

Proceedings of the
Fourteenth Annual Meeting

of the

ENTOMOLOGICAL SOCIETY

of

ALBERTA

held jointly with the
ENTOMOLOGICAL SOCIETY OF CANADA



Banff, Alberta

September 12th - 14th, 1966

Proceedings of the
ENTOMOLOGICAL SOCIETY OF ALBERTA
Held Jointly with the
ENTOMOLOGICAL SOCIETY OF CANADA

Volume 14

December, 1966

OFFICERS - 1966

| | |
|-----------------------------|---|
| President | R. W. Salt |
| Vice-President | B. Hocking |
| Secretary | D. S. Smith |
| Treasurer | A. M. Harper |
| Directors | K. R. Depner (Lethbridge) J. B. Gurba (Edmonton) H. Tripp (Calgary) |
| Regional Director to E.S.C. | C. E. Brown |
| Editor | J. A. Shemanchuk |

THE FOURTEENTH ANNUAL MEETING

The Fourteenth Annual Meeting of the Entomological Society of Alberta was held jointly with the Sixteenth Annual Meeting of the Entomological Society of Canada. The meeting was held at the Banff School of Fine Arts, September 12 to 14.

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and Entomological Society of Canada

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REPORT FROM THE PRESIDENT

The sessions were highlighted by invitational addresses and a symposium on the theme of insect attractants. Many of the 58 submitted papers dealt with the same topic. Registration totaled 169 delegates and 62 wives. A barbecue was held on September 12 and a banquet on September 13 at which W. O. Mitchell of High River, Alberta regaled guests with excerpts from his humorous writings on Western Canadiana.

Recipient of the annual Entomological Society of Canada Gold Medal was an Entomological Society of Alberta charter member, Dr. Chris Farstad, who, despite a serious heart affliction, attended the meetings and renewed acquaintance with his former colleagues.

- R. W. Salt

TITLES OF INVITATIONAL ADDRESSES

Joint Meeting of Entomological Society of Canada
and Entomological Society of Alberta

The Neural Background of Attraction

Dr. Vincent G. Dethier

Professor of Zoology and Psychology
University of Pennsylvania
Philadelphia, Pennsylvania

Insect Sex Attractants - Past, Present and Future

Dr. Martin Jacobson

Natural Products Investigations
United States Department of Agriculture
Beltsville, Maryland

INVITATIONAL SYMPOSIUM

Attraction of Some Blood-sucking Diptera to Various Stimuli

A. M. Fallis

Department of Parasitology
University of Toronto
Toronto, Ontario

Responses to Chemotactic Stimuli
by Some Stored-products Insects

S. R. Loschiavo

Research Station
Canada Department of Agriculture
Winnipeg, Manitoba

Chemosensory Influence of the Host Plant
on Insect Behaviour: Observations and Interpretations

A. J. Thorsteinson

Department of Entomology
University of Manitoba
Winnipeg, Manitoba

Attraction of Insects by Log Odours

J. A. Chapman

Forest Research Laboratory
Canada Department of Forestry
Victoria, British Columbia

INVITATIONAL PAPER

Pheromones of the Honey Bee

D. A. Shearer and R. Boch

ABSTRACTS OF SUBMITTED PAPERS
by
Members of Entomological Society of Alberta

Pheromones in Elaterids

C. E. Lilly

Studies concerning pheromones obtained from female elaterids are discussed. Sex attractants have been extracted from five species involving three genera and each has been located on paper chromatograms by bioassay. In field tests the active extracts from only three of the species--Limonius californicus (Mann.), L. canus (LeConte), and Agriotes ferrugineipennis (LeConte) have been used successfully to date to study adult behavior and distribution.

Detailed laboratory studies carried out with males of L. californicus are reported, including quantitative aspects of their response to the attractant and the location of sensory receptors on their antennae. Certain characteristics of the pheromone are noted.

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Natural Sex Attractants in Tephritid Fruit Flies,
Especially *Rioxa pornia* (Diptera: Tephritidae)

Gordon Pritchard

Synthetic lures attractive to male fruit flies have proved useful in control operations, but no natural counterparts have been found in female flies. Indeed, in the few tephritid species that have been examined, if an attractant is involved in mating, it is produced by the male. In *Rioxa pornia* the male secretes a volatile sex attractant just prior to dusk and when the female has been attracted he produces a mound of foam from his proboscis; the female feeds on this foam during copulation. The odour is produced by epidermal gland cells in the pleural region of abdominal segments 3, 4, and 5, during the male's courtship. The mucin base of the foam is produced and stored in the salivary glands. Courtship will be discussed in relation to the need to get the sexes together and to overcome female aggressiveness.

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Relation Between Bark Beetle Attack,
Fungal Infection, and Tree Mortality

R. W. Reid

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Artificial Diets and Some Growth Factor Requirements
for the Pale Western Cutworm

R. Kasting and A. J. McGinnis

The pale western cutworm, *Agrotis orthogonia* Morrison, has been reared in the laboratory on a partly defined artificial diet that contained no green-plant extracts. Deletion experiments with this diet showed that omission of inositol, biotin, or vitamin B₁₂ did not affect growth and development of feeding larvae. The absence of nicotinamide or choline chloride arrested growth of larvae in the first instar whereas pyridoxine or Ca pantothenate effects appeared in the third instar. Riboflavin, folic acid, or thiamine deficiencies allowed development into the fifth instar but no pupae were formed.

The inhibitory effect of the diet lacking thiamine on growth of newly hatched larvae was not caused by reduced consumption of the deficient diet.

Effect of Amino Acid Imbalance on Consumption
and Utilization of Food by Cutworm Larvae

A. J. McGinnis and R. Kasting

Diets prepared from lyophilized leaves of Thatcher wheat and supplemented with 1.4 per cent L-leucine caused death of newly hatched larvae of the pale western cutworm, Agrotis orthogonia Morr. Fifth-instar larvae survived when fed the leucine-supplemented diet but consumed much less and gained only about one-third as much weight as did those fed the control diet. On either diet larvae utilized about the same proportions of the different amino acids, suggesting that leucine concentration did not affect consumption by interfacing with digestion and absorption of amino acids. Results of feeding fifth-instar larvae on diets supplemented with sucrose indicate some relationship between osmotic pressure in the diet and the quantity of dry matter consumed. The implications of these observations will be discussed.

African Acacia Associates

Brian Hocking

About 70 of the 800 known species of Acacia occur in tropical East Africa and about 12 of these have swollen stipular thorns which may be hollowed and occupied by ants. As with the commonest species, A. drepanolobium, the association may be obligate for the Acacia and probably also for the three commonest species of ant, Tetraponera penzigi Mayr and two species of Crematogaster. Also associated with this species of Acacia directly or indirectly through one of the ant species are a bird, a snail, two spiders, and some 45 other insects, many of which mimic their ant associates in curious ways. Among these 140 are two butterflies and several moths, a thysanuran, and about 50 beetles. Nearly half the species were undescribed at the time of this study.

Pollen Preferences of Honey Bees

Margaret Skirving

The wind-borne odour of pollen pellets collected from honey bees of five species of pollen and a mixture of pollens was offered to honey bees in an olfactometer. The mixed pollen was most attractive to the bees followed by dandelion, mustard, plum, willow, and sweet clover.

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Observations on the Effects of Weather on the Activity
of Tsetse Flies, Glossina morsitans Westw.
(Diptera: Muscidae), in Bechuanaland, Africa, in the Field

P. Graham

A series of dawn-to-dusk captures of tsetse flies indicated that temperature was the main controlling factor. The results at high temperature agreed closely with the published results of laboratory experiments, but flies were found to be active at temperatures well below those indicated in the laboratory.

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Puparial Development of the Warble Flies
Hypoderma lineatum and H. bovis

J. Weintraub

Experiments in the field and laboratory showed that development of puparia of Hypoderma lineatum and H. bovis was controlled primarily by the environmental temperature. In the field, seasonal emergence of adults was concentrated by acceleration of puparial development as spring temperatures increased. During the adult season the daily emergence was concentrated in the morning when the daily temperature was increasing.

The effects of constant and of fluctuating temperatures on puparial development were determined in the laboratory. The implications of the results were discussed with respect to geographic distribution of warble flies, to colony maintenance, and to temperature summation theory.

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Swarming Behaviour of Tabanidae
in the Foothills of Southern Alberta

J. A. Shemanchuk and J. Weintraub

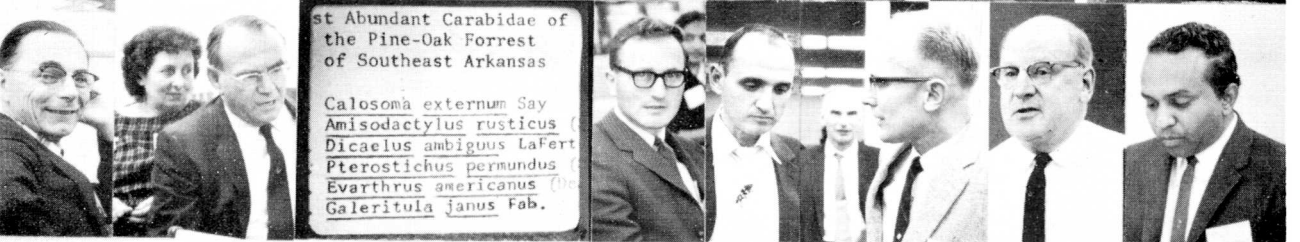
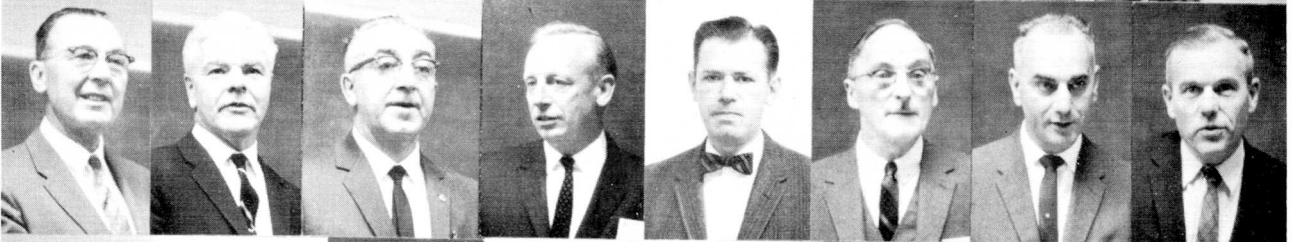
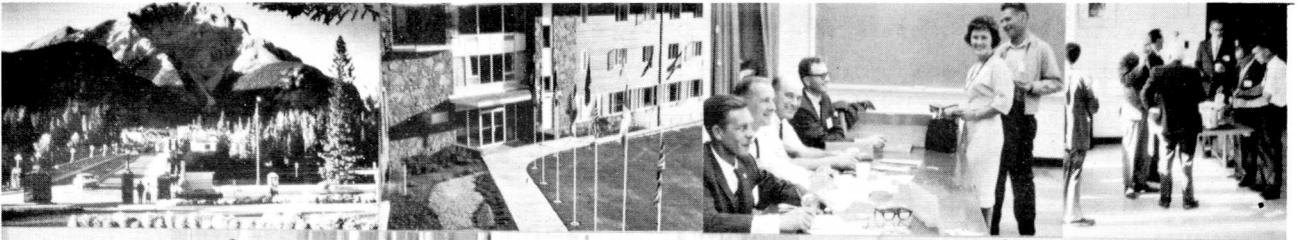
The hovering activity for three species of Tabanus males was observed in the Porcupine Hills west of Claresholm, Alberta. This hovering activity is a mating behaviour. Mating was observed and copulating pairs were caught. The males take up hovering positions in certain open areas and along pathways among trees. Each male occupies a definite territory, which it protects by an aggressive behaviour. Hovering activity occurred between 0700 and 1130 hours on warm and sunny days. No activity was observed on cool, cloudy days. Response by the males to moving objects and flying insects is described.

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|----------------|---------------------------------|--------------|
| Banff, Alberta | Banff School of Fine Arts | Registration |
|----------------|---------------------------------|--------------|

S c i e n t i f i c S e s s i o n

| | | | | | | | |
|---------------------|-------------------|--|------------------------|---------------------|------------------------|-------------------------|-----------------------|
| R. W. Salt | Becker | R. R. Le- Jeune | V. G. Dethier | M. Jacob- son | A. M. Fallis | S. R. Lo- schiavo | J. A. Chap- man |
| C. Johan- sen | D. A. Shearer | A. J. Thor- stein- son | L. K. Peter- son | C. E. Lilly | R. Silver- stein | I. S. Lind- say | H. G. Kin- zer |
| P. E. Blakeley | P. Graham | E. J. LeRoux L. A. O. Roadhouse A. P. Randall | J. Weintraub | C. W. Farstad | C. McGuffin | | |
| R. Kasting | A. J. McGinnis | D. J. Larson | J. Shorthouse | B. Hocking | I. Gilbert | | |
| K. R. Depner | W. H. Whitcomb | H. Cerezke | G. E. Ball | G. E. Swailles | H. Monro | K. Kalpage | |

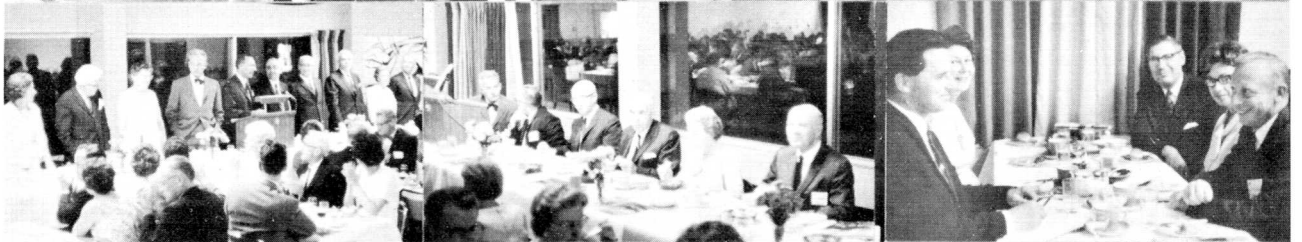
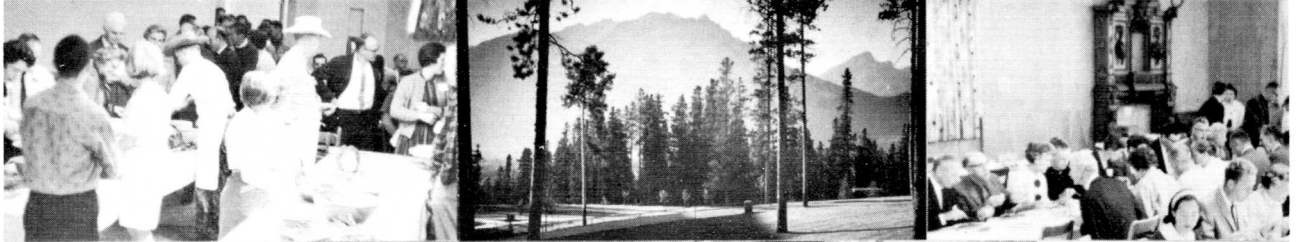


st Abundant Carabidae of
 the Pine-Oak Forrest
 of Southeast Arkansas

 Calosoma externum Say
 Amisodactylus rusticus (C)
 Dicaelus ambiguus LaFert
 Pterostichus permundus (C)
 Evarthrus americanus (C)
 Galeritula janus Fab.

FOURTEENTH ANNUAL MEETING-BANFF 1966

| | | | | | | | |
|-------------------------|--|--|---|-------------------------------|------------------------------|------------------------|-------------------------------|
| Mrs. Chance | Mrs. N. D. Holmes | Ivy Su | Mrs. E. T. Gushul Mrs. J. A. Shemanchuk | Mrs. I. S. Lind- say | Mrs. G. E. Swailles | Mrs. J. B. Gurba | Mrs. C. W. Far- stad |
| Bar-Be-Que | | | Banff | | | Bar-Be-Que | |
| | J. B. Gurba | L. K. Peterson E. E. Ballantyne | Harpers and Johansens | | Dr. and Mrs. Iwao | | |
| Head Table | | | Head Table | | | Banquet | |
| Banquet | F. O. Morri- son | C. W. Farstad R. R. LeJeune | C. W. Far- stad | E. E. Ballan- tyne | Sen- ator Came- ron | C. C. Ste- ward | |
| Chances | Rosenbergs | | Shemanchuks and S. Loschiavo | | Larsons | | Leechs |
| Rep's from U of A | E. J. LeRoux A. J. McGinnis | | W. O. Mitchell | Farstads | | G. E. Ball | Harpers |



ENTOMOLOGICAL SOCIETY OF ALBERTA

ENTOMOLOGICAL SOCIETY OF ALBERTA

Minutes of the Fourteenth Annual Meeting

Banff School of Fine Arts, Banff

14 September, 1966

The meeting was opened by the chairman, President R. W. Salt.

1. The Minutes of the Thirteenth Annual Meeting were read and approved on a motion by B. Hocking and seconded by R. Shepherd.
2. Arising from these minutes, the whereabouts of the library material had still not been discovered R. Stevenson reported. J. Gurba stated that the centennial issue of the Farm Guide might replace the proposed Insects of Alberta and both he and B. Hocking agreed that this matter might be dropped.
3. The only correspondence to be read was a letter of thanks from the Acadian Entomological Society for the gift of a gavel.
4. 1967 Meeting - A letter from the secretary of the Entomological Society of Saskatchewan was brought to the attention of the meeting. This was in reply to our suggestion of a joint meeting and requested details. L. A. Jacobson suggested that we invite them to be our guests and to participate but that it would be simpler if we ran the meeting ourselves. Various complications that could arise in arrangements if the meeting were jointly operated were brought forth. It was further suggested that the Saskatchewan society be invited to partake fully in submission of papers and that they be afforded an opportunity to hold their own business meeting if so desired.

Moved by J. Gurba, seconded by C. Lilly that the secretary reply to the Saskatchewan society in line with the present discussion. Carried.

The members from the university suggested that since we will be staying at a motel in all probability it would be simpler to hold the meetings there too rather than trying to find space at the University.

5. 1966 Proceedings - After some discussion of the feasibility of getting abstracts of invited papers it was moved by A. Harper and seconded by P. Blakeley that the 1966 Proceedings incorporate the titles of all presented papers and symposium papers and abstracts of all papers given by members of the Alberta society. Carried.
6. Sales of Collectors Guides - Edmonton reported a total sale of 1055 copies, 376 in the last year, Calgary some 60 copies and Lethbridge 40.
7. Insect Collections - C. Lilly reported that because of the poor showing of last year's collections none had been brought to Banff. Any submitted would be later brought to a central point for judging, but except for the possibility of one from Edmonton there had been no response.
8. Society Award - B. Hocking reported that it was difficult to decide on winners because of the way the award was described in the calendar. He mentioned that seven of 14 previous winners were present at these meetings.
9. Financial Report - An interim report presented by the Treasurer, A. Harper, was approved.
10. Alberta Conservation Council - P. Graham reported on this. Moved by P. Graham, seconded by G. Ball that the Entomological Society of Alberta signify its intention of joining the Council and appoint two delegates. Carried.

The President appointed P. Graham and J. Gurba as delegates.

11. Nominating Committee Report - Presented by the chairman L. A. Jacobson.

| | |
|-------------------------|----------------|
| President | B. Hocking |
| Vice-President | H. Tripp |
| Secretary | L. K. Peterson |
| Treasurer | K. Ball |
| Editor | M. Chance |
| Directors | H. F. Cerezke |
| | P. Chiang |
| | R. Larson |
| Regional Director (ESC) | G. Ball |

Moved by R. Shepherd, seconded by J. Weintraub, that nominations cease. Carried.

12. Resolutions Committee Report - Presented by chairman B. Hocking.

Whereas the success of the program of the 16th Annual Meeting of the Entomological Society of Canada jointly the 14th Annual Meeting of the Entomological Society of Alberta has been in large measure attributable to the following parties,

Be it resolved that letters of appreciation be sent to:

The invitation speakers,
The Banff School of Fine Arts and the Voyager Inn
for their accommodations and services,
The Government of the Province of Alberta for the
banquet provided,
The organizations listed on the back of the program
for their generous contributions,
Mr. Evan Gushul, who took leave to come to the meet-
ings to take the traditional pictures.

Seconded by R. Stevenson. Carried.

B. Hocking expressed the appreciation of the society to its executive committees and also extended the society's best wishes to two of its members who were recently married, Mr. and Mrs. Martin Chance.

13. Miscellaneous Business - The members appointed as the auditors for 1966 Miss Cathy Webster and Miss Betty Nishimura.

Moved by G. Ball, seconded by A. Harper that the Society send its usual grant to the Zoological Record. Carried.

It was suggested that surplus programs of the meetings be sent to those members of the Society were not present at the meetings.

In answer to a question L. A. Jacobson reported that 160 delegates had registered, and also 62 ladies. Banquet attendance was 246.

The President extended his appreciation to all those in charge of the meetings and this meeting closed at 8:30 p.m. Thirty-three members and guests were present.

Signed

R. W. Salt, President

Signed

D. S. Smith, Secretary

Report to the
ENTOMOLOGICAL SOCIETY OF ALBERTA
of the
INSECT-COLLECTION COMMITTEE
1966

The usual 1400 circulars advertising the annual competition were distributed to all schools throughout the province. The response was somewhat better than we have experienced for the last four years. Seven collections were submitted, although one was so badly damaged in transit that it could not be judged. The remaining six collections were categorized as follows: three in junior, two in senior, and one in the challenge competition. The project for the latter competition was entitled "Insects in Nature's Half Acre".

The collections were judged at the Lethbridge Research Station on October 27 by Dr. G. A. Hobbs, Dr. R. E. Stevenson, and Mr. C. E. Lilly. All of the six contestants were awarded prizes consisting of entomological books.

The following is a financial statement of the expenses incurred:-

| | |
|---|-------------|
| 1 book - "Field Guide of Butterflies".... | \$ 4.98 |
| 4 books - "Field Book of Insects" | 23.52 |
| Mailing charges (first-class) | 3.24 |
| | <hr/> |
| Total | \$31.74 |
| | <hr/> <hr/> |

(The sixth award was also a copy of "Field Book of Insects", but represented a carry-over from a previous year's purchase.)

Signed

C. E. Lilly, Chairman,
Insect-Collection Competition.

Financial Statement of 1966

Bank balance as at January 1, 1966 \$ 374.99

Receipts

Membership fees:

| | | |
|--|---------------|--------|
| Entomological Society of Alberta, 1964 ... | \$ 2.00 | |
| Entomological Society of Alberta, 1965 ... | 6.00 | |
| Entomological Society of Alberta, 1966 ... | 57.00 | |
| Entomological Society of Alberta, 1967 ... | <u>44.00</u> | 109.00 |
| | | |
| Entomological Society of Canada, 1965 | 16.00 | |
| Entomological Society of Canada, 1966 | 196.00 | |
| Entomological Society of Canada, 1967 | <u>116.00</u> | 328.00 |

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|---|----------------|
| Bank interest | 4.88 |
| Donation from ESA-ESC Joint Meeting Committee | 402.54 |
| Sale of bulletins | <u>25.25</u> |
| | <u>1244.66</u> |

Expenditures

| | | |
|--|-------------|---------------|
| Fees to Entomological Society of Canada (received 1966)..... | 328.00 | |
| Fees to Entomological Society of Canada (received 1965) | 4.00 | |
| Insect collection competition, prizes and circulars | 28.50 | |
| Scholarships to University of Alberta, Edmonton | 100.00 | |
| Proceedings | 58.22 | |
| Money sent to Dr. B. Hocking for bulletins .. | 25.25 | |
| Postage | 11.00 | |
| Bank charges | <u>1.05</u> | <u>556.02</u> |
| | | |
| Balance as at December 30, 1966 | | <u>688.64</u> |

Audited February 10, 1966

A. M. Harper, Treasurer

P. E. Blakeley

R. W. Salt, President

C. E. Lilly

Budget for
ESA-ESC Joint Meeting
Banff, Alberta
September 11-14, 1966

| <u>Expenses</u> | <u>Budgeted</u> | <u>Spent*</u> |
|--|---------------------|----------------------|
| Expenses of speakers at scientific program | \$ 750.00 | \$ 500.00 |
| Banquet | | |
| Dinner (Provincial government?) | 1000.00 | 1060.00 |
| Entertainment | 200.00 | 180.00 |
| Cocktail party | 250.00 | 345.00 |
| Barbecue - Food, buses, refreshments ... | 550.00 | 595.00 |
| Favors | 300.00 | 300.00 |
| Programs, abstracts, etc. | 400.00 | 535.00 |
| Meeting rooms, publicity, local arrangements, and president of ESC hospitality | 200.00 | 265.00 |
| First-night hospitality | 150.00 | 100.00 |
| Ladies program | 150.00 | 160.00 |
| Coffee during meetings | 100.00 | 65.00 |
| Local members travel and meals for meeting arrangements | 100.00 | 50.00 |
| Letters, stamps, phone calls and gratuities | 100.00 | 50.00 |
| Honorarium (photographer's expenses) ... | 50.00 | 50.00 |
| Stenographic assistance at Banff (registration) | 50.00 | 10.00 |
| | <u>4350.00</u> | <u>4265.00</u> |
| <u>Revenue</u> | <u>Budgeted</u> | <u>Received*</u> |
| Alberta Government grant for banquet ... | 1000.00 | 1000.00 |
| ESC - Program speakers | | |
| - Miscellaneous expenses | 1250.00 | 500.00 |
| Registration fees (130 @ \$10.00) | 1300.00 | 1670.00 |
| Contributions from industry | 800.00 | 995.00 |
| | <u>4350.00</u> | <u>4665.00</u> |

*Figures rounded off to the nearest five dollars.

IN MEMORIAM

Christian W. Farstad

August 5, 1906 - November 18, 1966

Dr. Christian W. Farstad passed away very suddenly in hospital at Toronto on November 18, 1966. Chris and Marj had attended the Banff meetings in September and there disclosed his plans for heart surgery after his return to Ottawa. He entered the Toronto General Hospital in October, underwent a series of examinations and tests, and submitted to surgery. The operation was successful and his condition was improving when he succumbed to a blood clot. A memorial service was held in Ottawa on November 21 and burial was at Creston, British Columbia on November 23. A number of his former colleagues from Lethbridge attended the funeral at Creston and acted as pall bearers.

The sympathy of the Entomological Society of Alberta goes to Marj, who will continue to reside in Ottawa, and to the children, Greig and Donna. His enthusiasum and interest in entomology will be missed by his friends and the Society.

MAILING LIST, 1966-1967

Honorary Members

| | |
|--------------------|--|
| Hopping, Mr. C. R. | 9924 Fifth Street S.E., Calgary |
| Painter, Mr. R. H. | 422 - 25 Street South, Lethbridge |
| Seamans, Mr. H. L. | 581 Fraser Avenue, McKellar Park, Ottawa |
| White, Mr. R. M. | R.R. 1, West Summerland, British Columbia |

Members

| | |
|-----------------------|---|
| Ball, Dr. G. E. | Entomology Department, University of Alberta, Edmonton |
| Ball, Mrs. K. | Entomology Department, University of Alberta, Edmonton |
| Blakeley, Mr. P. E. | Research Station, Canada Agriculture, Lethbridge |
| Burgess, Mr. G. D. | Biology Department, University of Alberta, Calgary |
| Brown, Mr. C. E. | Department of Forestry, Centennial Tower Building, 400 Laurier Avenue West, Ottawa 4 |
| Carr, Mr. J. L. | R.R. 4, Calgary |
| Cerezke, Mr. H. F. | Forest Research Laboratory, 721 Public Building, Calgary |
| Charnetski, Mr. W. A. | Research Station, Canada Agriculture, Lethbridge |
| Depner, Dr. K. R. | Research Station, Canada Agriculture, Lethbridge |

| | |
|-----------------------------|--|
| Edmunds, Mr. J. W. | Alberta Department of Agriculture, Edmonton |
| Elliot, Mr. D. P. | Forest Research Laboratory, 721 Public Building, Calgary |
| Evans, Dr. W. G. | Entomology Department, University of Alberta, Edmonton |
| Gurba, Mr. J. B. | Crop Protection and Pest Control, Alberta Department of Agriculture, Edmonton |
| Gushul, Mr. E. T. | Research Station, Canada Agriculture, Lethbridge |
| Harper, Dr. A. M. | Research Station, Canada Agriculture, Lethbridge |
| Hartland-Rowe, Dr. R. C. B. | Department of Zoology, University of Alberta, Calgary |
| Haufe, Dr. W. O. | Research Station, Canada Agriculture, Lethbridge |
| Hobbs, Dr. G. A. | Research Station, Canada Agriculture, Lethbridge |
| Hocking, Dr. B. | Entomology Department, University of Alberta, Edmonton |
| Holmes, Dr. N. D. | Research Station, Canada Agriculture, Lethbridge |
| Hopkins, Mrs. M. E. P. | 3 Canyon Drive, Calgary |
| Jacobson, Mr. L. A. | Research Station, Canada Agriculture, Lethbridge |
| Johnson, Dr. P. C. | Intermountain Forest and Range Experiment Station, Federal Building, Missoula, Montana, 59801 |
| Kush, Mr. D. K. | Forest Research Laboratory, 721 Public Building, Calgary |

| | |
|------------------------|---|
| Larson, Dr. Ruby I. | Research Station, Canada Agriculture, Lethbridge |
| Lee, Mr. F. C. | 633 Gore Avenue, Vancouver, British Columbia |
| Lilly, Mr. C. E. | Research Station, Canada Agriculture, Lethbridge |
| McDonald, Dr. F. J. D. | Entomology Department, University of Alberta, Edmonton |
| McDonald, Mr. S. | Research Station, Canada Agriculture, Lethbridge |
| McGinnis, Dr. A. J. | Research Station, Canada Agriculture, Winnipeg |
| Nelson, Dr. W. A. | Research Station, Canada Agriculture, Lethbridge |
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