Ent.* probably very little. I do think however that such events are akin to the canary in the coal mine. The level of lethal administrative and political gas is getting too high and must be tended to.

I do have a proposal however that I will put forward at whichever meeting of the Society is most appropriate. The Entomological Society of Canada should initiate an award (yes, another one!) for excellence in scientific publication. I would propose that we name this award the Hocking-Ball Award in honour of two entomologists who have contributed so much to entomological publishing in Canada. In this way perhaps the memory of the spirit that started and maintained a journal such as *Quaestiones Entomologicae* will serve to avoid too many more such tragedies.

Ron Aiken,  
Mount Allison University



# **SOCIETY BUSINESS / AFFAIRES DE LA SOCIÉTÉ**

## **40th Annual Meetings**

### **General Meeting**

The Annual General Meeting of the Entomological Society of Canada will be held at the Banff Centre in Banff, Alberta from 1600 to 1730h on October 9, 1990.

### **Governing Board**

The annual meeting of the Governing Board will be held at the Banff Centre in Banff, Alberta from 0900 to 1700h on October 6 and from 0900 to 1400 on October 7, 1990.

Matters for consideration at either meeting should be sent to the Secretary, Dr. R.J. West, Forestry Canada, Newfoundland and Labrador Region, P.O. Box 6038, St. John's, Newfoundland, A1C 5X8. FAX 709-772-2576.

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### **Auditor's Report**

To the Members, Entomological Society of Canada.

We have examined the balance sheet of the Entomological Society of Canada as at December 31, 1989 and the statements of revenue and expenditure and equity for the year then ended. Our examination was made in accordance with generally accepted auditing standards and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these financial statements present fairly the financial position of the Society as at December 31, 1989 and the results of its operations for the year then ended in accordance with generally accepted accounting principles, applied on a basis consistent with that of the preceding year.

McCay, Duff and Company,  
Chartered Accountants  
Ottawa, Ontario  
March 1, 1990



Entomological Society of Canada  
Statement of Equity  
For the Year Ended December 31, 1989

ASSETS

| CURRENT                            |                  | <u>1988</u>      |
|------------------------------------|------------------|------------------|
| Cash                               | \$235,076        | \$126,452        |
| Accounts receivable                | 34,909           | 19,862           |
| Advances to International Congress | 3,142            | 28,142           |
| Due from Scholarship fund          | -                | 1,122            |
| Accrued interest                   | 8,660            | 8,646            |
| Prepaid expenses                   | 3,236            | 2,464            |
|                                    | <u>285,023</u>   | <u>186,688</u>   |
| INVESTMENTS (note 2)               | 364,975          | 369,975          |
| FIXED ASSETS (note 3)              | -                | 111,395          |
|                                    | <u>\$649,998</u> | <u>\$668,058</u> |
| ENDOWMENT FUND                     |                  |                  |
| Cash                               | \$27,178         | \$15,920         |
| Accrued interest                   | 525              | 564              |
| Investments (note 2)               | 15,900           | 23,840           |
| Due from General Fund              | -                | 920              |
|                                    | <u>43,603</u>    | <u>41,244</u>    |
|                                    | <u>\$693,601</u> | <u>\$709,302</u> |

LIABILITIES

GENERAL FUND  
CURRENT

|                         |                  |                  |
|-------------------------|------------------|------------------|
| Accounts payable        | \$220,753        | \$17,604         |
| Deferred revenue        | 125,815          | 141,737          |
| Due to Scholarship Fund | 2,288            | -                |
| Due to Endowment Fund   | -                | 920              |
|                         | <u>\$148,856</u> | <u>\$160,261</u> |

EQUITY

|                       |                  |                  |
|-----------------------|------------------|------------------|
| GENERAL FUND          |                  |                  |
| BALANCE - END OF YEAR | 501,142          | 507,797          |
| ENDOWMENT FUND        |                  |                  |
| BALANCE - END OF YEAR | 43,603           | 41,244           |
|                       | <u>544,745</u>   | <u>549,041</u>   |
|                       | <u>\$693,601</u> | <u>\$709,302</u> |

| GENERAL FUND                           | 1989             | 1988             |
|--|------------------|------------------|
| BALANCE - BEGINNING OF YEAR            | \$507,797        | \$504,711        |
| Appropriation from Endowment Fund      | <u>2,488</u>     | <u>-</u>         |
|  | \$510,285        | 504,711          |
| Net revenue (expenditure) for the year | (9,143)          | 3,086            |
| BALANCE - END OF YEAR                  | <u>\$501,142</u> | <u>\$507,797</u> |

#### ENDOWMENT FUND (note 4)

|                               |                 |                 |
|-------------------------------|-----------------|-----------------|
| BALANCE - BEGINNING OF YEAR   | \$41,244        | \$37,679        |
| Appropriation to General Fund | <u>(2,488)</u>  | <u>-</u>        |
|                               | 38,756          | 37,679          |
| Bequest                       | 472             | -               |
| Gain on sale of investments   | 60              | -               |
| Interest income for the year  | <u>4,315</u>    | <u>3,565</u>    |
|                               | 4,847           | 3,565           |
|                               | <u>\$43,603</u> | <u>\$41,244</u> |

Entomological Society of Canada  
Notes to Financial Statements, December 31, 1989

#### 1. SIGNIFICANT ACCOUNTING POLICIES

- A. Revenues and expenses are recorded on the accrual basis, whereby they are reflected in the accounts in the period in which they have been earned and incurred respectively, whether or not such transactions have been finally settled with the receipt or payment of money.
- B. Furniture and equipment purchases are expensed in the year of acquisition.
- C. Entomological Society of Canada is incorporated without share capital under Part II of the Canada Companies Act and is non taxable.

## 2. INVESTMENTS

### GENERAL FUND

|   | <u>1989</u>      | <u>1988</u>      |
|---|------------------|------------------|
| Bonds, at cost (market value, 1989 - \$370,750<br>1988 - \$369,725) | <u>\$364,975</u> | <u>\$369,975</u> |

### ENDOWMENT FUND

|   |                 |                 |
|---|-----------------|-----------------|
| Bonds, at cost (market value 1989, \$17,880<br>1988 - \$25,580) | <u>\$15,900</u> | <u>\$23,840</u> |
|---|-----------------|-----------------|

## 3. FIXED ASSET

|          |             | 1989                               |            | 1988       |
|----------|-------------|------------------------------------|------------|------------|
|          | <u>Cost</u> | Accumulated<br><u>Depreciation</u> | <u>Net</u> | <u>Net</u> |
| Building | -           | -                                  | -          | \$111,395  |

## 4. ENDOWMENT FUND

The direction of the bequest, by which this fund was founded, states that without imposing any legal obligation, hope is expressed that the principal will not be eroded and that the income will be utilized to aid in the publication of *The Canadian Entomologist*.

## 5. STATEMENT OF CHANGES IN FINANCIAL POSITION

This statement has not been provided as management is of the opinion that it would not provide additional useful information.

## 6. COMPARATIVE FIGURES

Certain comparative figures have been reclassified to conform with the current financial statement presentation.



# STATEMENT OF REVENUE AND EXPENDITURE FOR THE YEAR ENDED DECEMBER 31, 1989

|   | <i>Canadian Entomologist</i> |          | <i>Memoirs and<br/>Other Publications</i> |         | Society    |            | 1989      |           |
|---|------------------------------|----------|---|---------|------------|------------|-----------|-----------|
|   | Actual                       | Budget   | Actual                                    | Budget  | Actual     | Budget     | Actual    | Budget    |
| <b>REVENUE</b>  |                              |          |   |         |            |            |           |           |
| Regular memberships   | \$33,360                     | \$42,000 | \$1,845                                   | \$3,000 | \$11,120   | \$14,000   | \$46,325  | \$59,000  |
| Student memberships   | 1,800                        | 3,000    | 105                                       | -       | 1,800      | 1,000      | 3,705     | 4,000     |
| Sustaining memberships  | 350                          | 300      | -   | -       | 350        | 300        | 700       | 600       |
| Subscriptions   | 88,536                       | 84,900   | 59,024                                    | 56,600  | -          | -          | 147,560   | 141,500   |
| Reprints  | 15,509                       | 15,000   | -   | -       | -          | -          | 15,509    | 15,000    |
| Page charges  | 38,391                       | 25,000   | 27,615                                    | 25,000  | -          | -          | 66,006    | 50,000    |
| Back issues   | 3,909                        | 4,800    | -   | -       | -          | -          | 3,909     | 4,800     |
| Sales of Memoirs  | -                            | -        | 12,243                                    | 3,500   | -          | -          | 12,243    | 3,500     |
| Sales of Arctic Arthropods &<br>Bibliography                      | 419                          | -        | -   | -       | -          | -          | 419       | -         |
| Gain on currency exchange   | -                            | -        | -   | -       | 370        | -          | 370       | -         |
| Government grant  | 1,000                        | 1,000    | -   | -       | -          | -          | 1,000     | 1,000     |
| Contracts and services  | -                            | -        | -   | -       | -          | -          | -         | -         |
| Miscellaneous   | -                            | -        | -   | -       | 2,278      | -          | 2,278     | -         |
|   | 183,274                      | 176,000  | 100,832                                   | 88,100  | 15,918     | 15,300     | 300,024   | 279,400   |
| <b>EXPENDITURE</b>  |                              |          |   |         |            |            |           |           |
| Publishing & mailing costs  | 90,479                       | 93,000   | 54,947                                    | 58,000  | -          | -          | 145,426   | 151,000   |
| Reprint costs   | 8,483                        | 8,400    | -   | -       | -          | -          | 8,483     | 8,400     |
| <i>Bulletin</i> publishing & mailing                              | -                            | -        | -   | -       | 21,472     | 11,800     | 21,427    | 11,800    |
| Special reports   | -                            | -        | -   | -       | 16,266     | -          | -         | -         |
| Salaries & benefits   | 45,097                       | 42,311   | 20,060                                    | 18,821  | 12,765     | 15,260     | 81,423    | 76,392    |
| Editor's expenses   | 5,026                        | 4,500    | 2,792                                     | 2,500   | -          | -          | 7,818     | 7,000     |
| Office  | 11,402                       | 5,000    | 6,841                                     | 3,000   | 11,402     | 5,000      | 29,645    | 13,000    |
| Professional fees   | 1,575                        | 1,500    | -   | -       | 1,575      | 1,500      | 3,150     | 3,000     |
| Prizes, awards, brochure, etc.                                    | -                            | -        | -   | -       | 1,520      | 1,650      | 1,520     | 1,650     |
| Graduate research/travel  | -                            | -        | -   | -       | 2,000      | 4,000      | 2,000     | 4,000     |
| Honoraria   | 1,200                        | 1,500    | -   | -       | 1,700      | 1,700      | 2,900     | 3,200     |
| Committees:   |                              |          |   |         |            |            |           |           |
| Heritage publication  | -                            | -        | -   | -       | 4,205      | 6,000      | 4,205     | 6,000     |
| Membership  | -                            | -        | -   | -       | -          | -          | -         | -         |
| Science Policy  | -                            | -        | -   | -       | 1,861      | 3,000      | 1,861     | 3,000     |
| Other   | -                            | -        | -   | -       | -          | 700        | -         | 700       |
| Support of other organizations                                    | -                            | -        | -   | -       | 3,849      | 4,900      | 3,849     | 4,900     |
| Annual Meeting:   |                              |          |   |         |            |            |           |           |
| Grant   | -                            | -        | -   | -       | 4,000      | 4,000      | 4,000     | 4,000     |
| Honorees  | -                            | -        | -   | -       | 2,889      | 3,000      | 2,889     | 3,000     |
| Governing Board:  |                              |          |   |         |            |            |           |           |
| Interim Meeting   | -                            | -        | -   | -       | 2,691      | 2,500      | 2,691     | 2,500     |
| Annual Meeting  | -                            | -        | -   | -       | 25,997     | 15,000     | 25,997    | 15,000    |
| Other Meetings  | -                            | -        | -   | -       | 1,224      | 1,750      | 1,224     | 1,750     |
| President's discretionary<br>expenses                             | -                            | -        | -   | -       | 1,026      | 3,000      | 1,026     | 3,000     |
| General   | -                            | -        | -   | -       | 109        | -          | 109       | -         |
|   | 163,262                      | 156,211  | 84,640                                    | 82,321  | 103,786    | 84,760     | 351,688   | 323,292   |
| <b>REVENUE (EXPENDITURE)<br/>FOR THE YEAR FROM<br/>OPERATIONS</b> |                              |          |   |         |            |            |           |           |
| Interest on investments   | 20,012                       | 19,789   | 16,192                                    | 5,779   | (87,868)   | (69,460)   | (51,664)  | (43,892)  |
| Gain(loss) on sale of invest-<br>ments                            | -                            | -        | -   | -       | 51,366     | 35,000     | 51,366    | 35,000    |
|   | -                            | -        | -   | -       | (8,845)    | -          | (8,845)   | -         |
|   | -                            | -        | -   | -       | 42,347     | 35,000     | 42,521    | \$35,000  |
| <b>NET REVENUE (EXPENDI-<br/>TURE) FOR THE YEAR</b>               |                              |          |   |         |            |            |           |           |
|   | \$20,012                     | \$19,789 | \$16,192                                  | \$5,589 | (\$45,347) | (\$34,460) | (\$9,143) | (\$8,992) |

Entomological Society of Canada - Scholarship Fund  
Balance Sheet as at December 31, 1989

| ASSETS                       | 1989                   | 1988                   |
|------------------------------|------------------------|------------------------|
| <b>CURRENT</b>               |                        |                        |
| Cash                         | \$21,092               | \$15,089               |
| Accrued interest available   | <u>649</u>             | <u>-</u>               |
|                              | 21,741                 | 15,089                 |
| <b>DUE FROM GENERAL FUND</b> | <u>2,288</u>           | <u>-</u>               |
| <b>INVESTMENTS (Note 2)</b>  | <u>40,925</u>          | <u>445,895</u>         |
|                              | <u><u>\$64,954</u></u> | <u><u>\$60,984</u></u> |
| <br><b>LIABILITIES</b>       |                        |                        |
| <b>DUE TO GENERAL FUND</b>   | -                      | \$1,122                |
| <br><b>EQUITY</b>            |                        |                        |
| <b>INCOME FUND</b>           |                        |                        |
| Balance - beginning of year  | 12,433                 | 14,374                 |
| Gain on sale of investment   | 30                     | -                      |
| Interest income              | <u>6,774</u>           | <u>6,059</u>           |
|                              | 19,237                 | 20,433                 |
| Scholarship awards           | <u>4,000</u>           | <u>8,000</u>           |
| Balance - end of year        | 15,237                 | 12,433                 |
| <br><b>CAPITAL FUND</b>      |                        |                        |
| Balance - end of year        | 47,429                 | 44,522                 |
| Donations received           | <u>2,288</u>           | <u>2,877</u>           |
| Balance - end of year        | <u>49,717</u>          | <u>47,429</u>          |
|                              | <u><u>\$64,954</u></u> | <u><u>\$60,984</u></u> |

**1. SIGNIFICANT ACCOUNTING POLICY**

Revenues and expenses are recorded on the accrual basis, whereby they are reflected in the accounts in the period in which they have been earned and incurred respectively, whether or not such transactions have finally been settled by the receipt or payment of money.

**2. INVESTMENTS**

|   | 1989     | 1988     |
|---|----------|----------|
| Bonds, at cost(market value 1989-\$40,928, 1988-\$46,150) | \$40,925 | \$45,895 |

## **Auditor's Report**

To the Members, Entomological Society of Canada.

We have examined the balance sheet of the Entomological Society of Canada - Scholarship Fund as at December 31, 1989. Our examination was made in accordance with generally accepted auditing standards and accordingly included such tests and other procedures as we considered necessary in the circumstances, except as explained in the following paragraph.

In common with many non-profit entities, the Fund derives a part of its income from donations which are not susceptible to complete verification by audit procedures. Accordingly, our examination of such income was confined to tests of deposits of recorded receipts in authorized depositories.

In our opinion, except for the effect of adjustments, if any, had donation receipts been susceptible to complete audit verification, this financial statement present fairly the financial position of the Fund as at December 31, 1989 and the results of its operations for the year then ended in accordance with generally accepted accounting principles, applied on a basis consistent with that of the preceding year.

McCay, Duff and Company,  
Chartered Accountants  
Ottawa, Ontario  
March 1, 1990



**Call for Nominations  
Achievement Awards Committee**

**Gold Medal for Outstanding Achievement in Canadian Entomology  
and  
The C. Gordon Hewitt Award**

Members of the Society are invited to nominate individuals whom they regard as eligible for these awards. Nominations should be sent in an envelope marked "Confidential" to the following address:

Achievement Awards Committee,  
Entomological Society of Canada,  
1320 Carling Avenue,  
Ottawa, Ontario  
K1Z 7K9

and should comprise: (1) the name and address of the nominee(s); (2) a statement of relevant achievements; and (3) the name of the nominator and at least one seconder. To be considered by the Achievement Awards Committee, nominations must bear a postmark no later than November 30, 1990.

The following conditions govern these awards:

1. Outstanding contributions should be judged on the basis of
  - a) superior research accomplishment either as a single contribution or as a series of associated endeavours and which may be either in entomology or a related field where the results obtained are of great consequence;
  - or
  - b) dedicated and fruitful service in the fields of Society affairs, research administration or education.
2. No more than one of each award shall be granted per year but, where circumstances warrant, more than one individual may be mentioned in a single award.
3. Recipients need not be members of the Society providing their contribution is judged to have a major impact on entomology in Canada.
4. The award may be granted on different occasions to the same recipient but for different contributions to entomology in Canada.
5. Nominees for the C. Gordon Hewitt Award must be less than 40 years of age throughout the calendar year in which the award is both announced and awarded.

## **Comité des décorations**

### **Médaille d'Or pour Contributions Exceptionnelle à l'Entomologie Canadienne et Prix C. Gordon Hewitt**

La Société invite les membres à lui faire parvenir les noms des personnes qu'ils considèrent éligibles à ces deux prix. Veuillez envoyer vos nominations au:

Comité des décorations,  
La Société d'entomologie du Canada,  
1320 av. Carling,  
Ottawa, Ontario  
K1Z 7K9

dans une enveloppe portant la mention "Confidentiel". La nomination doit contenir: (1) le nom ainsi que l'adresse du (ou des) candidat(s) désigné(s); (2) un compte rendu des réalisations pertinentes; et (3) le nom du parrain et celui d'au moins une deuxième personne appuyant la mise en nomination. Pour être acceptées par le Comité les nominations devront porter un sceau postal d'au plus tard le 30 novembre 1990.

Les conditions suivantes régissent le choix des récipiendaires de ces prix:

1. Les contributions exceptionnelles devraient être jugées dans le contexte  
(a) d'un accomplissement hors pair en recherche, soit comme résultat d'une seule contribution ou d'une série d'efforts reliés, réalisés dans le secteur entomologique ou tout autre domaine connexe et ayant abouti à des résultats de grande valeur

ou

(b) de service dévoué et fructueux au profit de la Société, de l'administration de recherche, ou de l'éducation.

2. Chaque prix ne sera décerné qu'une seule fois annuellement, quoique, les circonstances le justifiant, plus d'une personne pourront collectivement devenir récipiendaires d'un prix.

3. Les récipiendaires ne doivent pas nécessairement être membres de la Société en autant que l'on juge que leur contribution a exercé un impact majeur sur l'entomologie au Canada.

4. Chaque prix peut être décerné à différentes occasions au même récipiendaire mais pour différentes contributions à l'entomologie au Canada.

5. Le candidat désigné pour le prix C. Gordon Hewitt doit être âgé de moins de 40 ans pour toute la durée de l'année au cours de laquelle le prix est annoncé et décerné.

## ARTICLE

### Alternative Hosts for the Dispersal of *Varroa jacobsoni* and a Cautionary Note about Insect Imports into Canada

by

Peter G. Kevan,  
Department of Environmental Biology,  
University of Guelph,  
Guelph, Ontario N1G 2W1

and

Terence M. Lavery,  
Department of Zoology,  
University of Western Ontario,  
London, Ontario N6A 5B7

*Varroa jacobsoni* Oud. (Acari: Mesostigmata: Varroidae) is among the worst pests of the European honey bee (*Apis mellifera* L. (Hymenoptera: Apidae)) (see Needham et al., 1988). Its natural host is the Asiatic hive bee (*A. cerana* Fabr.) on which it is primarily a parasite of drone brood. In colonies of *A. mellifera* the mite attacks all castes and eventually destroys the colony. The mites invaded Europe in the early 1980's and reached the United States of America by September 1987. Although control measures for *V. jacobsoni* are known, they are expensive, troublesome, and not yet registered for use in Canada. The closure of the border between Canada and the United States to the import of *A. mellifera* (action taken to prevent the introduction of the honey bee tracheal mite, *Acarapis woodi* Rennie (Acari: Prostigmata: Tarsonemidae), which had become widespread in the United States following its discovery there in July 1984) seems to have stemmed the spread of both mite pests into Canada. However, vigilance and extensive programs to test honey bee colonies for the presence of mites have been necessary. Sporadically, *A. woodi* has been found and eliminated in Canada. *Varroa jacobsoni* was discovered in honey bee hives in New Brunswick, in one place along the border with Maine, in 1989 and eliminated (Anonymous 1989).

The introductory paragraph summarizes the seriousness with which mite pests of honey bees are regarded. The value of honey bees to agriculture rests mostly in their pollinating activities. Despite the debate on the monetary value of honey bees to pollination, and how that value should be calculated (Robinson et al. 1989, Southwick and Southwick 1989, Agriculture Canada 1989), it is abundantly clear that the value of pollination is many times that of the hive products (honey, wax, etc. and other honey bees). Thus, agriculture is starting to realize that pollination may suffer a set-back in Canada if the pestiferous mites of honey bees are allowed to invade (Agriculture Canada 1989). One way of preparing for the potential impact of mites is the use and encouragement of non-honey bee pollinators (Kevan et al. 1990). A wide variety of these exist, and some are successfully used in various parts of the world (Torchio 1987, Parker et al. 1987). The Canadian approach emphasizes the import of such pollinators rather than the exploration of our rich national resource of pollinators (see Gibson 1989). That, in spite of Canadian leadership and success in the culture and use of the alfalfa leafcutting bee (*Megachile rotundata* Fabr. (Hymenoptera: Apidae)) and sweat bees (Hymenoptera: Halictidae) (see Agriculture



Canada 1989). Both Agriculture Canada and the Ontario Ministry of Agriculture and Food, to mention two government agencies, have recently cut back or discontinued research and development in pollination and alternative pollinators at a time when such programs are sorely needed.

It is generally assumed that *V. jacobsoni* is restricted to the two species of *Apis* noted above. It is probably true that the mites cannot reproduce on any but those species, however, they can live temporarily outside active bee hives both on flowers and other insects.

Smirnov (1972) kept *V. jacobsoni* alive under experimental conditions for about a week. Gromyko (1982) kept them alive on flowers in the laboratory for about 5 days, 6 days on dandelions, and noted that they would move onto honey bees that visited the *Varroa*-inhabited flowers. The survival of *V. jacobsoni* on flowers for about a week has also been documented by Hartwig and Jedruszuk (1987). More recently, they have been kept in the laboratory on an artificial diet adequate for the females to produce viable eggs (Bruce and Chiesa 1988).

Gerig (1987) reported live mites being found in a colony of wasps (Vespidae) in Switzerland. They were found on the adult wasps and on the larvae in the cells. The study does not indicate that the mites can reproduce in the wasps' nests. It was not of sufficient duration for the possibility to be experimentally tested. Smirnov and Popov (1983) indicate that *V. jacobsoni* does not survive long on wasps, bumble bees, and flies in artificial conditions. The possibility of the spread of *V. jacobsoni* to wild bees in the field was examined by Mikityuk and Sedin (1980). They found no *V. jacobsoni* on 30 species of wild bees. However, recent discoveries in Florida of *V. jacobsoni* on the bodies of various anthophilous insects (*Bombus*, Diptera: Syrphidae, and Coleoptera: Scarabeidae) and on a honey bee that was found on cut flowers imported from South America by Denmark (personal communication) suggests that the mites can and do spread on other anthophiles.

The means of dispersal of *V. jacobsoni* appear to be more diverse than generally realized. The mites move from hive to hives of honey bees with the movement of bees between hives. They are capable of using flowers as way-stations. Further, they are also able to live on hive predators (e.g. wasps (Gerig 1987)), and possibly travel from hive to hive with them. Cuckoo bumble bees (*Psithyrus* (Hymenoptera: Apidae)), social parasites of bumblebees, are known to enter honey bee hives (Plath 1927). Kevan (unpublished) has collected several at a time in dead-bee traps on honey bee hives in southern Ontario. Thus, cuckoo bumble bees could act as vectors of the mite between honey bee hives and colonies of *Bombus* spp. At present these aspects of the biology of *V. jacobsoni* are hardly known but clearly warrant investigation.

In view of the potential for *V. jacobsoni* to spread on a variety of insects, we urge caution in the import of live insects which could come in contact with infected honey bees (e.g. Japan for horn-faced orchard bees *Osmia cornifrons* Rad. (Hymenoptera: Megachilidae), Europe for other *Osmia* spp., and the United States for *Osmia* spp., *Bombus* spp., and others (see Torchio 1987, Parker et al. 1987)). It would be ill-advised for permits to be issued for the import of non-honey bee pollinators into Canada until the quarantine requirements are determined to assure their being free from *V. jacobsoni* upon release.

All in all, it is not realistic for agricultural research to down-play pollination and pollinators, to look to other nations for solutions to our problems, or to assume that there is no problem. In Canada, there is a world-class record in pollinator research and development, an internationally acclaimed group of scientists in the area, and the willingness among them to work on existing and potential problems.

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# JOINT ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF CANADA AND THE ENTOMOLOGICAL SOCIETY OF ALBERTA

The Banff Centre, Banff, Alberta  
October 6 to 10, 1990

## Notice and Call for Papers

|                  |               |   |
|------------------|---------------|---|
| October 6        | 09:00 - 17:00 | ESC Governing Board Meeting   |
| October 7        | 09:00 - 14:00 | ESC Governing Board Meeting   |
|                  | 15:00 - 17:00 | Opening Ceremonies<br>ESC Awards<br>Gold Medal Address.   |
|                  | 19:00 - 20:00 | Students meet the Board Reception   |
|                  | 20:00 - 23:00 | General Mixer   |
| October 8        | 08:30 - 12:00 | Symposium: Systematics and Entomology:<br>Diversity, Distribution, Adaptation and<br>Application**<br>Organizers: G.E. Ball, H.V. Danks |
|                  | 13:00 - 17:00 | Discussion Group: Effects of Climatic Change on<br>Insect Distribution and Abundance*<br>Organizer: D. Johnson<br>Submitted Papers      |
|                  | 17:30 -       | B. B. Q.  |
|                  | 21:30 -       | President's Mixer (by invitation)   |
| October 9        | 08:30 - 12:00 | Symposium: Biotechnology & Insect Control***<br>Organizer: G. R. Wyatt  |
|                  | 13:00 - 15:00 | Discussion Group: Arctic Insects: Faunistics,<br>Biology and Abundance*<br>Organizers: H.V. Danks, R.A. Ring                            |
| Submitted Papers | 15:15 - 16:00 | Heritage Lecture (by John Carr)   |
|                  | 16:00 - 17:30 | ESC Annual General Meeting  |
|                  | 18:00 - 19:00 | Banquet Cocktail Hour   |
|                  | 19:00 -       | Banquet   |
| October 10       | 08:30 - 12:00 | Discussion Group: Livestock Insects*<br>Organizer: A. Khan<br>Submitted Papers  |
|                  | 12:00 - 14:00 | ESC Governing Board Meeting   |
|                  | 14:30 - 16:00 | ESA Annual General Meeting  |

\* \*\* \*\*\* Further information on following pages.



\*Those wishing to participate in the Discussion Groups are asked to contact the following:

“Effects of Climatic Change on Insect Distribution and Abundance”

Dr. Dan Johnson,  
Agriculture Canada, Research Station,  
P. O. Box 3000, Main,  
Lethbridge, Alberta, T1J 4B1 (Ph. 403-327-4561)

“Arctic Insects: Faunistics, Biology and Ecophysiology”

Dr. R. A. Ring,  
Department of Biology,  
University of Victoria,  
Victoria, B. C. V8W 2Y2. (Ph. 604-721-7102)

“Livestock Insects”

Dr. Ali Khan,  
Animal Industry Division,  
Alberta Agriculture,  
7000 - 113 St.,  
Edmonton, Alberta T6H 5T6 (Ph. 403-427-5083)

\*\* Details of the symposium “Systematics and Entomology: Diversity, Distribution, Adaptation and Application”, organized by G.E. Ball and H.V. Danks appeared in the *Bulletin* 21(4): 101-102

JOINT ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF CANADA  
AND THE ENTOMOLOGICAL SOCIETY OF ALBERTA

Symposium - Biotechnology and Insect Control

October 9, 8:30 a.m.-12:00 noon

Organizer: G.R. Wyatt

Provisional Program

Speakers

S. Whyard  
Queen's University, Kingston

*Molecular Genetics of Insecticide Resistance*

P. Lau  
Montreal Biotechnology Institute

*Improving the Effectiveness of Bacillus thuringiensis*

K. Iatrou  
University of Calgary

*Molecular Engineering of Baculoviruses*

D. Hickey  
University of Ottawa

*Molecular Genetics and Insect Pest Management*

G.R. Wyatt  
Queen's University

*Juvenoid Insect Growth Regulators*

For further information, contact G.R. Wyatt, Biology Department, Queen's University, Kingston,  
Ontario K7L 3N6 (613-545-06120)

# RÉUNION ANNUELLE CONJOINTE DE LA SOCIÉTÉ D'ENTOMOLOGIE DU CANADA ET DE LA SOCIÉTÉ D'ENTOMOLOGIE DE L'ALBERTA

The Banff Centre, Alberta  
du 7 au 10 octobre 1990

## Avis et Appel de Présentations

|            |             |   |
|------------|-------------|---|
| 6 octobre  | 09:00-17:00 | Réunion du Conseil de Direction de la SEC   |
| 7 octobre  | 09:00-14:00 | Réunion du Conseil de Direction de la SEC   |
|            | 15:00-17:00 | Cérémonies d'Ouverture<br>Décorations de la SEC<br>Allocution Médaille d'or   |
|            | 19:00-20:00 | Les Etudiants Gradués recontrent le Conseil   |
|            | 20:00-23:00 | "Mixer" Général   |
| 8 octobre  | 08:30-12:00 | Symposium: La Systématique et l'Entomologie: Diversité, Distribution, Adaptation et Application**<br>Organisateurs: G.E. Ball, H.V. Danks                   |
|            | 13:00-17:00 | Groupe de Discussion: Les Effets des Changements Climatiques sur la Distribution et l'Abundance des Insectes*<br>Organisateur: D. Johnson<br>Communications |
|            | 17:30-21:30 | Barbécue<br>Réception du Président (par invitation)   |
| 9 octobre  | 08:30-12:00 | Symposium: La Biotechnologie et le Contrôle des Insectes***<br>Organisateur: G.R. Wyatt   |
|            | 13:00-15:00 | Groupe de Discussion: Les Insectes de l'Arctique: Faunistique, Biologie et Abondance*<br>Organisateurs: H.V. Danks, R.A. Ring<br>Communications             |
|            | 15:15-16:00 | Historique de l'Entomologie (par John Carr)   |
|            | 16:00-17:30 | Assemblée Générale de la SEC  |
|            | 18:00-19:00 | Cocktail  |
|            | 19:00-      | Banquet   |
| 10 octobre | 08:30-12:00 | Groupe de Discussion: Insectes du Bétail*<br>Organisateur: A. Khan<br>Communications  |
|            | 12:00-14:00 | Réunion du Conseil de Direction de la SEC   |
|            | 14:30-16:00 | Assemblée Générale de la SEA  |

\*Ceux qui désirent participer aux Groupes de Discussion sont priés de contacter le personnes suivantes:

“Les Effects des Changements Climatiques sur la Distribution et l’Abondance des Insectes”

Dr. Dan Johnson,  
Agriculture Canada, Station de Recherche,  
C.P. 3000, Main,  
Lethbridge, Alberta T1J 4B1 (Tél. 403-327-4561)

“Les Insectes de l’Arctique: Faunistique, Biologie, et Ecophysiologie”

Dr. R.A. Ring,  
Département de Biologie,  
Université de Victoria,  
Victoria, B.C. V8W 2Y2 (Tél. 604-721-7102)

“Les Insectes du Bétail”

Dr. Ali Khan,  
Division de l’Industrie Animale,  
Alberta Agriculture,  
7000 - 113 St.,  
Edmonton, Alberta T6H 5T6 (Tél. 403-427-5083)

\*\*Les détails du Symposium: “La Systématique et l’Entomologie: Diversité, Distribution, Adaptation et Application”, organisé par G.E. Ball et H.V. Danks, ont paru dans le *Bulletin* de la SEC 21(4): 101-102.





## PERSONALIA / PERSONNALITÉS



**Dr. Hsien-Hua Cheng (1935-1990)**

Dr. Hsien-Hua Cheng, Senior Research Scientist, Agriculture Canada, Research Station, Delhi, Ontario, passed away on May 27, 1990.

Dr. Cheng was born in San Dung Province, China, and came to Canada in 1963. He received his B.Sc. degree from the National Taiwan University in 1959. He obtained his M.Sc. and Ph.D. degrees in entomology from McGill University in 1965 and 1967. In 1967, he joined Agriculture Canada and began a very productive career as an entomologist.

In his service with Agriculture Canada, Dr. Cheng published over 50 research papers. Although best known for outstanding work on tobacco insect biology, ecology and control, his experience, knowledge and enthusiastic approach to research was invaluable in all aspects of entomology. An active collector and curator, Dr. Cheng developed and established over 60 drawers of tobacco and peanut insect specimens at Delhi. He contributed over 50 different species to the Canadian National Collection in Ottawa for study and reference.

In recent years, Dr. Cheng was involved with a tobacco technology exchange program with China. His contribution to China's agricultural development was recognized by the award of an Agricultural Medal in 1989. Dr. Cheng was the 18th recipient of this prestigious honour from China.

He was a member of the Entomological Society of Ontario, Quebec, Canada and America, as well as the Ontario Tobacco Committee, Crop Protection Committee and Entomology Section of Tobacco Workers in North America.

Dr. Cheng will be sadly missed and fondly remembered by those with whom he worked and by his many friends. He is survived by his wife, Helen, his sons, Samuel and Edgar and his daughters, Jane and Doris.

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### **Dr. A. Keddie - University of Alberta**

Dr. B. A. (Andy) Keddie (B.S. Seattle University; Ph. D. University of California, Berkeley) has been appointed as an Assistant Professor in the Department of Entomology, University of Alberta. Dr. Keddie has been studying infectivity and the pathway of infection of *Autographa californica* nuclear polyhedrosis virus in *Trichoplusia ni*, for which he received the E. A. Steinhaus Award in 1988. Dr. Keddie will be responsible for developing a program in insect pathology emphasizing interactions between pathogenic viruses and their insect hosts, and will be accepting graduate students in this and related areas of study.



Mr. Brian V. Brown (right) has been awarded an Entomological Society of Canada Graduate Research Travel Grant. Brian is a Ph.D. student in the Department of Entomology, University of Alberta, studying the systematics of Phoridae with Dr. George Ball. The grant will assist Brian's travel to the Zoologisches Forschungsinstitut und Museum "A. Koenig", Bonn, West Germany, and to other European museums that house significant phorid collections. There is no explanation as to how the cheque fell briefly into the hands of Ron Gooding (left).



## NEWS OF ORGANIZATIONS / NOUVELLES DES ORGANISATIONS

### International Commission on Zoological Nomenclature

Application published in the Bulletin of Zoological Nomenclature

The following application was published 29 June 1990 in the *Bulletin of Zoological Nomenclature* 47 (2). Comment or advice on these applications is invited for publication in the *Bulletin* and should be sent to the Executive Secretary, I.C.Z.N., British Museum (Natural History), Cromwell Road, London, SW7 5BD, U.K.

Case 2687

***Longitarsus symphyti* Heikertinger, 1912 (Insecta, Coleoptera): proposed conservation of the specific name.**

Lech Borowiec, Department of Zoology, Agricultural University, Cybulskiego 20, 50-205, Wrocław, Poland.

**Abstract.** The purpose of this application is the conservation of the specific name of a flea beetle, *Longitarsus symphyti* Heikertinger, 1912, which is threatened by an unused senior synonym.

The following Opinions were published on 29 June 1990 in Vol. 47, Part 2 of the *Bulletin of Zoological Nomenclature*.

Opinion 1595 *Aleuropteryx* Löw, 1885 (Insecta, Neuroptera): *Aleuropteryx loewi* Klapálek, 1984 designated as the type species.

Opinion 1596 *Sembris* Fabricius, 1775 (Insecta, Trichoptera): *Phryganea phalaenoides* Linnaeus, 1758 conserved as type species, thus conserving *Sialis* Latreille, 1902 (Insecta, Megaloptera)

Opinion 1597 *Coryphium angusticollae* Stephens, 1834 (Insecta, Coleoptera): generic and specific names conserved

Opinion 1598 *Ophonus* Dejean, 1821 and *Tachys* Dejean, 1821 (Insecta, Coleoptera): *Carabus sabulicola* Panzer, 1796 and *Tachys scutellaris* Stephens, 1828 designated as the respective type species

Opinion 1599 *Papilio carthami* Hübner, [1813] and *Syrichthus serratulae major* Staudinger, 1879 (currently both in *Pyrgus*; Insecta, Lepidoptera): the specific names *carthami* and *major* conserved

Opinion 1600 *Tachina orbata* Weidemann, 1830 (currently *Peribaea orbata*; Insecta, Diptera): neotype designation confirmed

Opinion 1601 *Rapport sur les Myodaires du Docteur Robineau Desvoidy* (1826): suppressed for nomenclatural purposes



## **Biological Survey of Canada (Terrestrial Arthropods) Survey Report**

The Scientific Committee met in Ottawa on 19-20 April 1990. A fuller account of the meeting appears in the Fall 1990 issue of the Newsletter of the Biological Survey of Canada (Terrestrial Arthropods).

### **Notes on Selected Scientific Projects**

#### **1. *Arthropods of springs***

Initiatives for further work on the arthropods of spring habitats continue, following publication of a brief (Supplement to the *Bulletin* 22(1)) and a bibliography (published by the Biological Survey and available from the E.S.C.). Results of the springs conference held in St. John's (October 1989) are proceeding to publication.

#### **2. *Arthropod fauna of the Yukon***

Chapters on each of more than 20 major taxa are planned for a forthcoming book about the arthropod fauna of the Yukon, together with various introductory and synthetic chapters

#### **3. *Arthropods of peatlands in Canada***

Work on peatlands continues. Some of the recent information will be brought together in a symposium planned for the ESC annual meeting in 1991 (Montreal).

#### **4. *Arctic invertebrate biology***

There has been an excellent response to the brief about arctic invertebrate biology published last year by the Survey (Supplement to the *Bulletin* 21(3)), and international cooperative field ventures are planned for 1990 and 1991. A special interest group meeting at the 1990 ESC annual meeting (Banff), will further develop ideas and plans.

### **Other Scientific Priorities**

#### **1. *Climatic change***

A special interest group meeting at the 1990 ESC annual meeting (Banff), will consider the effects of climatic change on insect distribution and abundance. The outlines of a proposal for the Canadian Global Change research program now are being put into place by the Royal Society of Canada. A meeting of interested biologists and others was arranged, on behalf of the Biological Survey, to generate ideas for substantial biological inputs to this process.

#### **2. *Arthropod fauna of soils***

Dr. Behan-Pelletier reported on some recent developments in soil biology. For example, the Soil Ecology Society is active and will hold a meeting in 1991 on soil biodiversity and function (Oregon). Dr. Behan-Pelletier concluded that there is wide interest in soil arthropods, but there will be a crisis when this interest meets the lack of expertise that is available, especially in systematics.



### *3. Arthropod ectoparasites*

A document pointing out the need for and value of long-term studies of arthropod ectoparasites of vertebrates was discussed by the Committee. A brief on this subject will be developed.

### *4. Arthropods of the Queen Charlotte Islands*

Interest in a project on the arthropods of the Queen Charlotte Islands may lead to a visit to South Moresby Island, and to a more comprehensive analysis of the insect fauna of the islands.

### *5. Collections*

The Committee discussed a draft document pointing out the importance of research collections of terrestrial arthropods, and agreed that the document should be developed toward a brief aimed at a broad audience.

## **Secretariat Activities**

The 1989 round of visits to entomological centres by H.V. Danks included informal discussions with many entomologists and other biologists about the Survey and its projects. Formal seminars on a variety of subjects also were presented.

## **Liason and Exchange of Information with other Organizations**

### *1. Canadian Museum of Nature*

Dr. S. Cumbaa, Acting Assistant Director for Collections and Research of the Canadian Museum of Nature, reported that a permanent Curator of Entomology, Dr. Robert Anderson, had been hired, and an entomology technician will soon be added. The Museum's recent application for federal funds for additional modules of the Survey was not successful, but funds for many other Museum projects had also been refused. The Museum and the societies interested in eventual expansion of the Survey would remain in close touch.

### *2. Biosystematics Research Centre*

Dr. Smith, on behalf of Dr. R. Trottier, Director, Biosystematics Research Centre, reported that results of the review of BRC roles and responsibilities would soon be known. He noted some Agriculture Canada initiatives with respect to the BRC (Sustainable Agriculture Initiative, Great Lakes Water Quality Initiative).

### *3. Entomological Society of Canada*

Dr. R.A. Ring, Second Vice-President of the Society, reported some information from the recent Executive Council meeting, including discussions about the role of the ESC in the Canadian Federation of Biological Societies, and science policy matters especially with respect to public awareness.

### *4. Canadian Society of Zoologists*

Dr. D. Cone, invited as a representative of the Parasitology Section of the Canadian Society of Zoologists, reported that the section is still enthusiastic about a Biological Survey, and would likely pursue cooperation toward Survey goals, even without direct financial support for the time being.

### *5. Natural Sciences and Engineering Research Council*

Mr. J. Blais, Major Projects Officer, Life Sciences, asked the Committee to advise NSERC about

a recent preliminary proposal made to the Council for the preparation of a comprehensive catalogue of living organisms. Mr. Blais also introduced a provisional plan for the restructuring of the NSERC Grant Selection Committees in Life Sciences. The Chairman could reply to these enquiries on behalf of the Committee, following discussions at the meeting.

#### *6. Canadian Parks Service*

Mr. D. McBurney, Acting Head, Studies Section, Natural Resources Branch, reported that Parks had been providing input into the environmental agenda, from which the "Green Plan" for public consultation had been derived. Mr. McBurney added that prospective revisions to the National Parks policy include a favourable view of the need for research in Parks. Discussions between Parks and the Survey on a potential agreement about entomological research in parks had been deferred by staff changes and other developments, but will continue.

#### *7. Other organizations*

The Survey remains in contact with the Geological Survey of Canada, the Department of National Defense, the Association of Systematics Collections and other bodies.

### **Other Items**

#### *1. Biological Survey of Canada Foundation*

The Biological Survey Foundation has now been registered as a Charitable Organization by Revenue Canada. Because the Foundation currently publishes major works only intermittently, it was decided not to seek small ongoing donations, but rather to organize major fund-raising drives for specific targets when appropriate. The Foundation had a useful surplus in 1989.

#### *2. Biology and the Environment*

A document pointing out the deficiency of biological input to environmental studies has not yet been completed in the absence of publicly available information about the specific examples needed to underpin the document.

#### *3. Declining Diversity*

Dr. L. Masner, invited as a guest of the Committee, presented evidence from his long-term pan-trap studies of scelionid wasps that the diversity and abundance of soil-associated species are declining, especially over the last two years. He attributed this decline chiefly to increased soil degradation triggered by acid rain. The Committee noted the general relevance of these concerns to monitoring programmes for long-term change, and to research collections.

#### *4. Other Matters*

The Committee also discussed developments in different regions of the country, publicity for Survey publications, the draft Annual Report for 1990 to the Museum, and other subjects.

H.V. Danks

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## POSITIONS AVAILABLE / EMPLOIS DISPONIBLES

### NSERC Visiting Fellowship in Systematic Entomology at the Canadian Museum of Nature in Ottawa, Canada

The entomology section at the CMN invites applications for an NSERC Visiting Fellowship in a Government Laboratory in the field of Systematic Entomology for the years 1991-92, with possibility of extension to 1993. Taxonomic group and geographic area of study are unrestricted. Applicants must meet all NSERC eligibility requirements.

The entomology collection at the CMN is a general insect collection although is comprised mainly of Coleoptera, especially Curculionidae, Chrysomelidae, Cerambycidae, Buprestidae, as well as a number of smaller families and a large assortment of presently unsorted Coleoptera from Canada, U.S.A., Chile, Argentina, Australia, South Africa and various Central American countries. In addition to Coleoptera, Lepidoptera and Homoptera currently comprise the remainder of the collection. In addition to the collection and facilities at the CMN, extensive collections and facilities are available at the Biosystematics Research Centre and Carleton University. Library facilities in the Ottawa area are unsurpassed. In addition to the basic NSERC stipend, limited funding should be available for field work and other research-related expenses through the CMN. All inquiries concerning the collection, facilities and opportunities for research at the CMN (and the Ottawa area in general) are welcome and should be addressed to Dr. Robert S. Anderson, Curator of Entomology, Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, Ont. K1P 6P4 (613-954-2649).

Application forms and details of application procedure are available from Ms. Nicole Lalonde, NSERC, 200 Kent Street, Ottawa, Ont. K1A 1H5 (613-995-5075); forms for the 1991 competition should be available in late August 1990. The deadline for submission will be announced by NSERC. Fellowships normally commence on or soon after April 1, 1991. Those planning to submit an application should notify the Curator of Entomology at the Canadian Museum of Nature and submit a brief statement of their proposed research prior to submission of their application to NSERC.

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## PUBLICATIONS

### Book Reviews

Pfadt, Robert, E. 1988. *Field guide to common western grasshoppers*. U.S.D.A., A.P.H.I.S., Wyoming Agricultural Experiment Station.

Bob Pfadt is an unique gentleman, for not only is he a respected acridologist, he is also a naturalist. I think these two facets are well expressed in this publication on western grasshoppers. In the preface, Dr. Pfadt notes the need for a practical means of identifying common species, both the adults and the nymphal instars. I can vouch for that need, not only in the field but also for field-collected material that is examined subsequently in the laboratory.

The guide is published in sections which fit into a three-ring binder. The first section (25 pp.) deals with the external anatomy of the "typical" adult grasshopper, nymphal characters, and good, solid, introductory information on several aspects of life history and ecology. Then follows information on collecting and collections, including descriptions of how to collect, pin, and properly label. An adequate glossary completes this introductory section.

The second part of the guide is comprised of fact sheets on individual species. Each fact sheet is a four-page insert and includes information on distribution and habitat, economic importance, food habits, migration and dispersal, nymphal development, adults and reproduction, population ecology, and daily activity. Each fact sheet contains photographs, in colour, of each of the nymphal instars, the male and female adult, egg pods and eggs, and special diagnostic features (e.g., the wings of *Camnula pellucida*, the cercus in several *Melanoplus* species). A map showing the general distribution of each species in North America, including Mexico and Central America, and a list of selected references completes each species fact sheet. The fact sheets are very well produced - good quality paper and excellent photographs - and they surely will enable field workers, even inexperienced ones, to separate species in the field much more easily and accurately than they could with previous field instructions.

This field guide has to be one of the great bargains in recent memory. The first set, including the introductory section, 13 species fact sheets, and the binder costs \$12.00 U.S. There should be another dozen fact sheets available this fall, at a cost of \$6.00 U.S.; if more than a dozen new ones are produced this year, the price will be prorated. All in all, Dr. Pfadt hopes to produce about 75 fact sheets; it will be a most impressive book, and I highly recommend it to all acridologists.

You may obtain the first set, and subsequent sets, from the University of Wyoming Bulletin Room, P.O. Box 3313, Laramie, WY 82071-3313, U.S.A.

A.B. Ewen,  
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Peckarsky, B.L., P.R. Fraissinet, M.A. Penton and D.L. Conklin, Jr. 1990. *Freshwater macroinvertebrates of northeastern North America*. Comstock Publishing Associates, Cornell Univ. Press. Ithaca, N.Y. 442 pp. Softcover, \$(U.S.)26.50; Hardcover, \$(U.S.)57.50.

This book is a series of regional keys to freshwater macroinvertebrates found in northeastern



North America, and is based on keys prepared for aquatic entomology students at Cornell University. Adapted from various other sources to include only the fauna expected to be recorded from Pennsylvania, New York, New England, Ontario, Quebec, and New Brunswick, the keys have been tested by nine successive classes of students, and are, with few exceptions, clear, well-illustrated and easy to follow. The book begins with a brief introduction, then successive chapters deal with individual taxa. Chapters 2 - 14 cover the insect orders (including Collembola, placed here in a separate class), then these are followed by chapters on Crustacea, Hydrachnidia (=Hydracarina), Mollusca, Oligochaeta, and Hirudinea. Each chapter begins with a brief natural history section, with information on classification and preservation techniques, followed by the key and an extensive reference list. In addition, there is a glossary at the back of the book to explain terms and characters with which students may be unfamiliar.

The book specifically targets students of aquatic entomology or ecology and workers in environmental impact assessment (Introduction, Chapter 1). Further, the authors indicate (also in the Introduction) that most of the taxa can be collected by sweeping or kicking with D-frame nets (< 1mm mesh), preserved in 70% EtOH, and identified with a dissecting microscope with no further preparation or handling. However, the more extensive chapter notes indicate that many groups do require special collection or preservation techniques to adequately sample or identify them using these keys. For example, the microcrustaceans, water mites, and many chironomids are too small to be collected in large mesh nets; several groups, including chironomids, oligochaetes and some mites and beetles should be cleared and slide-mounted and viewed with a compound microscope; and others, such as some molluscs and the leeches must be relaxed before killing in order to use the keys.

The keys themselves allow identification to genus, except in a few cases where the taxonomy is not well enough known or where extensive preparation is required for generic identification. For three groups, the molluscs, oligochaetes, and leeches, keys to species are given. The focus is on the aquatic stage(s) in each group, though they omit aquatic pupae, considering them to be beyond the scope of most aquatic entomology courses (?!). In working through several of the chapters, I found the couplets to be generally clear with plenty of reference to figures. The illustrations are a combination of original figures and figures redrawn to standard format from other sources. However, despite a claim in the introduction that generalized illustrations would be provided for each group, and despite the fact that, in many cases, specialized characters were used in identification, well-labelled whole-animal figures were lacking for seven of the 18 groups. This occasionally made it difficult to orient some of the detailed figures to a whole-animal perspective, even when the glossary was consulted. The authors also assumed that students were already capable of distinguishing the major aquatic groupings, since no general key or list of characteristics were given to direct the student toward the insect key, or the Crustacea key, etc.

The major question that came to my mind as I read through this book was whether it had any advantages over the two existing major reference works for identifying North American freshwater invertebrates (Pennak, 1978, *Freshwater invertebrates of the United States*, and Merrit and Cummins, 1984, *An introduction to the aquatic insects of North America*); particularly since the authors unabashedly admit to having drawn heavily from these sources and they refer to them repeatedly. In the Introduction, they indicate that students find it difficult to work through the inapplicable or unwieldy couplets that stem from trying to cover too large a geographical area. I would add that the very reasonable price, especially for the paperback edition, makes this book far more accessible to most students than either Pennak or Merrit and Cummins. For students of aquatic ecology who are planning to continue in the field, I would still recommend one or both of the more broadly based reference works, despite their greater cost. However, students or others who live within the area covered by this book and simply have an interest in the aquatic invertebrates within their region should find this a useful alternative to more expensive keys.

Donna J. Giberson,  
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Harris, K.M. and P.R. Scott. (eds). 1989. *Crop protection information: an international perspective*. Proceedings of the International Crop Protection Workshop 1989. C.A.B. International, Wallingford, Oxfordshire, U.K. pp. xii + 321. Hard cover, £35.00; \$ (U.S.) 65.45.

In April, 1989, an International Crop Protection Information Workshop was held at Wallingford, with participation by representatives of government or international agencies concerned with crop protection in developing countries. The aim was to improve the availability of information on protecting crops from invertebrate and vertebrate pests, pathogens and weeds. The specific objectives were: 1. to review present systems of making crop protection information available to users, emphasizing the requirements of developing countries, 2. to identify deficiencies in present methods of dissemination of crop protection information and opportunities arising from new communication techniques, and 3. to develop proposals to ensure that information reaches users in a timely and efficient manner. The first objective was met by a survey of electronic databases and by presentations by participants. The second and third objectives were addressed by five topic-oriented working groups dealing with information as it relates to crops, organisms, plant quarantine, integrated pest management, and pesticides. The Workshop resulted in 54 specific and three general recommendations aimed at improving the flow of crop protection information to those who need it.

The book appears to be a fairly complete record of the Workshop, and is organized into three sections of papers and two appendices. In the first section, "Background Perspectives", three papers outline the type of information needed in crop protection, the current role of the different techniques of information dissemination, and the potential for use of electronic media in international agricultural research. The second section, "Crop Perspectives", deals with crop protection information for rice, wheat and tropical perennial crops, particularly coffee. The third section contains ten "Regional and Country Perspectives"; regions treated include Europe, francophone Africa, Kenya, areas of south-east and east Asia including China, the South Pacific, the Caribbean, Brazil and North America. The role of the papers in the Workshop was to stimulate the "brain-storming" sessions of working groups. This is facilitated if papers are wide-ranging and unconstrained. The unconstrained quality was not edited out for the Proceedings, so there is little uniformity in style, approach or quality. Although crop protection information is used by research, extension, regulatory and training agencies, and by suppliers of control products and farmers, there is no consistent treatment of the needs of each group. So, the regional perspective on Malaysia and the crop perspective on rice are thorough treatments of information exchange among researchers, extension agencies and farmers. But the perspectives on francophone Africa and wheat are mostly confined to information exchange among researchers. The information requirements of quarantine agencies are treated in several papers, but there are none on the needs of suppliers of pest control products. Surprisingly few papers pay much attention to the information needs of the farmer. Some papers do not address the topic of information *per se*; those on Brazil and China deal mostly with techniques of integrated pest management. It is ironic that many of these pages devoted to improving communication are so bespattered with acronyms as to obstruct communication.

Appendix 1 is a 54-page tabulation of information on 103 databases relevant to crop protection; these include bibliographic and non-bibliographic databases, expert systems and other decision-making software. This compilation is likely to be useful to many crop protection workers, even if they have no particular interest in crops in developing countries. The second appendix contains the reports and recommendations of the five working groups. There is a comprehensive index which includes pest and crop names, and which compensates a little for the uneven nature of the text. The text is almost completely free of typographic and similar errors.

It is unlikely that many entomologists will find it worthwhile to buy this book, unless they are particularly interested in information science or tropical pest control. Despite the uneven coverage of



the topic, there is much useful information in the book, and it may have a place in a library serving a group of crop protection scientists or those involved in international development.

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University of Manitoba,  
Winnipeg, Man.

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Speight, Martin R. and David Wainhouse. 1989. *Ecology and management of forest insects*. Clarendon Press, Oxford. (soft cover) \$43.95.

The emphasis in this presentation is on temperate region forest ecology. The multiple resources provided by a forest are discussed in the early chapters to provide a background for judging the significance of insect examples discussed subsequently. The reader is immediately struck by the fact that examples are drawn not only from Great Britain but also from the Soviet Union, Scandinavia, Europe, North America and Australia. The breadth of consideration makes this text ideal for senior undergraduate and graduate classes.

Chapters Two and Three discuss the forest as a habitat for insects and trees as a source of food. What then are the attributes of those relatively few insects that are rated as pests? This topic is addressed in Chapter Four. The authors then examine several aspects of management concerns and begin with a review of forest practices (Chapter Five) including a discussion of plantation forestry, silvicultural practices, and the implication of forest diversity. The next four chapters deal with specific management considerations including plant resistance, biological control, insecticides and behavior-modifying chemicals. In the final chapter, the authors present an overview of integrated pest management (IPM) in forestry. This is a discussion of the need for survey and detection, as well as monitoring and prediction of insect populations. This is followed by an evaluation of some hazard or risk rating systems for forests. The priorities for carrying out any particular control option are derived from an analysis of the costs and benefits associated with various alternatives. The authors conclude with a discussion of five case histories of IPM in forestry. Their chosen examples are pine processionary moth, *Thaumetopoea pitycampae* (Europe); the Douglas fir tussock moth, *Orgyia pseudosugata* (western North America); the pine looper moth, *Bupalus piniaria* (Europe); the spruce bark beetle, *Ips typographus* (Scandinavia); and the great spruce bark beetle, *Dendroctonus micans* (Europe).

The text is liberally illustrated with 178 figures that have all been redrawn from the originals which contributes to a uniform standard of presentation throughout. The 62 tables summarize much useful information and are well dispersed throughout the text. For students and professors of temperate forest insect pest management, this is an interesting and most worthwhile volume.

John A. McLean,  
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Huber, F., T.E. Moore and W. Loher. (eds.). *Cricket behavior and neurobiology*. Comstock Publishing Associates, Cornell Univ. Press. Ithaca, N.Y. 565 pp. Hardcover, \$(U.S.)65.00.

There have been remarkable insights into the physiological basis of cricket behaviour over the past two decades. This book, edited appropriately by Franz Huber, the instigator of many of these cricket discoveries, offers us the state of gryllid science with considerable success. Beginning students of neuroethology, insect behavioural ecologists, neurophysiologists studying other invertebrates or less focussed readers wishing only to sustain a general knowledge of cricket physiology, will profit alike from some fascinating revelations and a reasonably current overview of some of the leading workers in this field.

Some content is spectacular, such as the reproductive and aggressive behaviour of *Phaeophilacris*. The males of this earless African cricket communicate with vortices of air, generated by wings flicked forward over the head. Dambach describes his work with photographs of smoke-visualized air flows and in the same chapter addresses the perception and central processing of substrate-transmitted vibrations in field crickets in general. Or another example: while presenting an extensive overview of cricket mechanoreceptors, Gnatzy and Hustert describe fluid-filled club-shaped sensilla, shown in excellent SEM photographs, that function on the cricket cercus to detect gravity. Later, they present a story of mechanoreceptors mediating release of cricket head-stands and kicks in response to the attack of a solitary wasp. Pollack and Hoy describe how crickets evade bat predators, responding with negative phonotaxis to ultrasonic sounds mediated by now-identified interneurons.

Crickets emphasize sound communication and so does this book. There is a primer on the physical basis of sound reception (Larsen, Kleindienst, and Michelsen) and an assessment of how directionality is achieved through peripheral processing by the mechanical parts of the ear. Ball, Oldfield and Rudolph treat the anatomy of cricket ears from the ultrastructure of auditory sensilla to the response characteristics of auditory receptors and their central projections. Bennet-Clark contributes a chapter on the physical structure of cricket sounds and the tegmental mechanics and other adaptations by which mole crickets efficiently couple their generators to the air.

There is also a laudable attempt to deal with non-acoustic aspects. Loher and Zaretsky address the cricket endocrine system. Loher describes the adaptive basis of circadian rhythmicity. Honegger and Campan summarize the relatively modest amount of information available on the cricket visual sense. An introductory chapter by Walker and Masaki is an eclectic mix of life cycles, wing dimorphism, migration, defensive behaviours and the significance of crickets in human culture, together with some excellent drawings pointing up the great species diversity of crickets.

The core of this book is its treatment of a virtual revolution in neuroethology as it pertains to crickets. There is a chapter by Kutsch and Huber on the neural basis of stridulation, notable for its breadth and successful synthesis. They detail the anatomy and the neuromuscular events taking place in thorax and brain to control stridulation as a fixed action pattern. The Kramer spherical treadmill is a device that permits a cricket to locomote in place, revealing by the insect's turns the attractiveness and localizability of acoustic test stimuli. The efficiency of this tool, together with the neurophysiologist's new ability to identify and monitor single neurons, has allowed great progress in our understanding of recognition and localization processes within the central nervous system of crickets. This progress is outlined in two chapters, the first by Weber and Thorson and the second by Schildberger, Huber and Wohlers.

In a final chapter, Huber (as Loher and Dambach earlier) stresses the need for physiologists and behavioural ecologists to share and benefit from the interplay of their findings. The strength of this book, Loher on reproductive behaviour notwithstanding, lies overwhelmingly in its physiology and it is the behavioural ecologist who stands to gain the more from adding the book to his/her library. Though the



title puts behaviour first, the substantive content is physiological. Only a very little attention is paid to the ecological and evolutionary aspects of crickets studied in the context of sexual selection, mating systems, sperm competition, etc.

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University of Toronto (Erindale College)  
Mississauga, Ont.

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Cameron, P.J., R.L. Hill, J. Bain and W.P. Thomas. (eds.) *A review of biological control of invertebrate pests and weeds in New Zealand 1874-1987*. Tech. Comm. No. 10, CAB Internat. Inst. of Biological Control. Wallingford, Oxon, U.K. 424 pp. Hard cover, price not given.

This excellent review completes the coverage of biological control endeavors in commonwealth countries that have been published by the CIBC. The format follows that used for other countries, e.g. Canada, in that there are separate chapters, individually authored, for each of 70 pest species or closely related groups of pest species. These species are presented in 6 parts; Pasture Pests, Field Crop and Vegetable Crop Pests, Fruit Crop Pests, Forestry Pests, Weeds and Nuisance Pests. Each chapter summarizes the available records of introductions, releases and establishment of biocontrol agents and of their impact on the target species. A summary table indicates that 225 species of biocontrol agents have been released, of which 31% are established and 11% have had an impact on the target species.

Closer analyses of the programs will prove rewarding to those interested in the history of biocontrol, in improving biocontrol techniques, and in testing their theories. For example, Part 1, Pasture Pests, includes records of the release of 20 species of agents against 2 native target pests and that none of the agents became established. In contrast, releases of 11 species of agents against 8 species of introduced pests led to 55% of them becoming established and 18% having an impact on the host. The rate of success is much higher if futile releases, those involving small numbers of agents or based on inadequate knowledge of host/agent relations, are excluded: 50% of the releases against natural pasture pests and 36% of those against introduced pasture pests could be classed as futile.

Undoubtedly many useful lessons in biocontrol will be learned from analyses of the documentation provided in this review as readers test their hypotheses or draw out examples for use in classrooms. The DSIR, New Zealand, and CIBC are to be commended for producing this exhaustive review. I recommend this book to biocontrol practitioners, theoreticians and teachers.

W.J. Turnock,  
Agriculture Canada  
Winnipeg, Manitoba

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### Book Notices

Howard, R.J. and J. A. Garland. (eds.) *Diseases and Pests of Vegetable Crops in Canada* - Pre-publication Notice (available 1991). Published by the Canadian Phytopathological Society and Entomological Society of Canada

*Diseases and Pests of Vegetable Crops in Canada* is an illustrated compendium of important diseases and pests on vegetable crops. The book is intended as a practical guide to the diagnosis and

management of the more important diseases and pests of vegetable crops in Canada, including sustainable approaches to crop protection as much as possible. The symptoms of many infectious diseases are illustrated, as are numerous noninfectious disorders, insects, mites, nematodes and mollusc pests. The presentation of each disease/pest includes symptoms/damage, a description of the causal agent/characters for field identification, disease cycle and epidemiology of the causal agent/life history of the pest, and management strategies, covering monitoring techniques, cultural practices, resistant cultivars, and biological and chemical control.

*Diseases and Pests of Vegetable Crops in Canada* is a companion volume to *Diseases of Field Crops in Canada* published by the Canadian Phytopathological Society. It is intended for producers, extension personnel, students and other interested in the diseases and pests of vegetable crops grown in Canada. This book represents the combined efforts of plant pathologists and entomologists employed in or recently retired from careers in research, extension, teaching and regulation at universities and provincial and federal government offices across Canada.

For more information contact:

Dr. Ieuan R. Evans,  
Alberta Agriculture,  
7000-113th St.  
Edmonton, Alberta Canada T6H 5T6  
Telephone: (403) 427-7098  
FAX: (403) 422-9745

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Evenhuis, Neal L. 1989. *Systematics and evolution of the genera in the subfamilies Eusiinae and Phthiriinae (Diptera: Bombyliidae) of the world*. Bishop Museum Bulletin in Entomology 3. Bishop Museum Press, Honolulu. Distributor: E.J. Brill, Leiden, The Netherlands. (Entomograph Volume 11). 72 pp. Hardcover, \$(U.S.)35.00

This monograph constitutes a comprehensive phylogenetic and comparative morphological study at the generic level of taxa in the bombyliid subfamilies Eusiinae and Phthiriinae, which are shown to be closely related. Three genera in two new tribes of Eusiinae, and ten genera in two tribes of Phthiriinae, are recognized; twenty-three genera are removed from these subfamilies and placed elsewhere. Several synonyms at the generic level and homonyms at the species level are now identified; new name replacements, new generic placements, and new combinations are made.

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### Journals for Sale

The following journals are for sale: Journal of Economic Entomology, Vols. 1-62 (1-28 bound); Bulletin of the Entomological Society of America (Vols. 1-28); Annual Review of Entomology, Vols. 1-35. For more information contact:

Entomologist,  
1201 N. 112th St.,  
Lincoln, NE  
U.S.A. 68527

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## **Entomological Society of Canada Graduate Research-Travel Grants**

### **Invitation for Applications**

#### **Preamble**

To foster graduate education in entomology, the Entomological Society of Canada will offer two research-travel grants, awarded annually on a competitive basis. The intent of these grants is to help students increase the scope of their graduate training. These grants, up to a maximum of \$2,000, will provide an opportunity for students to undertake a research project or to do course work pertinent to their thesis subject that could not be carried out at their own institution.

#### **Eligibility**

To be eligible, a student must:

- 1) be enrolled as a full-time graduate student
- 2) be an active member of the Entomological Society of Canada

#### **Format of the Application Form**

The application form will be in the format of a grant proposal, where the applicant will provide the following information:

- 1) the subject of the thesis
- 2) a pertinent review of the literature in the field
- 3) a concise presentation of the status of the ongoing thesis research
- 4) a description of the research or course work to be undertaken, clearly indicating a) the relevance to the overall goal of the thesis, b) an explanation of why such work cannot be carried out at the student's own university and c) the justification of the site where the research/course work will be carried out.
- 5) a budget for the proposed project
- 6) anticipated dates of travel and date on which grant money is needed.

The application form should also be accompanied by:

- 1) an up-to-date C.V.
- 2) a supporting letter from the senior advisor
- 3) When appropriate, a support letter from the scientist or Department Head at the institution where the applicant wishes to go.

#### **Evaluation Procedure**

The scientific merit of each application will be evaluated by a committee that has the option of sending specific projects out for external review by experts in the field. A constructive written report, underlining the positive and negative aspects of the proposal, will be returned to the applicant.

#### **Timetable and Application Procedure**

Application forms, which may be obtained from the Secretary of the Society, must be completed



and returned to the Secretary of the Society by **15 February 1991**.

The committee will evaluate all applications by 30 April 1991 and determine if, and to whom, grants will be awarded. The successful applicants will be informed immediately, thereby providing sufficient time for students wishing to start in the fall to make necessary arrangements. Grants must be used in the 12 months following the award.

Recipients must provide a short final report, as well as a detailed list of expenses, in the three months that follow the trip. Any money not spent must be returned to the Society.

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## **La Société d'entomologie du Canada Allocations de Voyage pour Étudiants Gradués**

### **Appels pour Allocations**

#### **Préambule**

Afin de promouvoir les études graduées en entomologie, la Société d'Entomologie du Canada offrira deux bourses de voyage associées à la recherche. Celles-ci seront décernées annuellement sur une base compétitive. Le but de ces bourses est de permettre aux étudiants gradués d'élargir les horizons de leur formation. Les bourses, d'une valeur maximale de \$2,000 permettront à des étudiants de réaliser un projet de recherche, ou de suivre des cours pertinents à leur sujet de thèse qui ne pourraient pas être entrepris dans leur propre institution.

#### **Éligibilité**

Afin d'être éligible, l'étudiant doit:

- 1) être inscrit à temps plein comme étudiant gradué
- 2) être un member actif de la Société d'Entomologie du Canada

#### **Format du Formulaire de Demande**

Le formulaire d'application sera dans le style d'une demande d'octroi et l'étudiant devra fournir l'information suivante:

- 1) le sujet de la thèse
- 2) une revue de la littérature pertinente au domaine d'étude
- 3) une présentation concise du statut du projet de recherche en cours
- 4) une description de la recherche ou des cours qui seront entrepris, indiquant clairement a) le pertinence vis-à-vis les objectifs généraux de la thèse, b) les raisons pour lesquelles ce travail ne peut être entrepris à l'université où l'étudiant est inscrit, et c) une justification concernant le choix de l'endroit où la recherche/les cours seront entrepris
- 5) un budget pour le projet proposé
- 6) dates prévues pour le voyage et date à laquelle la bourse sera requis.

L'application devra aussi être accompagnée de:

- 1) un C.V. complet mis-à-jour
- 2) une lettre de recommandation du directeur de thèse, et
- 3) Lorsqu'appropriée, une lettre d'appui d'un administrateur de l'institution où le candidat désire aller.



### Evaluation

La valeur scientifique de chaque application sera évaluée par un comité qui aura l'option d'envoyer des demandes spécifiques pour évaluation par un lecteur externe, expert dans le domaine. Un rapport écrit, contenant une critique constructive, faisant ressortir les aspects positifs et négatifs de l'application, sera retourné à chaque candidat.

### Echéances et Procédures

Les formulaires d'application, qui peuvent être obtenus du Secrétaire de la Société, doivent être remplis et retournés pour le **15 février 1991** au Secrétaire de la Société.

Le comité évaluera toutes les applications pour le 30 avril 1990 et déterminera si, et à qui, les bourses seront décernées. Les candidats choisis seront informés immédiatement, cela afin d'allouer suffisamment de temps pour les préparatifs nécessaires à un départ possible à l'automne. La bourse doit être utilisée dans les 12 mois suivant son octroi.

Les récipiendaires devront préparer un court rapport final, en plus d'une liste détaillée de leurs dépenses, dans les trois mois suivant le voyage. Tout argent non dépensé devra être remis à la Société.

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## UPCOMING MEETINGS / RÉUNIONS À VENIR

*Entomological Society of British Columbia, General Meeting*, 25 October 1990, Vancouver, B.C.

CONTACT: Dr. Sheila Fitzpatrick, Agriculture Canada Research Station, 6660 N.W. Marine Dr., Vancouver, B.C. V6T 1X2

*North American Forest Insect Work Conference*, 25 - 28 March 1991, Denver, Colorado - "Getting Ready for the 21st Century"

CONTACT: D.C. Allen or L. P. Abrahamson, College of Environmental Science & Forestry, State University of New York, Syracuse, N.Y., U.S.A. 13210-2778 (315-470-6742)

*11th International Symposium on Chironomidae*, 12 - 14 August 1991, Amsterdam, The Netherlands.

CONTACT: Drs. F. Heinis, M & W Aquasense, P.O. Box 41125, 1009 EC, Amsterdam.

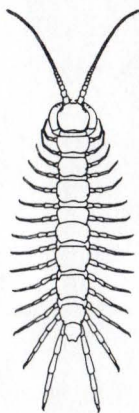
*43rd International Symposium on Crop Protection*, 7 May 1991, State University of Ghent, Belgium

CONTACT: Prof. Dr. ir. D. Degheele, Faculty of Agricultural Sciences, Coupure links 653, B-9000 Ghent, Belgium,

## ILLUSTRATED KEYS TO THE FAMILIES OF TERRESTRIAL ARTHROPODS OF CANADA

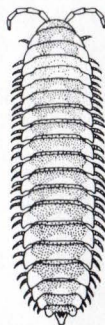
### 1. MYRIAPODS (Millipedes, Centipedes, etc.)

by D.K. McE. Kevan & G.G.E. Scudder



This profusely illustrated key provides a means of identifying the Canadian and northern United States' millipedes, centipedes, pauropods and symphylans to the family level. An additional key in the preface provides a means to identify the major groups of arthropods, and an appendix presents a classification of the Canadian and northern United States' families of myriapods, with included genera.

The myriapods are a neglected group of animals, and it is hoped that this key will encourage more study of these interesting arthropods. The publication has a lay-flat binding for easy use in the field and laboratory. It is aimed at entomologists and naturalists with some knowledge of arthropods and would be especially useful in field courses, introductory courses in high schools, colleges and universities, and for survey work on soil fauna, etc.



**Specifications:** vi + 88 pp., plasticized soft cover, 50 references, 51 figures, 5 1/2" x 8 1/2", spiral binding. Published by the Biological Survey of Canada (Terrestrial Arthropods), Ottawa. 1989.

**Only \$6.00 (+ \$3.00 postage & handling)**

**Contact:** The Entomological Society of Canada  
393 Winston Ave., Ottawa, Ontario, Canada K2A 1Y8

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