

PROCEEDINGS OF THE EIGHTH ANNUAL MEETING
OF THE
ENTOMOLOGICAL SOCIETY
OF
ALBERTA



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Proceedings of the
ENTOMOLOGICAL SOCIETY OF ALBERTA

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CONTENTS

	Page
The Eighth Annual Meeting	1
Some Remarks from the President, 1959-60	3
Abstracts of Papers Presented	
Mosquitoes and Encephalitis in Irrigated Areas of Alberta - J. A. Shemanchuk	4
Freezing Supercooled Insects in an Electro- static field - R. W. Salt	4
A Lunar Rhythm in the Emergence of a Tropical Mayfly - R. C. B. Hartland-Rowe	4
Observations on the Biology and Control of the Guava Shoot Borer, <u>Indarbela tetraonis</u> Moore, in Northern India - A. Mansingh	5
<u>Bathymermis</u> (Daday) sp.: A Nematode Parasite of Larval <u>Chrysops furcata</u> Walk. - M. Shamsuddin	6
On the Possibility of Interspecific Crosses in the Warble Flies <u>Hypoderma lineatum</u> (de Vill.) and <u>H. bovis</u> (L.) - J. Weintraub, R. H. Robertson, and R. H. Gooding	6
Amino Acid Requirements of the Pale Western Cutworm - R. Kasting and A. J. McGinnis	7
Nature of the Resistance of Sheep to the Sheep Ked - W. A. Nelson	8
Heptachlor as a Systemic Against Wheat Stem Sawfly Larvae - L. K. Peterson and N. D. Holmes	8

	Page
Sharigol as a Synergist of Pyrethrum - A. A. Khan	9
Sorption and Retention of HCN by <u>Calandra granaria</u> (L.) - H. J. Bhambhani	9
A Cutaneous Test for the Diagnosis of "Latent" Warble Infestations - M. A. Khan	10
Notes on the Outbreaks, Life History, and Distribution of the Bruce Spanworm, <u>Operophtera bruceata</u> (Hulst.), in Alberta - C. E. Brown	10
Notes on the Biology of the Engelmann spruce weevil, <u>Pissodes engelmanni</u> Hopkins - R. E. Stevenson	11
Management of Bumble Bees for Pollination Purposes - G. A. Hobbs, W. O. Nummi, and J. F. Virostek	11
Some Notes on <u>Acarapis</u> mites - J. W. Edmunds	13
Adaptive Coloration and Relationships in Geometrid Larvae - W. C. McGuffin	14
A Collecting Trip to the Nordegg Area, July 4 and 5, 1960 - R. L. Anderson	14
Collecting Data for 1960 for Lepidoptera from Southwestern Alberta - N. W. Van Veen	16
Some Aspects of Entomological Photography - N. E. Kloppenberg	17
Roy Mason White, Honorary Life Member	20
Pictorial Highlights - E. T. Gushul	22
Society Business	
Minutes of Executive Meetings - April 13, 1960	26
- May 2, 1960	27
- Sept. 22, 1960	28
- Nov. 3, 1960	29

	Page
Minutes of the General Meeting, Nov. 4 and 5, 1960 (with suggested regulations for the insect collection competition)	30
Financial Statement for 1960	37
Announcement Regarding the Entomological Society of America	38
Mailing List, 1960-61	39

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THE EIGHTH ANNUAL MEETING

The Eighth Annual Meeting of the Entomological Society of Alberta was held in the El Rancho Motor Hotel, Lethbridge, on Friday and Saturday, November 4 and 5, 1960. Attendance was again excellent and the enthusiastic participation of all the members and guests who were present ensured an interesting, useful, and happy occasion.

On Thursday evening Society members and friends were the guests of Sicks' Lethbridge Brewery during a tour of their plant and a smoker. The brewery's production procedures and the qualities of their products were both demonstrated.

The technical sessions on Friday featured two invitation speakers, Dr. James H. Pepper, Head of the Department of Zoology and Entomology, Montana State College, and Dr. Henry Hurtig, Associate Director (Pesticides) of the Research Branch, Canada Department of Agriculture. Their papers, as expected, were effective stimulants to discussion and thought.

Pepper emphasized the danger in biological research of accepting unquestioningly the classical taxonomists' species as discrete entities. The shifting genetic composition and physiological state of different populations of a species under the influence of the environment can cause them to respond quite differently, even oppositely, to particular conditions.

Hurtig presented evidence of the value of fundamental research on "the ecology of pesticides". Toxicology has become immensely more than were pesticide screening. This field of research is essentially new and its influence is only beginning to be appreciated.

The various other papers submitted to the meeting are abstracted on the following pages.

Members of the Lethbridge Junior Science Club were interested guests during the Saturday morning sessions. Some of them were prizewinners in the insect collection competition. They displayed an electrical key to the orders of insects that they had devised and built.

The Society's Annual Banquet was held on Friday evening. Mr. W. J. Cousins, Dean of the Lethbridge Junior College, told the fascinating story of the earliest explorations of the Blackfoot country of southern Alberta. After dinner Mr. David Happold of the Entomology Department, University of Alberta, gave a well illustrated description of the 1959 Cambridge Congo Expedition and Mr. N. W. Van Veen an entertaining showing of motion pictures.

SOME REMARKS FROM THE PRESIDENT, 1959-60

The completion of the Eighth Annual Meeting of the Entomological Society of Alberta marks another successful milestone in the history of this organization. We can now see and measure the progress that we have made from our modest beginning eight years ago. Our assured success can be attributed to many factors: the enthusiasm and interest of our members, their concern that we meet on the common ground of interest in entomology at all levels, our regard for a sound organizational basis involving formation and incorporation, and the continuity of our deliberations as a society by the medium of the Proceedings. Thus far we have built easily. Our task now is to maintain and exceed the excellence that has been attained.

The outstanding feature of the Eighth Annual Meeting was the high calibre of the technical sessions. They were made notable by the presence of two guest speakers, Dr. J. H. Pepper and Dr. H. Hurtig, and by the participation in the program of amateurs and students in entomology as well as professionals. There was time, too, for informal exchange of ideas through the medium of the social arrangements.

I am extremely pleased that the Society agreed to honour a colleague, R. M. White, for his contribution to the entomology of our own area by electing him to Honorary Life Membership.

ABSTRACTS OF PAPERS PRESENTED

Mosquitoes and Encephalitis in Irrigated Areas of Alberta

J. A. Shemanchuk

Conditions necessary for the occurrence of an epidemic of western equine encephalitis are (1) the presence of a suitable vector, (2) the presence of a suitable reservoir of infection, (3) the maintenance of adequate contact between reservoir, vector, and host, and (4) environmental conditions suitable for the development of the virus in the vector. All of these conditions exist in the irrigated areas of southern Alberta, which would indicate an equine encephalitis potential in these areas.

Freezing Supercooled Insects in an Electrostatic Field

R. W. Salt

Supercooled water and two species of insects froze at higher temperatures than normally when placed in an electrostatic field. The effect became more certain and occurred earlier as the amount of supercooling increased. The amount of supercooling in the presence of the electrostatic field was not related to that in its absence.

A Lunar Rhythm in the Emergence of a Tropical Mayfly

R. Hartland-Rowe

Povilla adusta, an African member of the mayfly family Polymitarcidae, is unusual in three respects. First, the larvae cause considerable damage to wooden structures submerged in lakes in tropical Africa by burrowing into them. Second, the larvae secrete a silk-like material from the Malpighian tubules; the material is passed out of the anus and used to line the burrow in which the larva lives.

Third, the adults possess a marked lunar and diurnal periodicity in the time of emergence. Over 90 per cent of any month's catch is taken during a three-day period, one day of which is always the second day after full moon. The adults, which live only for about $1\frac{1}{2}$ hours, are seen only between 7.30 and 9.00 p.m. (East African Standard Time), the vast majority coming to light between 7.50 and 8.00 p.m.

This periodicity was observed in Lake Victoria and suspected in some other lakes, but apparently is not present in Lake Albert or Lake Tanganyika.

The possible adaptive significance of the lunar periodicity and the causal factors involved were briefly considered.

Observations on the Biology
and Control of the Guava Shoot Borer,
Indarbela tetraonis Moore, in Northern India

A. Mansingh

Indarbela tetraonis has been in epidemic form on the guava orchards (Psidium guajava) since 1950 in the District of Fatehpur, in U. P., North India.

The second-instar caterpillars bore tunnels in the pith of the stem and branches. In about five to seven years the average annual yield of about 250 pounds per plant is reduced by 30-40 per cent, due to the breaking off of the hollowed branches. The average life of about 35 years of a plant is also reduced by 10-15 years.

The pest has only one generation in a year. The eggs are laid on the bark in July-September. There are six caterpillar instars. The pest overwinters in the third or fourth instar. It pupates after mid-June on the mouth of the tunnel and the adult moths come out after the first monsoon showers in early July.

The caterpillars feed on the bark during the night. They always move out of the tunnel under protective galleries of excreta and wood dust woven together by silken threads.

The most effective control was obtained by spraying the shoots with 0.05 per cent Endrin once every three weeks in August-September. The survivors are controlled by injecting

the tunnels with 0.2 per cent DDT or BHC solution in kerosene, plugging the mouth with mud mixed with two per cent DDT, and spraying the insecticidal mixture on the bark in the feeding range of caterpillars.

Bathymermis (Daday) Sp.: A Nematode Parasite
of Larval Chrysops furcata Walk.

M. Shamsuddin

Bathymermis sp., a nematode parasite of Chrysops furcata collected from the Winterburn Swamp, eight miles west of Edmonton, was reported. Transmission of the nematode parasite obtained from infective soil to Chrysops mitis was accomplished in the laboratory. Eggs(?) and free-living forms of the parasite were found in the infective soil. Larvae were obtained from the hosts and were identified by Dr. H. E. Welch, Canada Department of Agriculture. The known geographic distribution of the parasite, notes on its life-cycle, and its pathogenic effects were described. Its possible use as a means of biological control for larval tabanids was suggested.

On the Possibility of Interspecific Crosses
in the Warble Flies Hypoderma lineatum (De Vill.)
and H. bovis (L.)

J. Weintraub, R. H. Robertson, and R. H. Gooding

Gansser (1951, 1956) raised the question of interspecific crosses after finding adults that combined the characteristics of both species. In addition the literature contains reports of small numbers of internal larvae recovered atypically from gullet (H. bovis) and spinal canal (H. lineatum). The problem was investigated by examining the diagnostic characteristics of the three instars of larvae extracted from naturally and artificially infested cattle; it was finally settled by mating experiments and morphological measurements of the adult genitalia.

The results showed that the mouth hook characteristics of the first-instar larvae are inadequate to separate the two species. The counts, color and clumping of stigmal

plates of the posterior spiracles, commonly used in the second-instar larvae, are inadequate, but mouth-hooks by themselves appear to be completely satisfactory. Description of the posterior spiracles in the third-instar larvae are inadequate but the presence or absence of a row of spines on the tenth segment separated the two species in over 95 per cent of the specimens. Of 15 pairs of old flies (of both species) in cross-mating experiments at 25-27° C., all responded with the proper mating behavior but could not complete copulation because the male genitalia slipped off the ovipositor. However, measurements showed more than 75 per cent separation in only one female and three male structures and these were not intimately involved in the final copulatory position. Subsequent experiments with newly emerged flies at 20-25° C. resulted in completion of copulation and transfer of sperm. However, none of the eggs were fertilized and no larvae developed. It is concluded that a physiological barrier is the factor separating the two species but that each species shows great variation in both morphology and behavior.

Amino Acid Requirements of the Pale Western Cutworm

R. Kasting and A. J. McGinnis

The indirect procedure which utilizes radioactive carbon compounds for determining amino acid requirements (Kasting and McGinnis, Can. J. Biochem. and Physiol. 38: 1229-1234, 1960) was applied for the first time to a plant-feeding insect, the pale western cutworm, Agrotis orthogonia Morr. The amino acids found to be nutritionally non-essential were glutamic acid, aspartic acid, alanine, proline, serine, and glycine. The nutritionally essential amino acids were phenylalanine, leucine, isoleucine, arginine, histidine, valine, lysine, and probably methionine. Tyrosine would be classed as essential by this method but we have shown that it is readily formed from phenylalanine. The proper categories for cystine and threonine remain in doubt. Although the requirements for the common amino acids have been established, the possibility of a need for other less common amino acids remains.

Nature of the Resistance of Sheep to the Sheep Ked

W. A. Nelson

Previous work has shown that annual cycles of rise and decline in numbers of keds occur in any continually infested and untreated band of sheep. Recent work has produced evidence that sheep develop a resistance to the insects when population levels reach a maximum. The resistance is a response of the sheep to the infestation, and is manifested by increased ked mortality. Skin biopsies taken from 20 sheep before and after resistance had set in showed the following histopathology:-

<u>BEFORE</u>	<u>AFTER</u>
1. Gross appearance during biopsy: copious bleeding	Great reduction in bleeding
2. Arterioles and capillaries well supplied with blood	Arterioles and capillaries mostly empty
3. Eosinophilic infiltration present but slight	Eosinophilic infiltration heavy
4. Arterioles normal	Evidence of fibrinoid degeneration in arteriolar walls
5. Keds feed on these animals easily	Keds cannot obtain blood

Heptachlor as a Systemic against Wheat Stem Sawfly Larvae

L. K. Peterson and N. D. Holmes

Heptachlor was shown to have systemic action against the larvae of the wheat stem sawfly, Cephus cinctus Nort., in stems of Thatcher wheat. The insecticide was mixed as a five per cent granular formulation with the seed at various rates.

In plants that received 0.0, 0.5, 1.0, and 2.0 pounds of actual heptachlor per acre the percentage infested stems cut by the larvae were 90, 52, 31, and 30, respectively.

Sharigol as a Synergist of Pyrethrum

A. A. Khan

Sharigol is obtained as a by-product in the process of desulphurisation of coal and the simultaneous recovery of depolymerised coal resin by treating pulverised coal at subcarbonisation temperatures with superheated steam.

Its action as a synergist of pyrethrum was tested according to the Peet Grady method after it was confirmed that it had no insecticidal action of its own. Two formulations were made: 0.1 per cent pyrethrins in kerosene and 0.01 per cent pyrethrins plus two per cent sharigol in kerosene. Tests were conducted on three to five days old laboratory-bred flies (Musca domestica L.).

Fisher's T test was applied to the data and it was found that there were no significant differences between the two formulations in the times required for 50 per cent and 75 per cent knock-down and in the numbers of dead flies after 24 hours, thus establishing that the two formulations were equally effective.

Sorption and Retention of HCN by Calandra granaria (L.)

H. J. Bhambhani

Calandra granaria adults were fumigated in a specially designed apparatus for various periods of from $\frac{1}{2}$ to 16 hours and it was found that the insects sorbed hydrogen cyanide during up to 16 hours of fumigation.

C. granaria were found to retain some of the sorbed fumigant in their bodies for as long as 70 days after fumigation. Thirty to 38 per cent of the fumigant was found to have diffused from the insects' bodies and 15-35 per cent was recovered by distillation 16 days after fumigation. It appears that 35-47 per cent of the hydrogen cyanide was converted into some compound from which it was not possible to recover hydrogen cyanide.

A Cutaneous Test for the
Diagnosis of 'Latent' Warble Infestations

M. A. Khan

Intradermal injections of 0.1 ml. crude saline extract of first-instar larvae were used to detect warble infestation before the grubs appeared in the backs of infested cattle. An ulcer developed in infested animals, but not in the uninfested ones, at the site of injection within 18 hours.

Notes on the Outbreaks, Life History,
and Distribution of the Bruce Spanworm,
Operophtera bruceata (Hulst.), in Alberta

C. E. Brown

Outbreaks of the Bruce spanworm occurred in 1903, 1913, and from 1957 to 1959. The main host was aspen poplar. The first outbreaks occurred in the area near Calgary, the last covered most of the area where aspen grows in the southern two-thirds of Alberta.

The Bruce spanworm overwinters in the egg stage. The eggs are laid late in the fall and do not develop until spring; hatching takes place about the time of aspen bud burst. There are four larval instars. The insect pupates in the soil in late June and early July. The adults emerge in October or November.

This insect is distributed from stand to stand in the first larval instar. The larvae spin long threads of silk which act as balloons and can carry the larvae long distances. Larvae were caught in traps half a mile from the nearest infested stand.

Notes on the Biology of the Engelmann Spruce Weevil,
Pissodes engelmanni Hopkins

R. E. Stevenson

The Engelmann spruce weevil is indigenous to western North America. The insect has one generation annually. Adult weevils overwinter in the forest duff (generally beneath infested trees) and emerge in the spring and deposit eggs in the upper terminal growth. The new larvae mine down the terminal leader in the phloem tissue, thus girdling and killing the leader. Two months is generally the minimum time required for development from the egg to adult.

The weevil destroys the leader and upper branch terminals of native spruce. Damage to the terminal growth in open sapling stands results in the trees becoming bushy. Trees of this form are commercially valueless.

Management of Bumble Bees for Pollination Purposes

G. A. Hobbs, W. O. Nummi, and J. F. Virostek

In 1960, bumble bees established in 120 of 336 above-ground domiciles placed in and around copses of trembling aspen in the foothills of southern Alberta, and in 12 of 114 on the prairie; bumble bees also established in five of 20 underground domiciles in the foothills and six of 30 on the prairie. The treed foothills region was the better area for acceptances because it supported a higher population of bumble bees with a more diversified and abundant flora. The following species established nests in the domiciles (the numbers in parenthesis indicate the number of acceptances obtained above-ground/underground): Bombus rufocinctus Cresson (53/1), B. appositus Cresson (29/2), B. frigidus F. Smith (14/0), B. nevadensis Cresson (4/2), B. vagans F. Smith (4/0), B. californicus F. Smith (5/0), B. fervidus (Fabr.) (4/2), B. huntii Greene (2/2), B. bifarius var. nearcticus Handl. (2/0), B. ternarius Say (0/1), and B. melanopygus Nyl. (1/0). Fourteen above-ground and one underground establishments were unidentified. Numbers of acceptances in domiciles painted blue were significantly less than in those painted white or yellow, probably because the contrast between the entrance hole in the blue was not as great as in the white or yellow domiciles and therefore did not attract the searching queen to the same extent.

Problems associated with the transfer of colonies from the places of establishment to the crops to be pollinated were overcome in the following ways: The portion of the foraging force that sometimes remained in the field overnight was captured the following morning by means of a trap with a celluloid door that opened only inward. The painting of the domiciles white, yellow, and blue resulted in a smaller percentage of the foraging queens being killed as a result of having mistaken other occupied domiciles for their own and then fighting for possession. Above-ground domiciles of the type used in the experiments had to be placed in the shade on the prairie, as temperatures, especially in the domiciles painted blue, greatly exceeded the temperature of the surrounding air. Entrances of domiciles should be accessible to bees that cannot fly as old queens sometimes are pushed or fall out of their domiciles when the weather is hot and the queens fan at the entrances. (The bees began to fan when the temperature in the domicile rose to 100° F. and ceased when it fell to 97.)

The colonies that produced best were four of B. rufocinctus and four of B. appositus that were formed in large, 4-compartmented domiciles. When the wire screens that separated the four colonies of B. rufocinctus were removed the colonies lived and perhaps worked together in apparent harmony.

The skunk, Mephitis mephitis Schreber, would have been the worst enemy of bumble bees in artificial domiciles if the domiciles had not been skunk-proof and had not been tied securely to posts or trees. Psithyrus spp., mostly P. insularis (F. Smith), were responsible for the destruction in whole or in part of five colonies of bumble bees. In two instances Psithyrus killed the bumble bee queens before the bees had reared their first broods to adult. Though P. insularis invaded seven colonies of B. frigidus, no Psithyrus adults were produced; production in colonies of B. frigidus with Psithyrus was as good as that from colonies without Psithyrus. The big-headed fly Physocephala texana (Will.) destroyed one founding queen and many worker bumble bees after the colonies were moved to the prairie from the foothills. Wasps, Vespula spp., occupied 29 domiciles and ants nine. "Tat" ant traps were used to destroy the ants without harming the bees.

Megachile relativa Cresson inhabited 10 of the domiciles. (Melittobia sp. and Coelioxys sp. destroyed the M. relativa in some of the cells in three and nine of the nests, respectively.)

Queens were produced in 79 of the 143 domiciles that were accepted by Bombus. One or more broods of workers were produced in another 25, one of which also produced males. Thirty-nine failed to produce workers.

Some Notes on Acarapis Mites

J. W. Edmunds

One of the most significant pests of honey bees (Apis mellifera) in parts of Europe, Asia, and Africa, is the mite Acarapis woodi (Rennie). A fairly recent survey in Britain showed one colony out of six infected. The disease caused by this mite is known as Acarine disease. Acarapis woodi enters and breeds in the tracheae leading into the thorax from the first pair of spiracles. The life cycle commences by the adult female entering the trachea through the spiracle and laying eggs. The young nymphs go through several moults prior to becoming adults. Adults and nymphs feed on the blood of their host. They have suctorial mouth parts; punctures are made in the wall of the trachea by small retractable stylets enclosed by the mouth opening.

Symptoms and diagnosis of Acarine disease: Similar to paralysis and Nosema apis or poisoning. Bees may be seen crawling up blades of grass, wings fluttering, abdomen somewhat distended. The wings may appear dislocated. These symptoms alone are not sufficient, and dissection and observation of the mites are necessary for a correct diagnosis. A magnification of 20-30 diameters is necessary for detection of the mites. In addition to the presence of mites there will be considerable darkening of the tracheae themselves.

There appear to be four Acarapis species: A. woodi, A. dorsalis, A. externus, and A. vagans. Dr. Morgenthaler's (Swiss) key to the species is based on: (1) length of last two tarsal segments of the fourth pair of legs (female), (2) distance between stigmata (female), and (3) breeding place. The only mites found in Canada or the United States are of the group consisting of A. externus, dorsalis, and vagans, which are all external mites. A. woodi is referred to as an internal mite.

The mites I have found in Alberta are considered to be A. dorsalis. There is a distinct morphological difference between dorsalis and woodi. In A. woodi the median-posterior coxal plate has a wavy margin at the rear, whereas A. dorsalis has a deep median cleft in this plate. A. dorsalis is widely distributed throughout the world. At least 10 per cent of all bees checked in Alberta have had A. dorsalis.

Our interest in Acarapis has three purposes: (1) to keep A. woodi out, (2) to recognize A. woodi should it sneak in, and (3) to learn something of the behaviour of those species other than woodi.

- 1) Canadian and U. S. legislation prohibits the importation of Apis mellifera from countries outside Canada and U. S. However, steps are being taken to import Apis indica, which has been known to be infected by Acarapis woodi, from India.
- 2) Apiculturists and entomologists are requested to become familiar with the diagnosis of Acarine disease and to consider legislation for its control should an outbreak occur.
- 3) Little is known about species other than A. woodi. For example, how and on what does A. dorsalis feed and does it reduce the vitality of the host? It is found in all stages in the scuto-scutellar groove of the bee.

Adaptive Coloration and Relationships in Geometrid Larvae

W. C. McGuffin

Geometrid larvae may take up several positions when at rest. Most lie flat on the leaf or twig and, because of their colour patterns, are able to blend into the background. A large number mimic twigs. A few mimic other things, and a small number build shelters. Although colour patterns may vary within the species, resting positions are constant throughout genera, and even groups of closely related genera.

A Collecting Trip to the Nordegg Area July 4 and 5, 1960

R. L. Anderson

The Nordegg area is very interesting because very little collecting has been done there for many years. As I had made only two previous trips to that area, picking up only a few specimens, I had to try my luck this year.

Nothing of any consequence turned up during the morning of July 4 on the road between Rocky Mountain House and Nordegg. After lunch I toured the side roads around Nordegg, and the first thing to hit the bottle was a fine specimen of Oeneis jutta, taken sitting on the road just about a mile west of Nordegg. One of the hazards of collecting is the inevitable curiosity of spectators, and just as I was ready

to clap the net down over the jutta, an old car pulled up driven by teenage characters. Fortunately, the butterfly did not budge and I was able to take it, notwithstanding their curious stares and numerous questions.

During the rest of the afternoon I turned up a few Colias christina and interior, Phyciodes campestris, Euphydryas anicia, Carterocephalus palaemon mandan, Speyeria atlantis (close to lais) and a few others, but nothing new to my collection. After supper I drove back along the road which crosses the main road going west, and stopped about six miles out of Nordegg at a likely looking spot to camp for the night.

The following morning was quite cool and nothing was flying until about 9.30. Inasmuch as I found nothing particular in the area where I spent the night, I decided to head back to Nordegg. On the way back and about three or four miles out from Nordegg I came across a trail with a signpost which read "Trail to Mt. Baldy, Four Miles, Restricted". Proceeding up the trail about 300 yards, I came to a locked forestry gate, with a rough trail around the gate which was not negotiable by my low slung wagon. Therefore, I left the car and proceeded on foot, and this walk up the "Trail to Mt. Baldy" will always live in my memory as one of the most rewarding.

The trail gradually ascends for four miles through a well watered and very beautiful valley with many little streams running across the trail and a brook following it on the right. At the outset, in temperate zone vegetation, there is considerable loam overlying glacial drift. In some places where the trail had been graded bare banks of loam are exposed, and these banks were festooned with Erebia disa mancinus sucking up moisture from the damp earth. For five years I had searched for this butterfly but without success, and now I came upon it suddenly. Needless to say, I was in very high spirits and plodded on up the trail, collecting huge numbers of disa, Oeneis chryxus, Boloria eunomia tricularis and Titania grandis, a few Euchloe creusa and others. Oeneis jutta also turned up again, and I took several excellent specimens.

As the trail ascended, temperate vegetation gradually changed to subarctic and not far below the summit stunted evergreens and tundra prevailed. Nothing was flying up there, and after a short rest I started the long walk back. About a third of the way down I came upon a forestry truck driven by two men from the ranger station near Nordegg. These men said that they had seen both grizzly and black bear along the trail, and it was with great apprehension that I walked the rest of the way down--but no bears, only the occasional footprint.

I wanted to collect as many specimens as possible, particularly of E. disa, an excellent exchange item, so I took another walk up the trail in the middle of the afternoon. It had become quite warm by now and there was not the abundance I found in the morning. It was on the way down this time that I came upon a black bear, but fortunately I was around a bend in the trail and just waited there until he ambled off into the woods.

As a result of this trip, I came to these conclusions. The Erebia disa were largely past their prime, and the last two weeks in June would be the best time for them. Oeneis jutta were scarce, the ones I took being very fresh, therefore indicating a somewhat later date for abundance. It was somewhat early for most Pieridae on this trail, and I believe that towards the end of July many interesting forms might be found on the upper reaches.

Further intensive collecting in this area may turn up new sub-species, especially in the area to the west, which is now opened up by new roads and trails.

Collecting Data for 1960 for Lepidoptera from Southwestern Alberta

N. W. Van Veen

Rhopalocera

Main collecting sites: within a 10-mile radius of Nordegg, within a 10-mile radius of Lake Louise, within a 30-mile radius of Banff, the Kananaskis Highway over the Highwood Pass to Longview, Calgary and 30 miles westward, Turner Valley and 20 miles westward, and within a 15-mile radius of Waterton.

Papilio glaucus canadensis, Vanessa antiopa, and Nymphalis j-album were scarcer than in the last few years. Forty-five N. j-album were recorded within a narrow band between 4000 and 5000 feet, much higher than they are usually seen in B. C. Leminitis arthemis and Polygonia were fewer than in 1959, L. arthemis being very scarce. Vanessa atalanta was not seen at all. The almost complete absence of Vanessa cardui baffled us. In 1959 it was abundant in practically all of southern Alberta. On the other hand, there were more Oeneis around than we were able to find in the five previous years.

Several Speyeria, Colias, and Boloria species were collected from the Kananaskis and Lake Louise areas, as well as a few Chrysophanus snowi. Other Speyeria were obtained from the Turner Valley and Waterton areas. Cercyonis were fairly common in the Kananaskis and Turner Valley areas. At Calgary, Speyeria calippe calgariana, Papilio zolicaon, and Euptoieta claudia were captured. A male specimen of Plebius icaroides pembina was caught on June 24 at Calgary--a new locality record.

Heterocera

In this field not very much was done. Twice light-trapping was done with "500" (white light) Coleman lamps and sheets. Once trapping was done with "black light".

In the last week of May a try with white light was made in the bird-sanctuary in Calgary. The temperature was around 50 degrees. From 10.30 to 11.00 p.m. seven specimens of Smerinthus jamaicensis geminatus hit the sheets. The second white light-trapping attempt was made just outside Cochrane in the last week of June. The lights began showing their effect only at a quarter past 10.00 p.m., when the first visitor was a Sphinx (Hyloicus) chersis with a wingspan of almost four inches. It was followed by two specimens of S. jamaicensis geminatus and one Smerinthus cerisyi. "Black light" was used for only two hours (10.00-12.00 p.m.) approximately eight miles south of Twin Butte. We were rewarded with a nice specimen of Payonia (Calasymbolus) myops. A tattered Pseudohazis egalanterina also showed up, and of course the usual numbers of Noctuidae.

Some Aspects of Entomological Photography

N. E. Kloppenborg

The vast majority of entomological photography is covered by the area of reproduction from 1:20 through 1:1 and down to 20:1 magnifications and by photomicrography, which latter was not discussed in this paper.

Extreme close-ups or photomacrography present some rather special problems, which were discussed briefly as follows:-

The desired magnification is obtained by extending the lens-to-film distance by means of bellows or extension tubes.

Thus a 1:1 reproduction is obtained by using an extension of twice the normal focal length of the lens. This rule applies to any format of camera and to any lens whether it be normal or telephoto.

The focus is very critical and is best achieved by racking the whole camera forth and back by means of a rack-and-pinion device. The focusing adjustment on the lens mount should not be moved as this would produce a change in the predetermined magnification.

The depth of field becomes increasingly more shallow with increased magnification and is measured in millimeters or in fractions of a millimeter. It is often not possible, even with a small aperture to produce a depth of field which will cover the full depth of the specimen. In this case the photographer would focus on a point, not half way between the nearest and furthest of the subject, but about one-third of this distance from the nearest point. The depth of field increases as the diaphragm is closed down, but this should not be overdone as any lens has an optimum aperture and large deviations from this will impair the resolution.

Where a lens is extended beyond one-eighth of its normal focal length, then the aperture values engraved on the lens mount are no longer valid. To determine the correct exposure the exposure value indicated by the meter must be multiplied by an exposure factor. This exposure factor is found by dividing the square of the total extension by the square of the focal length of the lens.

Movement during the exposure should be minimized by using a high shutter speed. If this is not possible, the photographer could use flash bulbs, the midget size having a peak duration of about 1/200 second, or better yet, use an electronic flash, which has a peak duration of 1/500 to 1/2000 second or less. A further advantage of electronic flash is that the color quality is nearly correct for daylight type color film.

A good quality camera with high-resolving optics is essential for acceptable results and the single lens reflex with through-the-lens focusing is much preferred.

For magnifications beyond 1:1 special macro-lenses should be used. Standard lenses, even the very finest, are designed for optimum resolution at a distance of several feet or yards and the resolution decreases considerably when used for extreme close-ups. If it is possible to do so, a standard lens will perform better at 1:1 reproductions and higher if the lens is turned end for end so that the normal "front" of the lens faces the film plane. Long focus or telephoto

lenses are often used to advantage in photomacrography. The purpose of this is not so much to obtain a larger image, but to provide a greater working distance between lens and subject and to obtain better perspective in specimens of considerable depth. With the non-reflex type of camera supplementary lenses can be used in conjunction with a special focus-and -frame finder.

Under field conditions the light to shadow ratio is often far beyond the capability of color film. In this case the l/s ratio can be modified by using a white card reflector to throw some light into the deep shadow areas, or by using a scrim or diffuser over the source of light. For both field and lab conditions an electronic ring illuminator is an invaluable adjunct as it provides even and shadowless illumination which will project into deep cavities.

ROY MASON WHITE, HONORARY LIFE MEMBER

One of the highlights of the Eighth Annual Meeting of the Entomological Society of Alberta was the election of Roy Mason White, M. M. and Bar, B. S. A., M. Sc., as an Honorary Life Member of the society.

Mr. White was born near Darlingford, Manitoba, on December 15, 1888, attended school at Morden, Manitoba, obtained his B. S. A. from the Manitoba Agricultural College in 1924, and received his M. Sc. from Macdonald College in 1927. He served in the First World War with the 27th Battalion C. E. F. from 1914 to 1918, participated in the battles at St. Eloi, the Somme, Vimy Ridge, Hill 70, Passchendale, Amiens, Arras, and Cambrai and was wounded three times.

He began his entomological career with Norman Criddle at Treesbank, Manitoba, in 1922. After one winter, 1930-31, at Saskatoon, he was transferred to Lethbridge where he remained until his retirement in July, 1948. At Lethbridge he was in charge of grasshopper investigations and contributed greatly to knowledge concerning the ecology, distribution, and population forecasting of the economic species. In addition, he maintained an interest in the taxonomy of Coleoptera, the botany of the prairies, and recognition of birds.

On retirement in 1948, he and Mrs. White moved to Summerland, B. C., where he continues his hobby of flower growing with avid enthusiasm. His special interest is the irises; he has produced many new varieties and is well known in this field in Canada and the United States. His wife died in April, 1960. Mr. White still resides at West Summerland, B. C.





ENTOMOLOGICAL SOCIETY OF ALBERTA

Inspecting Sicks' Brewery I		Inspecting Sicks' Brewery II		Registration I	
Registration II	and III		W. C. McGuffin G. A. Hobbs	J. Weintraub W. C. Broadfoot W. O. Haufe	
W. A. Nelson J. B. Gurba M. A. Khan		G. E. Ball J. W. Edmunds		J. B. Gurba D. S. Smith	
L. A. Jacobson G. W. Evans		A. M. Harper C. E. Brown K. R. Depner	President Jacobson	Enough said	Secretary Harper
Left to right: A. A. Khan, A. Mansingh, A. Pucat, H. J. Bhambhani, M. Shamsuddin		A. J. McGinnis	Salt and Pepper		N. W. Van Veen
D. Cherry S. McDonald		N. S. Church R.C.B.Hartland-Rowe		Refreshment	
M. W. McFadden	G. R. Hopping		R. Madge	C. Davidson	R. F. Shepherd

H. Hurtig	J. Weintraub	C.E.Lilly	N. E. Kloppenborg	H. McDonald	J.H.Pepper
R. Kasting	R. E. Stevenson	W.O.Nummi	L. K. Peterson	J. A. Shemanchuk	J. F. Virostek
Ruby I. Larson	C.E.Brown	Judging the insect collections: Ball Salt Hartland-Rowe		E.T.Gushul	R. H. Robertson
Lights, please		Members of the Lethbridge Junior Science Club			
N. D. Holmes		Collection competition winners: K. Richards D. Larson J. Shorthouse		Key to the insects	
Mesdames N. E. Kloppenborg J. A. Shemanchuk E. T. Gushul S. McDonald D. S. Smith W. J. Cousins		Mesdames J. F. Virostek and W. O. Nummi		Mesdames A. M. Harper J. Weintraub W. O. Haufe	
D. Happold G. E. Swailes Mrs. G. E. Swailes					
S. McDonald	Mrs.D.S. Smith	Guest speaker: W. J. Cousins	Mrs. P. E. Blakeley	At the annual banquet	
Mrs. S. McDonald			P. E. Blakeley		



EIGHTH ANNUAL MEETING-LETHBRIDGE-NOVEMBER 1960

SOCIETY BUSINESS

Minutes of Executive Meeting, April 13, 1960

Minutes of an executive meeting held in the Biology Building, Research Station, Lethbridge, Alberta, April 13, 1960.

Present were: N. S. Church, E. T. Gushul, P. E. Blakeley, A. M. Harper, and L. A. Jacobson in the chair.

After considerable discussion about the desirability of allowing amateurs extra time to complete their collections, E. T. Gushul moved that our annual meeting date be November 4 subject to the approval of the members in Calgary and Edmonton. Seconded by N. S. Church. CARRIED.

L. A. Jacobson read a letter from Professor Hocking concerning the Honorary Degree for Mr. H. L. Seamans. Dr. Johns, President of the University of Alberta, informed Professor Hocking that allocations of Honorary Degrees for 1960 have already been decided. Mr. Seamans' name is still on the list, however.

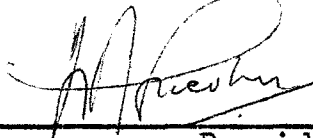
L. A. Jacobson read a letter from Professor Hocking, President of the Canadian Entomological Society, concerning the notification of other regional societies and the national society about activities of our society. L. A. Jacobson moved and E. T. Gushul seconded the motion that we file a copy of the proceedings of our annual meeting with the Secretary of the Entomological Society of Canada and Secretaries of all Regional Societies, and that points of national interest discussed at our executive meetings be circulated to the national executive, and the executives of the regional societies.

L. A. Jacobson asked the secretary to go through the minutes of past years and examine motions that have been made and check to make sure that there are no motions contradictory to our constitution.


P. E. Blakeley moved and A. M. Harper seconded that R. M. White be made an honorary member of our society.

E. T. Gushul suggested that we have a photo display at the next annual meeting.

The meeting was adjourned on a motion by N. S. Church.



President



Secretary

Minutes of Executive Meeting, May 2, 1960

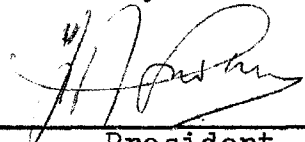
Minutes of an executive meeting held in the Biology Building, Research Station, Lethbridge, Alberta, May 2, 1960.

Present were: P. E. Blakeley, N. S. Church, A. M. Harper, E. T. Gushul, and L. A. Jacobson in the chair.

L. A. Jacobson informed the meeting that Mr. Max McFadden, graduate student at the University of Alberta, had been recommended by Professor Hocking as the winner of the Entomological Society of Alberta Award.

A. M. Harper moved and E. T. Gushul seconded the motion that the executive accept Professor Hocking's recommendation. CARRIED.

The meeting was adjourned on a motion by P. E. Blakeley.



President



Secretary

Minutes of Executive Meeting, September 22, 1960

Minutes of an executive meeting held in the Biology Building, Research Station, Lethbridge, Alberta, September 22, 1960.

Present were: E. T. Gushul, P. E. Blakeley, N. S. Church, A. M. Harper, and L. A. Jacobson in the chair.

P. E. Blakeley reported that there was \$293.92 in the treasury of our society.

N. S. Church reported that he had sent out advance notices about papers for our next annual meeting.

The following committees for our next annual meeting were appointed:-

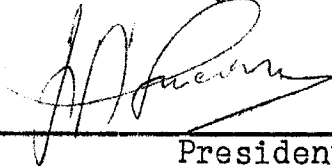
Local arrangements committee

G. E. Swailes - Chairman
S. McDonald
P. E. Blakeley
E. T. Gushul

Program committee

N. S. Church - Chairman
A. J. McGinnis
J. Weintraub

The meeting was adjourned on a motion by N. S. Church.



President



Secretary

Minutes of Executive Meeting, November 3, 1960

Minutes of an executive meeting held in the Board Room of Sicks' Lethbridge Brewery, November 3, 1960.

Present were: J. W. Edmunds, J. B. Gurba, P. E. Blakeley, N. S. Church, G. W. Evans, C. E. Brown, A. M. Harper, and L. A. Jacobson in the chair.

G. W. Evans moved and J. B. Gurba seconded the motion that the minutes of the previous executive meetings be adopted as read. CARRIED.

J. B. Gurba moved and P. E. Blakeley seconded the motion that a copy of our constitution be filed with the registrar of the Societies Act. CARRIED.

The following committees were appointed by the executive:-

Resolutions committee

J. B. Gurba - Chairman
D. S. Smith

Nominations committee

C. E. Brown
G. E. Ball
W. O. Haufe

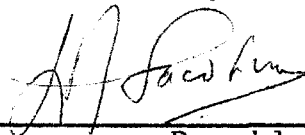
Judges for the insect collections

R. C. B. Hartland-Rowe
G. E. Ball
R. W. Salt

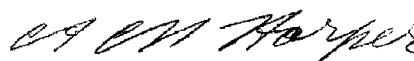
G. W. Evans moved and P. E. Blakeley seconded the motion that Mr. C. Davidson, an amateur, be awarded \$25.00 to cover expenses for travel to our meeting. (Mr. Davidson brought a graduate student with him to the meeting.) CARRIED.

W. L. Pelham was accepted as a new member by the executive.

The meeting was adjourned on a motion by N. S. Church.



President



Secretary

Minutes of the
8th Annual Meeting of the Entomological Society
of Alberta

El Rancho Motel, Lethbridge

First Day, November 4, 1960

The general business meeting of the 8th Annual Meeting of the Entomological Society of Alberta was held at 11.00 a.m. on Friday, November 4, 1960, in the lower dining room of the El Rancho Motel, in Lethbridge. L. A. Jacobson was in the chair.

N. S. Church moved and J. B. Gurba seconded a motion that the minutes of the previous business meeting be accepted as circulated in the Proceedings. CARRIED.

P. E. Blakeley moved and R. F. Shepherd seconded a motion that the financial report from last year be accepted as circulated in the Proceedings. CARRIED.

The secretary read correspondence pertinent to business of general interest.

L. A. Jacobson announced that the secretary would forward a copy of our constitution to the Registrar of the Alberta Societies Act.

G. R. Hopping moved and J. A. Shemanchuk seconded the motion that we give \$10.00 to the Zoological Record. CARRIED.

The treasurer, P. E. Blakeley, reported that we had \$399.77 in the bank prior to the meeting, of which \$85.00 was convention funds. He also reported that we had 39 members who belonged to both the Alberta and Canadian Entomological Societies, 19 members who belonged only to the Alberta Society and one student member. He indicated that both the number of members and the finances of the society would change rapidly during the meeting. P. E. Blakeley moved and W. C. McGuffin seconded that the treasurer's report be accepted as read. CARRIED.

Ruby I. Larson gave the report of the insect collection committee. She then gave all members copies of "Suggested regulations for the insect collection competition" and "Suggested topics for the challenge competition" which she indicated she would like to discuss at the business meeting on the second day.

G. E. Ball reported that no progress had been made on the "Insect Collector's Guide".

G. E. Ball reported that Mr. Max McFadden had been awarded the Alberta Entomological Society prize and that Mr. A. Mansingh had been awarded the North American Cyanamid scholarship.

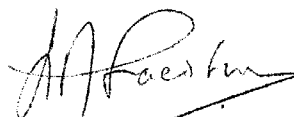
G. W. Evans reported that Mr. Chris Davidson had been awarded \$25.00 financial assistance to attend our 8th Annual Meeting. The recipient thanked the society for this aid.

P. E. Blakeley moved and G. A. Hobbs seconded the motion that Mr. R. M. White be made an honorary member of the Entomological Society of Alberta. He then read a report of Mr. White's life work in entomology. The motion was CARRIED.

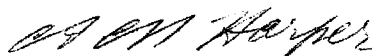
Ruby I. Larson gave a demonstration of the electric insect identification key designed and produced by the Lethbridge Junior Science Club.

N. S. Church asked all members presenting papers to give him an abstract of the paper and also thanked the members for their cooperation in agreeing to give papers.

The meeting was adjourned on a motion by C. E. Lilly.



President



Secretary

Second Day, November 5, 1960

The final business session of the 8th Annual Meeting was held on Saturday morning, November 5, 1960, at 11.30.

Ruby I. Larson, chairman of the insect collection competition committee, read over the list of suggested regulations and suggested topics for the challenge competition. The amended form of these suggestions as appended to the minutes was accepted by the society.

G. E. Ball reported on the insect collection competition for this year. In the senior class the following awards were made: David Larson, Lethbridge, first; Joe Shorthouse, Lethbridge, second; Ken Richards, Lethbridge, third; M. S. Carleton, Banff, Honorable Mention. In the junior class the following award was made: Grade VIII, Lacombe, first.

The insect collection committee for 1961 was named as follows:-

G. W. Evans, Edmonton - Chairman
R. E. Stevenson, Calgary
C. E. Lilly, Lethbridge

The following auditors for 1960 were appointed:-

L. K. Peterson
Miss C. M. Webster

Report of the Resolutions Committee:

WHEREAS the accommodations and arrangements provided for the meetings and the banquet have been very comfortable and convenient,

BE IT RESOLVED THAT a letter of thanks be sent by the Secretary to the management of the El Rancho restaurant.

WHEREAS the financial assistance given to the Society by the following commercial firms: Alberta Wheat Pool, Canadian Sugar Factories, Oliver Chemical Company, and Seventy Seven Oil, and the name tags provided by the United Grain Growers have contributed materially toward the success of the meeting,

BE IT RESOLVED THAT a letter of thanks be sent by the Secretary to each of these firms.

WHEREAS the Sicks' Lethbridge Brewery supplied accommodation for the Executive Committee Meeting and provided an interesting tour and enjoyable smoker for members,

BE IT RESOLVED THAT a letter of thanks be sent by the Secretary to the management of this firm.

WHEREAS the local Program and Arrangements Committees have done an excellent job in arranging and conducting an interesting program and in providing for the comfort and entertainment of all those attending,

BE IT RESOLVED THAT a sincere vote of thanks be tendered to those committees.

WHEREAS the three invited speakers at the meetings and the banquet added considerably to the interest and entertainment of all those attending,

BE IT RESOLVED THAT a letter of thanks be sent by the Secretary to: Dr. J. H. Pepper, Dr. H. Hurtig, and Mr. W. J. Cousins, and further that a sincere vote of thanks be tendered to Mr. D. Happold and Mr. N. W. Van Veen for their interesting presentation of colored slides and films.

WHEREAS the Executive and Standing Committees have conducted the affairs of this Society in a most efficient manner during the past year,

BE IT RESOLVED THAT a sincere vote of thanks be tendered to them.

Signed by: J. B. Gurba, D. S. Smith

It was moved by J. B. Gurba and seconded by P. E. Blakeley that the report of the Resolutions Committee be accepted. CARRIED.

The report of the Nominations Committee was made as follows:-

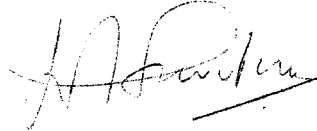
President.....	J. W. Edmunds
Vice-President.....	N. W. Van Veen
Secretary.....	Joan Shore
Treasurer.....	E. B. Swindlehurst
Editor.....	G. W. Evans
Regional directors.....	H. Cerezke, Calgary
M. W. McFadden, Edmonton
W. O. Nummi, Lethbridge
Director-at-large.....	R. W. Salt
(Director to the Canadian Entomological Society--to begin term of office in the fall of 1961)	

Signed by: W. O. Haufe, G. E. Ball, C. E. Brown

It was moved by L. K. Peterson and seconded by W. C. McGuffin that nominations cease and the report of the Nominations Committee be accepted. CARRIED.

G. R. Hopping opened a discussion on collecting trips. J. W. Edmunds suggested that it was probably advisable to have regional trips. The matter of collecting trips was left to the new executive.

The meeting was adjourned at 12.00 on a motion by C. E. Lilly.



President



Secretary

Suggested Regulations for the Insect Collection Competition

1. The prizes (consisting generally of books, insect boxes, and pins) should be procured and sent from Edmonton each year.
2. The date of closing of the competition should not be earlier than October 31 unless the annual meeting of the Entomological Society of Alberta must be held before November.
3. All collections for the competition should usually be brought to the annual meeting of the Society for judging and display. If a very large number of competitors should enter any class or classes of the competition in a region that is not host of the annual meeting, the members of the region shall be permitted to judge the local entries in the class or classes and submit a minimum of three collections for each class.
4.
 - a) There shall be first, second, and third prizes in each of a junior and senior class. A junior shall not have attained his 13th birthday by the date the competition closes each year and a senior shall have attained his 13th but not his 18th birthday by that date.
 - b) Anyone who has received first prize in the junior class may not compete in that class again, regardless of age, but may compete in the senior class.
 - c) Anyone who has received first prize in the senior class may not compete in that class again but may enter the challenge competition as often as he wishes provided he has not attained his 18th birthday by the closing date of the competition.
 - d) Each year a challenge competition shall be set and all previous winners who are not yet 18 years old shall be notified of the chosen topic by December 1 following each annual meeting.
5. Some special commendation, such as a certificate from the Society, or payment of expenses to attend the meeting of the Society should be made. This applies especially to winners of the senior first prize or challenge prize, or to those ineligible to compete because they are over 18 years of age.

6. Prize winners shall be awarded student memberships in the Society without payment of dues.
7. Competitors shall be invited to attend the Saturday sessions of the annual meeting of the Society.
8. The competition shall be publicised by whatever means the committee sees fit. Previous competitors and persons who have shown interest in the competition should be sent notice of the competition soon after each annual meeting. Scouts, Guides, and Y.M.C.A. and 4-H groups may select insect collections as projects if they hear about the competition early in the year.
9. Only individual collections will be accepted for competition.

Suggested Topics for the Challenge Competition

1. Collection of insects that spend all or part of their lives in the water.
2. Galls, gall formers, and gall inhabitants.
3. Insect associations: predator-prey; parasite-host.
4. Locality collection from December 1 to the following September 30 of the current year. Competitor chooses a limited area, i.e., his own yard, an alfalfa field, a section of road allowance, a coulee bank, and works it intensively. The area should not exceed a few acres.

Emphasis is to be put on: life cycles; identification of hosts; record of first and last observation of a species; relative abundance of species; variation in coloration; classification.

5. Orders of insects or some other taxonomic groups.

Financial Statement for Year Ending December 31, 1960

Receipts

Bank balance at January 1, 1960 ...	358.56		
Cash on hand	<u>2.00</u>	360.56	
Membership fees:			
Ent. Soc. of Canada - 1959	18.00		
- 1960	138.00		
- 1961	<u>132.00</u>	288.00	
Ent. Soc. of Alberta - 1959	14.00		
- 1960	68.00		
- 1961	54.00		
Students	<u>10.00</u>	146.00	
Annual meeting:			
Contributions from industry	135.00		
Registration fees	162.00		
Banquet receipts	<u>144.00</u>	441.00	
Contribution from I.G.P.C.E.		<u>15.03</u>	1,250.59

Disbursements

Entomological Society of Canada		288.00	
Competition prizes	15.90		
University of Alberta award	50.00		
Zoological Record	10.00		
Student travel assistance	25.00		
Framing life membership	1.15		
Printing and stationery, 1959	42.18		
Bank charges	3.39		
Postage	<u>7.91</u>	155.53	
Annual meeting:			
Programs	5.70		
Banquet refreshments	66.65		
Coffee	17.20		
Banquet	202.50		
Hall rent	<u>15.00</u>	307.05	<u>750.58</u>
Bank balance at December 31, 1960			<u><u>500.01</u></u>

Audited and found correct
January 19, 1961

L. K. Peterson
Webster

P. E. Blakeley
P. E. Blakeley
Treasurer

ANNOUNCEMENT REGARDING
THE ENTOMOLOGICAL SOCIETY OF AMERICA

The Entomological Society of America is anxious to increase its membership in Western Canada. The fees are \$13.00 per year and include subscriptions to the Bulletin of the Society and either the Annals of the Entomological Society of America or the Journal of Economic Entomology. The Society is a member of the American Institute of Biological Sciences and the A. I. B. S. Bulletin is sent to each member of the E. S. A.

Mr. L. A. Jacobson is on the Membership Committee of the Pacific Branch of the E. S. A. and will send application forms to any members of the Entomological Society of Alberta who are interested in joining.

MAILING LIST, 1960-61

Members

Anderson, Mr. R. L.	Field Titles Service, Royalite Building, 11 Hunter Street, Calgary
Archibald, Mr. J. G.	Alberta Department of Agriculture, Court House, Lethbridge
Ball, Dr. G. E.	Department of Entomology, University of Alberta, Edmonton
Bhambhani, Mr. H. J.	Department of Entomology, University of Alberta, Edmonton
Blakeley, Mr. P. E.	Research Station, Lethbridge
Broadfoot, Dr. W. C.	Research Station, Lethbridge
Brown, Mr. C. E.	Forest Biology Laboratory, 102 - 11 Avenue South East, Calgary
Brown, Mr. J. H.	Provincial Entomologist, Alberta Department of Public Health, Edmonton
Carr, Mr. J. L.	R. R. 4, Calgary
Cerezke, Mr. H. F.	Forest Biology Laboratory, 102 - 11 Avenue South East, Calgary
Chisholm, Mrs. R.	14716 - 108 Avenue, Edmonton
Church, Dr. N. S.	Research Station, Lethbridge
Clancy, Mr. D. N.	92 Westview Drive, Calgary
Davidson, Mr. C.	c/o Department of Entomology, University of Alberta, Edmonton
Depner, Mr. K. R.	Research Station, Lethbridge
Edmunds, Mr. J. W.	Supervisor of Apiculture, Alberta Department of Agriculture, Terrace Building, Edmonton

Evans, Dr. G. W.	Department of Entomology, University of Alberta, Edmonton
Ewen, Mr. A. B.	Department of Entomology, University of Alberta, Edmonton
Farstad, Dr. C. W.	Director, Plant Protection Division, Production and Marketing Branch, Canada Department of Agriculture, K. W. Neatby Building, Carling Avenue, Ottawa
Gurba, Mr. J. B.	Supervisor of Crop Protection and Pest Control, Field Crops Branch, Alberta Department of Agriculture, Edmonton
Gushul, Mr. E. T.	Research Station, Lethbridge
Happold, Mr. D.	Department of Entomology, University of Alberta, Edmonton
Harper, Dr. A. M.	Research Station, Lethbridge
Hartland-Rowe, Dr. R. C. B.	Department of Zoology, University of Alberta in Calgary, Calgary
Haufe, Dr. W. O.	Research Station, Lethbridge
Hewitt, Mr. A. G.	Research Station, Lethbridge
Hobbs, Dr. G. A.	Research Station, Lethbridge
Hocking, Prof. B.	Department of Entomology, University of Alberta, Edmonton
Holmes, Dr. N. D.	Research Station, Lethbridge
Hopkins, Mrs. M. E. P.	Forest Biology Laboratory, 102 - 11 Avenue South East, Calgary
Hopping, Mr. G. R.	Forest Biology Laboratory, 102 - 11 Avenue South East, Calgary
Hurtig, Dr. H.	Associate Director, Research Branch, Canada Agriculture, K. W. Neatby Building, Carling Avenue, Ottawa
Jacobson, Mr. L. A.	Research Station, Lethbridge

Khan, Mr. A. A.	Department of Entomology, University of Alberta, Edmonton
Khan, Dr. M. A.	Research Station, Lethbridge
Klassen, Mr. W.	Department of Entomology, University of Alberta, Edmonton
Kloppenborg, Mr. N. E.	Research Station, Lethbridge
Larson, Dr. Ruby I.	Research Station, Lethbridge
Lilly, Mr. C. E.	Research Station, Lethbridge
Lindsay, Mr. I. S.	Environmental Protection, Defence Research Board Headquarters, Ottawa
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