

Entomological Society of Canada
Société Entomologique du Canada

Bulletin

Vol. 14 No. 4 December - décembre 1982

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GUEST EDITORIAL
Entomological Heritage
by
P.W. Riegert*

What is "heritage"? The dictionary tells us it is property that can be inherited. However, it also includes something that is handed down from the past, perhaps by some ancestor, such as a culture, a tradition, or a birthright. Does entomology fit into the mould of this definition? It seems that some reflection upon, and consideration of that question may be useful in directing our future endeavours.

Our entomological heritage is a unique tapestry of science woven from the threads that are the lives and fortunes of man and insect. This association is a special admixture of humanism and scientific rigidity. An entomologist must have that special quality of being able to relate to earth's lowly creatures, many of which, like the cockroach or louse, are repugnant to the common man. He must recognize the ally, or the foe within that hexapod form; or, like the artist, accept it for its own beauty and functional splendour.

Have we an entomological heritage in Canada? We need only cast about to quickly find the answer. There was Eric Hearle who, in 1917, suffered unmercifully in the Sumas swamp of the Lower Fraser Valley, from the bites of dense clouds of mosquitoes. Yet he laid the foundation for good and effective mosquito control when he drained the waters from the land and oiled the residual pools. There was J.D. Tothill, who from 1911 onward, pioneered Canada's efforts in finding and introducing insect parasites for the control of forest and field crop pests. He was the ancestor of Canada's Biological Control Institute at Belleville, Ontario.

We need look no further than the Annapolis Valley in Nova Scotia to find the birth of Integrated Pest Management in the work of A.D. Pickett. Norman Criddle in Manitoba sought the ecological course in insect management and control, while C.W. Farstad and A.W. Platt used plant breeding and new crop varieties to vanquish the wheat stem sawfly.

These were the men and the insects who enriched our entomological heritage. Hundreds of other tales of interaction can be told, if we just look for them. There are the stories of the tribulations and hardships of men who participated in the Northern Insect Survey, the triumphs of the Green River Project, Dick Painter and his warble-fly campaign, . . . *ad infinitum!*

Is it not in our best interest to preserve and record these events? How many photographs, memoranda, and letters lie buried in files which, if unearthed would enrich our lives and brighten our workplace. Unless these records are preserved, gathered, annotated, and stored, their stories will die. The richness of our entomological past will dim unless everyone, yes everyone, does their part in finding and collecting the artifacts of their entomological birthright.

Many years ago Dr. Robert Glen, the former Dominion Entomologist, had to decide whether he would seek a career in medicine or in entomology. He chose the latter thereby verifying the advice given him by his former boss, Dr. K.M. King, then Officer-in-Charge of the Dominion Entomological Laboratory at Saskatoon. Dr. King had said, "If you choose medicine you will be a relative, but if you choose entomology you will be an ancestor!" Bob Glen is our entomological ancestor. What are you?

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THE PRESIDENT'S REPORT

32nd Annual Meeting of the Entomological Society of Canada Toronto, November 1982

I would ask that this report be viewed as the final instalment in the continuing communication I have maintained with membership of the Society during the year, the three preceding communications having appeared in issues of the Bulletin throughout 1982. In this way, I am able to focus these remarks on issues of immediate concern and, not without significance at

this busy joint meeting, to do so in rather less time than would be required for a comprehensive review. Moreover, a summary of all actions by the Governing Board and final reports of committees will appear in the Bulletin; I commend these to your attention for specific information about the Society's programme. I shall be concerned here with some particular achievements, some recent developments from the meeting of the Governing Board a few days ago, and some personal observations on the Society and its progress.

Confirmation was received last week for a contract enabling the Society to proceed with the second *Study of Entomological Manpower in Canada 1976-1986* by our Employment Committee under the guidance of a small Scientific Committee. Funding of \$15,000 has been provided by Agriculture Canada and the Canadian Forestry Service of the Department of the Environment, and I have been pleased to acknowledge this support on your behalf.

From the Science Policy Committee the Board has approved two reports: one, a brief on the need in Canada for permanent government-supported research concerned with the role of insects in development of renewable natural resources; the second, a review of the study programmes available in Canadian universities for the education and advanced training of entomologists.

The Biological Council of Canada in which the ESC is an active participant along with six other Canadian life science societies will sponsor a Canadian Congress of Biology, 23-30 June 1985, at the University of Western Ontario in London. This will be an unprecedented gathering of the societies for life sciences in Canada, and an unusual opportunity for them to forge a more unified base from which to deal with concerns shared by all. Toward several of those concerns, the brief *Biological research in federal laboratories* was recently released by B.C.C.

Perhaps most challenging of the problems with which the Governing Board must contend is that while the Society is large enough to undertake ambitious projects, these activities collectively are now stretching our resources in available time of volunteers and in dollars. The problem will not lessen, for the Society is in that difficult intermediate stage of many successful enterprises where they are no longer small but yet not large enough to be cost efficient. At the request of the Governing Board the Finance Committee has been reviewing the Society's finances throughout the year, and I reported at some length in the September Bulletin on their recommendations, including the need for reserve funds. In their final report to the Governing Board, the Finance Committee has stated that a deficit for 1982 is now certain, and an increase in fees unavoidable if the Society is to hold present reserves in the face of increases in costs. Part of the increase is attributable to higher charges for mailing; the present \$10 student membership fee, for example, meets only half the current cost of mailing alone for the journal and other items. The easy and perhaps even popular solution would be to use reserve funds to meet these increases. To do so would be irresponsible because if the Society is going to continue in the business of publishing, virtually a *sine qua non* of the ESC, it must be prepared to carry this growing financial responsibility. Publishing must be firmly based on the stability of reserve funds and not on the vicissitudes of annual income. Therefore the Governing Board has accepted the recommendation of the Finance Committee to implement increases in fees for members and subscribers, and increases in page charges, all to become effective in 1984. The Governing Board has also authorized the president to strike an *ad hoc* committee to make recommendations during the coming year on ways in which the expenses of the Governing Board itself can be reduced.

Another approach to the problem of increasing costs is increased membership in the Society, and a campaign to enlist new Canadian members has been launched by the Membership Committee. It is important for all members to encourage any of their fellow entomologists who are not now members to join the Society. Of the current membership of approximately 1000 individuals, about 500 are from Canada. A society with the growing profile in Canadian science which the Entomological Society of Canada has should have a higher proportion of its members from within the country. Certainly there are Canadian entomologists who are not ESC members; and there are numbers of graduate students in entomology who are not members, even at the attractive discount on fees, and even though the Society provides services and opportunities to graduate students involving scholarships, meetings with those of like interests, and contacts with potential employers. A noticeable weakness in membership is with experimental and theoretical biologists who study insects but who prefer to be identified as physiologists, ecologists, etc., disciplines in which Canada has in fact considerable strength. Any way one wishes to slice entomology, it is the study of insects; and the Entomological Society of Canada supports the work of all Canadian scientists studying insects by effectively demonstrating on several fronts that more knowledge about insects of all kinds is essential for the future development of science and of natural resources in Canada. The achievements and growing thrust of the Society in these directions merit the support through membership of all scientists studying insects in this country.

I should like now to turn to that favoured ground of retiring presidents—the future, and its

challenge for entomology in Canada. One after another, recent presidents of the Society have observed with alarm the erosion of entomological research in this country, and other aspects of change through which the expanding Canadian establishment in entomology of the 50's and 60's is receding. And the Society has not been content simply to observe these changes; we have undertaken one projection of entomological positions and manpower and are about to begin a follow-up study. At the time of the first manpower study in 1976, it was important to document the reduction in entomological programmes and positions. But let us now be absolutely clear that the issue is not imbalance between the projected supply of entomologists and job opportunities, nor is it simply reduction in funding or in numbers of positions. Objective observers, of whom parliamentarians are only one group, are not much impressed with those arguments because they are heard routinely from all professional pressure groups. The hard truth is that Canada along with many other countries is undergoing now a very difficult economic period; and retrenchment in government spending is necessary because this country is living beyond its means.

The real issue for entomology in Canada, in my view, is how best to compete for those funds that must be allocated for the development of renewable natural resources and of science. To take one example: the Minister of Agriculture released in 1981 a discussion paper *Challenge for Growth: Strategy for the Agri-Food Sector*, in which there is the prediction among many others, that by the year 2000 Canadian farmers can increase production by two-thirds and double their real income. Insects seemed to be lumped with other "natural hazards" in the list of constraints to this projected growth and development. Entomologists will know that constraints from destructive insects can have decisive influence on those goals; they will know that increasing resistance of insects to chemical insecticides and the broad toxic effects of these materials on beneficial organisms will for the long term place greater emphasis on biological control agents; and they will know that success in both of these approaches to insect control absolutely requires a greater investment in long-term entomological research than is currently in place. Entomologists know these things, but if they expect any constructive response, they will need to document the case in terms of today's funding priorities and in startling clarity.

Forests are another resource relevant to entomology, and an extremely important one because forest products contribute more to Canada's international trade balance than agriculture, mining, fisheries and fuels combined. If entomologists do not believe that the current investment in research on forest insects is consistent with the magnitude of the constraint of insects on forest productivity, then they have to organize data for a clear-cut case for more of the resource development dollars to be invested in long-term research in forest entomology.

These are rigorous assignments, but they are feasible because insects are significant; the evidence does exist. The Science Policy Committee's brief on the necessity for long-term entomological research in developing Canada's renewable natural resources will be published during the coming year; completion of the report concerning real costs of destructive insects on three selected crops (apples, onions and potatoes) is soon expected; and a proposal for a review of biological control agents in Canada is to begin. This is the course of action now being taken by the Governing Board. I believe that the Society must move quickly and decisively on these projects, through its Science Policy Committee and the scientific committees responsible for the more specific studies.

Turning now to entomology in universities, we find a sector of our science which must share the austerity of higher educational institutions throughout the country. With a future of diminishing funds and hence reduced academic staff, the universities somehow are expected to produce more entomologists, and indeed biological scientists generally, to fill vacancies for Canada's resource development programmes such as the Agri-food strategy and for basic science. The Society's second study of entomological manpower in Canada will provide basic data on supply, and some projections of requirements for entomologists are now available from government. Comparison of the two data sets will undoubtedly reveal net shortages of scientists in some branches of entomology and perhaps surpluses in others. The value of the Society's study is that it will offer a meeting ground for dialogue between government as the major employer and universities as the only producer of entomological manpower. In this context, the universities have a unique contribution to make to development of renewable resources in Canada, and that role merits more consideration and assistance than it is currently receiving.

Let me dwell briefly on this matter of dialogue with government. When the Society's Biological Survey Project was struggling for a beginning, there was not encouragement from all quarters. But with a lot of hard work, that project went on to show decisively that an initiative from the Entomological Society of Canada could effectively adduce the serious shortcomings in basic knowledge of the insect fauna of Canada in a tangible fashion never before achieved; and moreover in doing so could bring together from throughout the country entomologists of governments, universities and museums to work together effectively. The

model of an advisory Scientific Committee of experienced scientists working voluntarily with a full-time secretariat yields a high return on the funds invested. It is my impression that the Biological Survey project now is endorsed from all quarters because its report *Canada and its Insect Fauna* is a landmark publication in Canadian biology, and it is a model for an integrated national approach to national problems. Although this report was the largest, it is by no means a unique example of the responsible initiatives by the Society. Review, if you have forgotten them, the briefs published in the ESC Bulletin: *Pesticides and the environment* 3(1), 1971; the initial concept for *A biological survey of the insects of Canada* 6(2), 1974; *Entomological manpower in Canada* 8(3), 1976; *Collections of Canadian insects and certain related groups* 10(1), 1978; *The funding of university research in entomology* 10(2), 1978; and *Status and research needs of Canadian soil arthropods* 14(1), 1982. These are the forerunners of what I hope will be many significant ESC commentaries on entomology in this country. The conclusion to be drawn here is that the Entomological Society of Canada is by its performance establishing the credentials to be heard in the formulation of national policy where biological science is concerned.

In my contacts with other organizations during the past year, I have been gratified to hear from many quarters that the Entomological Society of Canada is one of the most effective associations of biological scientists to be found anywhere. I conclude these remarks by saying, as I have on other occasions, that it is the collective efforts of many individuals serving in the Society's many offices and committees that have brought about these achievements. On behalf of members, I thank all of them sincerely for their contributions. For me, the past year has been very educational, intensely busy, and rewarding because of the goodwill and co-operation that I have received; I thank you for the honour bestowed in the presidency of this Society.

Glenn B. Wiggins
President

RAPPORT DU PRESIDENT

J'aimerais que ce rapport soit considéré comme étant l'étape finale de la communication suivie que j'ai eue avec les membres de la Société au cours de l'année, les 3 communications précédentes ayant été publiées dans divers numéros du Bulletin de 1982. De cette façon, mes remarques pourront porter sur des questions d'importance immédiate, et être faites plus brièvement que ne le permettrait un rapport complet, ceci m'apparaissant important dans le cadre de cette réunion conjointe dont l'horaire est particulièrement chargé. De plus, un résumé de toutes les décisions du Bureau de Direction, ainsi que les rapports finals des comités, paraîtront dans le Bulletin; j'aimerais signaler ces rapports à l'attention de ceux d'entre vous qui désirent des renseignements plus précis sur le programme de la Société. Je me concentrerai donc sur certaines réalisations en particulier, sur certains développements récents ayant suivi la réunion du Bureau de Direction d'il y a quelques jours, et sur certains commentaires personnels concernant la Société et son évolution.

L'obtention d'un contrat a été confirmée la semaine dernière, lequel permettra à la Société d'entreprendre une deuxième *Etude sur les ressources humaines en entomologie au Canada, 1976-1986*, qui sera effectuée par le Comité de l'emploi lequel sera supervisé par un Comité Scientifique de petite taille. Des fonds s'élevant à \$15,000, ont été fournis par le Ministère de l'Agriculture et le Service Canadien des Forêts du Ministère de l'Agriculture et le Service Canadien des Forêts du Ministère de l'Environnement, et j'ai eu le plaisir de les en remercier en votre nom.

Le Bureau a accepté deux rapports du Comité des Politiques Scientifiques: un rapport sur le besoin au Canada de recherche permanente soutenue par le gouvernement sur le rôle des insectes dans le développement des ressources naturelles renouvelables; et un second qui passe en revue les programmes d'études offerts dans les Universités canadiennes pour l'éducation et la formation avancée des entomologistes.

Le Conseil Canadien de Biologie, auquel participe la SEC conjointement avec six autres sociétés scientifiques canadiennes, organisera un Congrès Canadien de Biologie les 23-29 juin 1985, à l'Université de Western Ontario à London. Ce sera une première au Canada pour les Sociétés scientifiques concernées, et une occasion unique pour elles de consolider les bases d'un effort concerté dans la recherche de réponses à leurs inquiétudes communes. Le CCB a récemment déposé son document intitulé *La Recherche en Biologie dans les laboratoires fédéraux*, lequel porte sur certaines de ces inquiétudes.

L'un des problèmes les plus sérieux auquel doit faire face le Bureau de Direction concerne le fait que bien que la Société soit de taille suffisante pour entreprendre des projets ambitieux, l'ensemble de ces activités menace les ressources autant monétaires que sous forme du bénévolat de nos membres. Ce problème ne va pas diminuer en importance, car la Société est maintenant à ce stade difficile de l'évolution des entreprises qui réussissent, stade où elles ne sont plus de petites tailles, mais pas encore assez grandes pour être vraiment efficaces. A la demande du Bureau de Direction, le Comité de financement a étudié les finances de la Société tout au long de l'année, et j'ai rapporté en détail ses recommandations dans le Bulletin de Septembre, incluant la nécessité de maintenir le fond de réserve. Dans son rapport final au Bureau de Direction, le Comité de financement soutient qu'un déficit pour 1982 est certain, et qu'une augmentation des frais est inévitable si la Société veut maintenir ses réserves actuelles, dû à l'augmentation des coûts. Une partie de l'augmentation provient des frais de poste plus élevés; ainsi par exemple les frais d'inscription actuels de \$10. pour les étudiants, ne couvrent que la moitié des frais encourus pour poster le journal et autres items. La solution finale, voire souhaitée par certains, serait d'utiliser les fonds de réserve pour couvrir ces augmentations. Cependant ce serait irresponsable parce que si la Société doit continuer de publier, en fait une condition *sine qua non* de son existence, elle doit être prête à supporter cette responsabilité financière croissante. La publication doit reposer sur la stabilité des fonds de réserve, et non pas sur les vicissitudes du revenu annuel. En conséquence le Bureau de Direction a accepté la recommandation du Comité de financement de procéder à des augmentations des frais d'inscription et d'abonnement, ainsi que des coûts imputés aux auteurs par page publiée, lesquelles prendront effet en 1984. Le Bureau de Direction a aussi mandaté le Président de constituer un comité *ad hoc* chargé de faire des recommandations l'an prochain concernant les façons possibles de couper les dépenses du Bureau de Direction lui-même.

Une autre approche de solution au problème de l'augmentation des coût a été d'accroître le nombre des membres de la Société, et le Comité de l'adhésion a lancé une campagne de recrutement de nouveaux membres canadiens. Nos membres se doivent d'inciter leurs collègues entomologistes qui ne sont pas membres de la Société à le devenir. Environ 500 des quelques 1000 membres actuels sont canadiens. Une Société comme la nôtre, dont le statut dans le domaine scientifique au Canada est en plein essor, devrait être constituée d'une proportion plus élevée de membres provenant de l'intérieur du pays. Il y a certainement des entomologistes canadiens qui ne sont pas membres de la SEC; il y a un grand nombre d'étudiants gradués en entomologie qui ne sont pas membres, malgré la réduction attrayante dont ils bénéficient sur les frais d'inscription, et bien que la Société offre des services et avantages aux étudiants gradués incluant des bourses, ainsi que l'opportunité de rencontre avec ceux dont ils partagent les intérêts et avec des employeurs potentiels. On note une faible participation en particulier chez les biologistes du côté expérimental et théorique qui s'intéressent aux insectes mais préfèrent être identifiés comme physiologistes ou écologistes etc. ... disciplines où le Canada possède en fait une compétence considérable. Peu importe la façon dont l'entomologie peut être subdivisée, il s'agit toujours de l'étude des insectes; et la Société Entomologique du Canada appuie tous les scientifiques canadiens étudiant les insectes, en démontrant de diverses façons qu'une meilleure connaissance des insectes est essentielle au développement futur de la science et des ressources naturelles au Canada. Les réalisations de la Société et sa réputation grandissante à l'égard de ces questions, méritent l'appui de l'adhésion de tous les scientifiques canadiens étudiant les insectes.

J'aimerais maintenant me pencher sur la préoccupation favorite de tous les présidents-sortants: le futur et les défis qu'il présente pour l'entomologie au Canada. L'un après l'autre, les derniers présidents de la Société se sont alarmés devant l'érosion de la recherche entomologique au pays, et devant d'autres changements qui font que le développement expansif qu'a connu l'entomologie au Canada dans les années '50 et '60, est maintenant en nette régression. De plus la Société ne s'est pas contentée de mettre ces changements en évidence; nous avons déjà effectué une étude prévisionnelle des postes et des ressources humaines en entomologie, et commencerons bientôt une autre étude semblable visant à la compléter. Au moment de la première étude en 1976, il était apparu important de bien documenter l'érosion des programmes et du nombre de postes entomologie. Mais il est absolument clair que la question n'est pas un déséquilibre entre la disponibilité prévue d'entomologistes et le nombre prévu de postes, ni simplement une baisse des fonds disponibles ou du nombre de postes existant. Les interlocuteurs visés, parmi lesquels les parlementaires ne sont qu'un groupe parmi d'autres, ne sont pas très impressionnés par de tels arguments parce qu'ils les entendent régulièrement de la part de tous les groupes professionnels de pression. Le fait est que le Canada, comme plusieurs autres pays, passe par une période économiquement difficile; et une contraction des dépenses de l'Etat est nécessaire parce que le pays vit présentement au dessus de ses moyens.

La vraie question pour l'entomologie au Canada, selon moi, est de savoir quelle est la meilleure façon de compétitionner pour l'obtention des fonds qui devront nécessairement être alloués pour le développement des ressources naturelles et des sciences. Par exemple: le Ministère de l'Agriculture a publié en 1981 un document pour fins de discussions intitulé *Défis pour la croissance: Une stratégie pour le secteur agro-alimentaire*, dans lequel se trouve une prévision parmi d'autres à l'effet que d'ici l'an 2000, les producteurs canadiens auront augmenté la production des deux tiers et doublé leurs revenus réels. Les insectes semblent avoir été regroupés avec les autres "désastres naturels" parmi la liste des contraintes limitant la croissance et le développement projetés. Les entomologistes savent que les contraintes imposées par les insectes pourraient avoir une influence décisive sur ces objectifs; ils savent que l'augmentation de la résistance des insectes aux insecticides chimiques, et leurs multiples effets toxiques sur les organismes utiles, nous forceront dans l'avenir à mettre l'accent sur les agents biologiques de lutte; et ils savent des universités qu'elles produisent davantage d'entomologistes, et de biologistes en général, afin de combler les postes prévus pour les divers programmes de développement des ressources du Canada, tels la stratégie agro-alimentaire, et pour la science de base. La seconde étude de la Société sur les ressources humaines en entomologie fournira des données de base sur l'offre, et des prévisions concernant le besoin d'entomologistes sont maintenant disponibles à partir de sources gouvernementales. La comparaison des deux ensembles de données révélera sans doute le manque de scientifiques dans certains secteurs de l'entomologie, et peut-être aussi des surplus dans d'autres. L'utilité de cette étude de la Société est qu'elle constitue un terrain de dialogue entre le gouvernement en tant qu'employeur principal, et les universités en tant que seules sources de personnel entomologique. Dans ce contexte, les universités ont une contribution unique à faire pour le développement des ressources renouvelables du Canada, et ce rôle devrait leur mériter plus de considération et d'assistance qu'elles n'en reçoivent présentement.

Permettez-moi d'aborder brièvement cette question du dialogue avec le gouvernement. Lorsque le Projet de l'Inventaire Biologique de la Société en était encore à ses débuts difficiles, l'encouragement ne venait de nulle part. Cependant, avec beaucoup d'efforts, ce projet a été mis de l'avant, démontrant de façon décisive qu'une initiative de la part de la Société Entomologique du Canada pouvait effectivement solutionner le manque sérieux de connaissances de base concernant la faune entomologique du Canada, et ce d'une façon plus tangible que jamais auparavant; et de plus, forcer ainsi des entomologistes des gouvernements, des universités et des musées provenant de partout au pays à se rencontrer pour travailler ensemble. Le modèle d'un Comité Scientifique d'experts travaillant bénévolement en collaboration avec un secrétariat permanent, a permis d'obtenir un rendement élevé en résultats, comparativement à l'investissement en fonds. Selon moi le projet de l'Inventaire Biologique a été appuyé de toutes part parce que le rapport intitulé *Le Canada et sa faune entomologique* constitue une publication de marque en biologie au Canada, et parce qu'il s'avère le modèle d'une approche nationale cohérente à la solution de problèmes nationaux. Quoique ce rapport est le plus volumineux, aussi que la réussite de l'une ou l'autre de ces deux approches de lutte nécessite absolument un investissement en recherche entomologique à long terme qui soit bien supérieur à celui qui prévalait actuellement. Les entomologistes sont parfaitement au courant de ces choses, cependant ils ne pourront espérer une réponse positive que dans la mesure où ils pourront documenter leur cas sur la base des priorités actuelles de financement et ce avec une clarté exceptionnelle.

Les forêts constituent une autre ressource non-négligeable pour l'entomologie, en fait d'une importance extrême, car les produits forestiers contribuent plus largement à la balance économique internationale du Canada que l'agriculture, les mines, les pêches et les combustibles combinés. Si les entomologistes croient que l'investissement actuel en recherche sur les insectes forestiers n'est pas à la hauteur des contraintes imposées par ces insectes sur la productivité forestière, alors ils devront fournir les données devant justifier qu'une plus large part des fonds alloués au développement des ressources, soit investie en recherche à long terme en entomologie forestière.

Ce sont des tâches difficiles, mais possibles parce que les insectes sont importants et que les faits sont là pour le prouver. Le document du Comité des Politiques Scientifiques sur le besoin de recherche entomologique à long terme pour le développement des ressources naturelles renouvelables du Canada sera publié durant l'année courante; l'achèvement du rapport sur les coûts réels des insectes nuisibles pour trois productions choisies (pomme, oignon, pomme de terre) sera bientôt prêt; et un projet d'évaluation des agents biologiques de lutte au Canada sera mis en marche. Voilà des actions entreprises en ce moment par le Bureau de Direction. Je crois que la Société doit procéder rapidement et décidément avec ces projets, via son Comité des Politiques Scientifiques et ses comités scientifiques oeuvrant sur des questions spécifiques.

Passant maintenant à l'entomologie dans les universités, notre science doit y partager

l'austérité à laquelle sont soumises les institutions de haut savoir de tout le pays. Dans un contexte de financement régressif et en conséquence caractérisé par une réduction du personnel académique, on attend néanmoins il n'est certainement pas l'unique exemple des initiatives de la Société. Rappelez-vous, si vous les avez oubliés, tous les documents publiés dans le Bulletin de la SEC: *Les Pesticides dans le milieu* 3(1): 1971; la conception originale de l'*Inventaire biologique du Canada* 6(2): 1974; *Les Ressources Humaines en Entomologie au Canada* 8(3): 1976; *Les Collections d'insectes et de certains autres groupes au Canada* 10(1): 1978; *Le Subventionnement de la Recherche Universitaire en Entomologie* 10(2): 1978; et *Situation de la recherche sur les arthropodes du sol au Canada, et ses besoins* 14(1): 1982. Ce sont là, je l'espère, les ébauches d'autres mises au point importantes de la SEC sur l'entomologie au Canada. La conclusion à tirer ici, et que la Société Entomologique du Canada établit par ces réalisations, les témoignages qui seront entendus lors de la formulation des politiques nationales pour les questions touchant les sciences biologiques.

Lors de mes contacts avec d'autres organisations durant l'année qui se termine, j'ai été souvent flatté d'entendre de la part de diverses sources, que la Société Entomologique du Canada est considérée comme l'une des associations de biologistes les plus efficaces qui soit. Je conclus mes remarques en ajoutant, tel que je l'ai fait dans d'autres circonstances, que ce sont les efforts collectifs de tous les individus oeuvrant aux divers postes de la Société et à l'intérieur de ses divers Comités, qui ont permis ces réalisations. De la part de tous les membres, je remercie sincèrement ces individus de leur contribution. Quant à moi, l'année que se termine aura été instructive, extrêmement chargée, et profitable grâce à la bonne volonté et à la coopération de tous. Je vous remercie pour l'honneur qui entoure la présidence de cette Société.

Glenn B. Wiggins
Président.

GOLD MEDALLIST'S ADDRESS

Wing Patterns in the Lepidoptera

by

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May I begin by expressing deep appreciation to the Society for the honour it has conferred on me. If there were any distinction I could have chosen to receive in my entomological career it would have been this one. My work has in large part dealt with global subjects, but it has been based in Canada and made possible by Canadian resources. I have been a member of the Entomological Society of Canada and of its predecessor, the old Entomological Society of Ontario since early youth. Even if it were not for these associations, any entomologist would be proud to join the outstanding roster of previous Gold Medalists that the Society has had the good fortune to number in its membership and the wisdom to select. I thank you all very much.

Gold Medalists' addresses have been varied. Some have dealt with broad aspects of entomology, some with issues and problems of entomology in Canada, and some with aspects of the speaker's own research. I have decided to do none of these things, but to explore a subject that promised to be instructive for me and that had a possibility of being entertaining for my audience, namely, wing patterns in the Lepidoptera. Though I have made only a sketchy survey of the voluminous and scattered literature, I hope to be able to point out some challenging problems and some unanswered questions. The talk is illustrated by slides. In this printed version I substitute references to illustrations in a few readily available books.

It is well known that both butterflies and moths are colorful. The colors reside mainly in the dense covering of modified setae called scales, found on the head, body, antennae, legs and wings, though parts of the integument may be colored and exposed, either permanently, as in the genital areas of many species, or temporarily, as in abdominal intersegments and eversible glandular structures. Denuded of scales, the wings are transparent, generally colorless or light brown. Because of their thickness, the wing veins are often semiopaque or opaque. In some groups the wing itself is pigmented, as in some kite swallowtails of the genus *Graphium* (Watson and Whalley, 1975, pl. 99), where bile pigments give a green or blue colour to translucent windows in the wing. The scales covering these areas are reduced and hairlike or, on parts of the underside, themselves translucent, permitting the greenish color to be seen. The pigment is contained in granules in the interstitial material between the dorsal and ventral wing membrane (Allyn, Rothschild and Smith, 1982). The Papuan species *Graphium weiskei* (Sandved and Brewer, 1981, figs. 107, 108) has the bile pigments supplemented by pinkish and mauve pigments of unknown composition. Bile pigments are also found in the wings of many pierid butterflies, where they are generally covered by opaque pigmented scales, in some Nymphalidae, in at least one *Morpho*, in the green pyralid *Stemorrhages sericea*, and in saturniids of the genera *Actias* and *Argema* (Watson and Whalley, 1975, pl. 336, 332). Some wing membranes contain small amounts of brown pigment, perhaps melanin, but in general contrasting patterns, as seen in various Trichoptera, Neuroptera, Megaloptera, Mecoptera and Diptera, are lacking.

The scales are typically strongly pigmented, and generally cover the entire wing surface dorsally and ventrally, overlapping like shingles on a roof, and forming a more or less definite fringe of either broad or hairlike scales along the distal and posterior margins of the wings (Sandved and Brewer, 1981, figs. 221, 220, 201). Among the most common pigments are melanins, though for most species this identification rests on conjecture. Melanins may be yellow, brown or blackish; presumably they are responsible for many of the brownish and dark elements in lepidopteran patterns. Red pigments are widespread. Ford (1942, 1944, 1944a) recognized six kinds in the Lepidoptera he studied, though his list is probably incomplete. Of these, "pigment A" occurs in certain papilionids, in arctiids, zygaenids, *Catocala* spp., some riodinids and no doubt in other groups. "Pigment B", somewhat resembling melanin, but closer to the yellow papiliochrome II of swallowtails, is known only from papilionids. "Pigment C" is known from vanessine nymphalids; this is perhaps related to ommachromes, known from various families; pigments "D" and "E", uric acid derivatives, occur in the pierid genus *Delias* (Smart, 1976: 164-165). Such derivatives, the pterines, are rather general in pierid wings; they range in color from white through yellow to orange-red. Descimon (1971) found ten pterines or pterine derivatives in the wings of *Colias croceus*. The sixth of Ford's red pigments is of unknown chemistry and was found in the Riodinidae. Other classes of pigments found in the scales are anthoxanthins, white or yellow materials found in Pieridae, Satyridae and probably other groups, purines, also found in Pieridae, and carotenoids, widely distributed in Lepidoptera, but of uncertain importance as wing pigments. The pigments of most species remain unstudied; such conspicuous examples as the green pigments of the Geometrinae are unidentified.

In addition to pigments, the scales and sometimes the wing membrane have structural colors, produced by interference of light waves reflected from parallel ridges, layers, fibers or particles in the body of the scale. These are responsible for the faint luster of the wings in most Lepidoptera, and for the brilliant iridescent colors seen in *Morpho*, *Prepona*, *Urania* and many others. Forbes (1939) noted that there are two main types of iridescence, specular, in which

the angle of the light source to the wing is not critical and the best line of sight is in the opposite direction and at about the same angle of elevation, and oriented, in which the light source must be from a certain direction and the line of sight from another definite direction to yield maximum brilliance. Forbes proposed a system for characterizing iridescence, and applied it to a sample of species, but his scheme has so far not been much used in the descriptive literature. He did not try to relate the type of iridescence to scale structure, of which there are two main iridescent types: first, the lamellar type, with two subtypes, those with plate lamellae in the lumen, found in *Urania* and *Papilio* (Sandved and Brewer, 1981, figs. 125, 126), and those with porous lamellae, also in the lumen, found in *Lycaenidae* (Allyn and Downey, 1976); and second the ridged type, in which a system of regularly spaced shelves and grooves on the scale ridges forms the basis of the diffraction system, again with two subtypes, one with solid ridges, found in *Morpho* (Sandved and Brewer, 1981, figs. 86-88, 217); the other with internal sinuses in each ridge, found in *Pieridae* (Sandved and Brewer, 1981, fig. 128). Downey and Allyn (1975) give diagrams and a bibliography.

Reflection from pigments and from diffracting structures extends far into the ultraviolet. The consequent plain and iridescent "colors" have definite patterns, often very different from those we can see with the unaided eye. These can be discerned by photography, using a pinhole camera or an ultraviolet-passing lens, or by use of a television camera and screen (Lutz, 1924, 1933; Eisner et al., 1969; Allyn and Downey, 1977). Under ultraviolet radiation the wings of many species show areas that fluoresce; that is, the wing pigment returns radiation at a lower frequency than that of the input. Using an ultraviolet source, convenient hand-held ones are standard equipment in geology and analytic chemistry, one can, in a dark chamber, see vividly glowing colors, most often in the yellow, green or blue ranges. The fluorescence of a number of butterfly species was surveyed by Cockayne (1942). Unlike the ultraviolet reflectance patterns, the visible fluorescent patterns tend to coincide with elements of the normal visible pattern of the wing. However, ultraviolet and fluorescent colors are alike in that they may be present or absent or have different distributions in closely related species or in the sexes of one species.

So much for the palette from which wing patterns are painted. Let us now look at a few general features of the patterns themselves. First, though *Lepidoptera* collectively have a kaleidoscopic variety of colors and designs yet it is easy to identify common elements or themes running through extended groups. Examples are seen in the eyespots of many nymphaloid butterflies (Watson and Whalley, 1975, pl. 164-214) and the discocellular spot and transverse antemedial and postmedial lines of many geometroid, noctuid, bombycoid and pyraloid moths (Watson and Whalley, 1975, pl. 297-300, 317f, 318-340, 60 62, 64, 72). In addition to resemblances of this kind, which rest on homology, there are many examples of convergent resemblance, due sometimes to chance, as between *Lamproptera meges* and *Chorinea faunus* (Watson and Whalley, 1975, pl. 94m and 268f), sometimes to shared functional adaptations, as in dark heat-absorbing arctic and alpine moths (Munroe, 1975, fig. 8), to similar cryptic or aposematic designs, as in certain *Geometridae*, *Uraniidae* and *Oxytenidae* (Watson and Whalley, 1975, pl. 46a, 50, 370), or to mimicry (Smart, 1976: 78, 79).

Second, though homologous patterns and pattern elements may be traceable through very wide groupings of *Lepidoptera*, the homologies can easily be overridden by genetic or developmental influences, to the extent that the fundamental pattern and its homologies may be completely hidden or almost unrecognizably altered. Many species of the paleotropical butterfly genus *Acraea*, for example, have a pattern of dark spots and bands easily homologized with the patterns of many nymphalid genera (Watson and Whalley, 1975, pl. 163a, 1). In *A. uvui* and *bonasia*, however (Watson and Whalley 1975, pl. 156, 157), the pattern is largely obscured, and in the closely related *Actinote ozomene* a new pattern is substituted (Watson and Whalley, 1975, pl. 163). Patterns may be quite different in sexes of the same species, e.g. in *Ornithoptera* spp. (Smart, 1976: 156, 157), in genetically different forms of one sex as in *Papilio dardanus* (Smart, 1976: 77) or both sexes, as in *Heliconius melpomene* or *erato* (Smart, 1976: 182-185), on forewings and hind wings of the same individual, as in *Catocala* spp. (Carter, 1982: 174), on upper and under sides of the same wing, as in *Morpho* spp. (Smart, 1976: 236-237), or in genetically identical individuals that have developed under different temperature and humidity regimes, as in *Precis octavia* and *Araschnia levana*, (Smart, 1976: 68), which look quite different in wet and dry seasons or spring and summer, respectively.

Third, the wing patterns are determined by both general and local influences. *Argynnis adippe*, for example, (Carter, 1982: 84), has on the upperside a relatively simple pattern of rows of black spots. This falls within the fundamental nymphalid type already mentioned, and the rows and other pattern elements are morphological units. Yet the rows are dislocated and the spots variously distorted. The local influence in each venational cell is such that in no two cells are the disposition markings exactly the same. A broader regionalization is seen in that the parts of the underside normally exposed when the insect is at rest are differently colored from the concealed parts of the wings.

With these points in mind, let us look at some of the main types of fundamental patterns. The most primitive living Lepidoptera, the Micropterigidae, have the forewings colored, often patterned above, but the hind wings and the underside of the forewings without conspicuous markings. In the primitive Patagonian genus *Heterobathmia*, the forewing upperside scales are wide and form a complete covering, whereas the scales of the remaining wing surfaces are narrow and do not overlap. The membrane of the forewing of *Heterobathmia* is dark-pigmented, darker at the pterostigma and with hyaline areas on the intersectoral-sectoromedial crossveins, on the fork of M_{1+2} and M_3 , and on CuP. The scales are dark, with a bronzy iridescence. In one species there is a contrasting pale bar at the tornus and a pale mark on the fringe. Some micropterigidae have a simple contrasting pattern of pale transverse bars (Heath et al., 1976, pl. 10), occasionally supplemented by marginal patches or a longitudinal basal bar. Similar patterns of transverse bars on a dark ground are seen in Nepticulidae, Heliozelidae and Incurvariidae among the lower heteroneurous moths (Heath et al., pl. 11-13). The tornal bar of *Heterobathmia* can perhaps be interpreted as a rudiment of this barred pattern, which often has a short bar isolated in the tornal position. In the homoneurous families similar banded patterns appear in complete form in Acanthopteroctetidae, in the eriocraniid genus *Neocrania* and in Lophocoronidae (Davis, 1978; Common, 1973). Tornal or posterior-marginal pale bars are found in most Eriocraniidae (Heath et al., pl. 10) and in one of the two known species of Agathiphagidae.

However, in Eriocraniidae, Lophocoronidae and Agathiphagidae, and also in the additional homoneurous families Mnesarchaeidae and Neopseustidae, a different and significant pattern element is found, namely, a general irroration of dark strigae over the forewings, extending transversely, often from one vein to the next. In neopseustids these are particularly well developed and tend to aggregate to form dark spots, bars, and even transverse chains of ringlike markings (Davis, 1975: 28, 29). In neopseustids similar markings are seen more faintly on the hind wings. In this family there can be a series of dark terminal spots at, and not between, the vein ends, and the veins can be dark, though whether from scaling or their own opacity is not clear from Davis' figures. There is also a tendency to form dark spots in the discal and cubital areas, including one at the anterior end of the radio-medial crossvein: the veins are rather differently laid out than in the higher Lepidoptera, and it is hard to say whether the neopseustid spots may be precursors of the discocellular, intracellular and posterior cubital spots found in more advanced groups.

Rounding out the Homoneura, the hepialoids vary from plain brown, as in *Neotheora* and the hepialid genus *Gorgopsis*, to the complex patterns of many hepialids. Discal and postcubital spots seem to be present in Prototheoridae, though I am judging only from illustrations. Strigae are often present, and these develop into chains of round spots in *Charagia* and other hepialid genera, recalling the patterns of some Neopseustidae (Watson and Whalley, 1975, pl. 7). More strongly integrated loops, bands and elbowed markings are found in many hepialids. Colors may be well developed, including a somewhat fugitive sulphur yellow in *Sthenopsis thule*, salmon, purplish brown, bright green, orange, white, and metallic silver and gold. The chemical or structural bases of these colors have not been worked out.

Proceeding now to the Heteroneura, we have already mentioned the widespread occurrence in the primitive groups of a pattern of broad whitish bars on a dark ground, apparently corresponding to the similar patterns found in various Homoneura. In addition to bars, strigae are found in the Monotrysia, for instance in *Nematopogon* spp. and *Lampronia rubiella* of the Incurvariidae (Heath et al., 1976, pl. 13). Strigae are very strongly developed in a whole suite of families in the lower Ditrysia, the next grade up in the classification. Strigae are particularly clear and definite in the Cossidae and their relatives and in the Thyrididae (Watson and Whalley, 1975, pl. 8, 51), but occur also in a number of other families, for example Tineidae, Eriocottidae, Psychidae, Megalopygidae, Chrysopolomidae, Hyblaeidae, Tortricidae, Uraniidae and Geometridae. Thus, while most common in the more primitive Ditrysia, they extend well up the scale, even to the rather advanced superfamily Geometroidea. It is tempting to compare the strigae of cossids with those of many Trichoptera, as was done by Botke (1916), and in turn perhaps with the multiple crossveins of Neuroptera and Palaeoptera. While it must be noted that the strigae of Lepidoptera are scale patterns and not membrane plus scale patterns like those of many Trichoptera, it is nonetheless interesting that in cossids and others the strigae of the upperside of the wing exactly match those of the underside in position, arguing that they express a structural pattern of the wing itself rather than simply of one surface or its vestiture. As Botke (1916) noted, the strigae tend to coalesce into transverse lines extending across several cells, but it has not been shown that these are related to the well-defined transverse lines of higher families.

The lower Lepidoptera have a number of very interesting secondary patterns, for instance an elaborate metallic area or *speculum* in the incurvariid *Adela ridingsella* (Powell, 1969, figs. 3, 4), where it is coupled with a remnant of the primitive light-banded pattern.

Somewhat similar, though not homologous, patterns are found in Choreutidae, Glyphipterigidae and Tortricidae among the Ditrysia (Watson and Whalley, 1975, pl. 14, 34). Longitudinal markings, either dark or light, and on or between veins, occur in many families. In the small moths of several ditrysian families that have leaf-mining larvae, the forewings are narrow and the wing veins are reduced and simplified. In these moths there is a tendency to longitudinal organization of the pattern, often emphasized by convergent oblique markings or by radial markings at the apex, as in *Phyllonorycter* spp. and other Gracillariidae (Watson and Whalley, 1975, pl. 6, 26). Day-flying Microlepidoptera tend to have conspicuous, presumably aposematic or mimetic patterns; often the moths are larger in size than their dull-colored nocturnal relatives. Examples are the Zygaenidae, Chalcosiidae, Immidae, Sesiidae and Castniidae (Watson and Whalley, 1975, pl. 27-29, 33, 45, 46, 48).

It is time now to consider the dominant elements of the patterns of the higher Lepidoptera. These are interesting for two reasons, first because there are evident homologies extending across a considerable number of families and super-families, and second because we have some knowledge of the morphogenetic processes that govern the formation of the pattern during ontogeny. It has already been mentioned that different pattern elements can respond differently to genetic or environmental influences. The transverse bands, for example, may be modified or lost while the large cell spots remain unchanged. It is known that these elements are formed at different times during development and that there are different sensitive periods during metamorphosis when their expression can be changed by injury or temperature shock. The transverse bands and the cell spots are in fact the two most regularly found major elements in the patterns of higher Lepidoptera.

The cell spot system consists in the first place of a marking or group of markings on the veins at the end of the discal cell. Morphologically these are the sectorial, radio-medial and medial crossveins, with short segments of the connecting radial and median branches. A second marking often occurs in the discal cell, generally at about the fork of R_{2+3} from R_{4+5} . There may be one or more additional spots related to this system on CuP. Of these the discocellular spot is by far the most widely distributed. In Saturniidae it is frequently developed as a large circular or crescentic field, with or without a transparent center, and with one or more contrasting borders surrounding the central zone (Watson and Whalley, 1975, pl. 326-340). The comparative structure of the discocellular fields in Saturniidae has been considered by Henke (1936). In the Noctuoidea the discocellular spot is called the reniform, because of its usual kidney shape (Carter, 1982: 144, 145); in some noctuids and many geometroids and pyraloids it is a simple lunule or bar or is separated into a pair of dots, one at the anterior and one at the posterior angle of the discal cell (Carter, 1982: 129, 151). The spot at the forking of the radial sector is the orbicular of Noctuidae (Carter, 1982: 144, 145). It is found also in Pyralidae and in Drepanoidea, but is usually if not always absent in Bombycoidea and Geometroidea. A spot on the CuP fold more or less directly behind the orbicular is common in Noctuidae, where it is called the claviform; it also occurs in some Pyralidae (Carter, 1982; Watson and Whalley, 1975, pl. 65). A discocellular spot and a cell spot are found in many butterflies; they are well seen in *Parnassius* and in *Cressida* among the Papilionidae. The system of cell and cubital-posterior spots is clearly seen in butterflies and in many Gelechioidea, and can be traced back to the Tineidae and perhaps even the Hepialoidea (Watson and Whalley, 1975, pl. 35, 36, 5h, 7a).

The second main element of the patterns of higher Lepidoptera comprises the system of transverse bands. In their simplest form these comprise a pair of lines or bands that extend from costa to posterior margin, one basal and the other distad of the discocellular spot. If the basal and distal zones or edges of the transverse bands are distinguishable in thickness or color, then their sequence is reversed from the basal to the distal band, so that the two form a so-called symmetry system centered on the discocellular veins. The symmetry of the bands extends usually to color sequence and often to definition, but generally not to shape, though the pattern is more symmetrical in the unexpanded pupal wing. The bands themselves may be simple lines, as in *Eochroa trimeni* (Watson and Whalley, 1975, pl. 338), or they may consist of double, multiple or repetitive elements of various colors (Watson and Whalley, 1975, pl. 340). The wing veins influence the course and expression of the lines, which may be scalloped, constricted, intensified, or interrupted at the veins, or reduced to a series of spots or other markings (Watson and Whalley, 1975, pl. 317f, 326, 272t, 369g). The symmetry system is found in Pyralidae and all higher moth families, also in butterflies, in Castniidae and in some Gelechioidea. Its ontogeny has been studied intensively in several species (Kühn and Henke, 1936; Kühn and Engelhardt, 1936; Henke, 1933, 1936; Schwarz, 1953 1962; Meyer, 1973). These include the Mediterranean flour moth, *Anagasta kuehniella* (Watson and Whalley, 1975, pl. 56e), and the Indian meal moth, *Plodia interpunctella*, among the Pyralidae, the magpie moth, *Abraxas grossulariata* (Carter, 1982: 122), in the Geometridae, and the Cynthia moth, *Samia cynthia* (Watson and Whalley, 1975, pl. 333b) in the Saturniidae. In all these it turns out that the symmetry is determined in an essentially similar fashion: the bands arise as

expanding semicircles arising from roughly the midpoints of the anterior and posterior margins of the wing; as they meet, these semicircles fuse to form the separate bands, which then migrate towards the base and distal margin, respectively. In the forewing of *A. kuehniella* and *S. cynthia* the anterior element is stronger than the posterior; in that of *P. interpunctella* only the anterior loop is normally active, but if expansion of the anterior element is experimentally inhibited then the posterior element takes over. In the hind wing of *S. cynthia* the posterior element is dominant. The hind wings of *A. kuehniella* and *P. interpunctella* are almost patternless. In the mature hind wing of *S. cynthia* the posterior loop extends only partway across the wing on the upperside, whereas on the under side it reaches the costal margin and the base of the wing; interestingly, however, it is narrowly reflected along the posterior margin so that the loops of upper and under sides maintain contact at the margin from which they originated. This is a common but not universal condition.

Spreading of the symmetry system from its points of origin can be influenced not only by genetic factors, but also by local injury or by heat or other shock at certain sensitive periods in late larval and early pupal life. In *E. kuehniella* after about 4.5 days into pupal life the position of the bands can no longer be changed by such intervention. The sensitive period comes well before the development of pigment or even the full differentiation of scales. The future position of the dark bands lies in a zone of retarded scale differentiation, in which mitoses are concentrated after their concentration has diminished in future paler areas. This implies delayed sclerotization of the scales and a longer time for synthesis and deposition of melanin in the dark regions. The resulting scales are not only darker but also longer and narrower than the light-colored scales of the ground. The determination of scale form and color is evidently influenced by either a diffusible substance or a wave of physicochemical excitation spreading from the marginal starting points. Interference with the blood circulation in the developing wing inhibits spread of the symmetry field or differentiation of form and pigment of cells, depending on the time of interruption. Dilution of the haemolymph in *P. interpunctella* affects differentiation of the scales, either as to shape or as to pigmentation, depending on the stage of pupal life at which it occurs. It appears that these effects are due to lowering of the tyrosine supply to the developing scale-forming cells, and that interference with different stages of differentiation explains the time-related differences in end results. The determination stream that accounts for the expanding symmetry field, on the other hand, as is clear from its spatial progression, does not travel through the circulatory system, but travels from cell to cell across the developing scale-forming tissue. The supply of tyrosine and no doubt other pigment and structural precursors brought by the haemolymph is evidently essential for the pattern so determined to achieve its full expression.

Though interesting and relatively well investigated, the symmetry field is only one of the important determinants in the pattern of higher Lepidoptera. In the Saturniidae, for instance, Henke (1963) has shown that the discocellular spot can be the focus of complex pattern fields that generate eyespots, simple or complex transparent patches, and other prominent markings. In addition, a basal field, a subbasal field, a subbasal dusted area, a median field, a median shade, a median shade field, an outer dusted area, an apical dusted area, an apical line, a complex terminal field, costal and posterior marginal fields and longitudinal bands along the veins are discernible as independent pattern elements. These may in turn give rise to secondary patterns along their zones of interaction, or by parallel multiplication or alternation, in a pattern compared by Goldschmidt (1938) to the Liesegang rings seen in colloidal systems.

In Nymphalidae and related butterflies there is a comparable symmetry system, well known from the work of Schwanwitsch (1924) and Suffert (1925). Though the transverse bands and the cell spots are similar to those seen in bombycoids and noctuids, there is an additional element not represented in those groups. This element is the distal row of eyespots or ocelli, found between the postmedial symmetry band and the terminal margin of the wing. In their simplest form these spots consist of a row of round spots, commonly blue or bluish white as in *Nymphalis antiopa* or *N. io* (Carter, 1982: 78), the color being a structural one generated by a suspension of air bubbles in the solid matrix of the scales. Very frequently these spots are surrounded by one or more dark rings, as in *Precis limnoria* or *Morpho* spp. (Smart, 1976: 197, 228-237). In the Queen of Spain fritillary, *Argynnis lathonia* (Carter, 1982: 84), the ocelli are reduced to simple black spots on the upperside, but on the under side of the hind wing their homology is clearly evident. Ocelli typically occur one to each intercellular space; in the apparent cell CuA_2 there are two eyespots, the posterior one really being that of cell CuP . Often the eyespots are better developed in some wing cells, and smaller or absent in others. Cells R_5 or R_s , M_1 and CuA_1 seem particularly favorable for the development of large ocelli, whether for physiological or defence reasons is uncertain. Sometimes, as in *Taenaris* spp. (Smart, 1976: 226, 227), the eyespot may overlap more or less widely into adjacent wing cells. Eyespots may also be asymmetrical, as in *Morpho hecuba* and *phanodemus* (Smart, 1976: 230), the asymmetry generally being greatest in the longitudinal axis of the wing.

Nijhout (1981), who has studied nymphalid wing patterns experimentally, considers that in that group the fundamental unit of pattern organization is the cell, and that the pattern of each cell is for the most part determined independently under the influence of foci lying within that cell. He thus sees the wing pattern as "not only a mosaic of scales but also a mosaic of wing cells that are independent units of development". He considers also that the patterns of upper and under sides develop independently.

Nijhout (1981) has given particular attention to the large eyespot in cell CuA₁ of the buckeye butterfly, *Junonia coenia*. This is organized as a series of concentric rings of different shades of melanin around the bluish white center that appears to mark the organizing focus of the spot. Cautery early in pupal life of a small group of cells at the center of the presumptive future spot prevents development of the spot if performed in the first four hours after pupation, or to production of an abnormally small spot if done between 4 and 24 hours after pupation. Cautery after that time does not affect the size of the eyespot. As in the symmetry field of *E. kuehniella* and *P. interpunctella* the sensitive period for pattern modification is well before the appearance of pigment in the eyespot. Transplantation of the central cells to a different part of the wing results in formation of an eyespot at the new site instead of at the original one, though the displaced spot is abnormally small. Evidently the central cells determine the position, shape and size of the eyespot, very likely by diffusion of a chemical substance from a center where it is produced. Such a diffusion process can be represented graphically as a cone expanding at a constant slope with time. The periphery of any element of the eyespot can be represented as the intersection of a plane perpendicular to the axis with the surface of the cone. The longer the diffusion has been going on at the time of determination of the pattern, the larger the ring will be. Smaller rings can be generated either by shorter diffusion times, i.e. intersections nearer the apex, or by slower diffusion rates, i.e. narrower cones. Of course, the cone might model some time-related physical field as well as a chemical diffusion process. Similarly the intersecting plane might be the graph of either a chemical or a physical limiting mechanism. Observed distortions of eyespot homologues in different species can be represented as projections of the conic sections produced by various oblique or flexed planes (Nijhout, 1981: 151). The flexures, like the pattern elements to which they correspond, often are symmetrical or nearly so with respect to the midline of the wing cell, but strongly asymmetrical in a radial direction from the base. The various distortions obviously give clues to the interaction of processes that determine pattern, but the nature of these processes is not yet well understood. Nijhout (1981) has emphasized the importance of ringlike elements in butterfly wing patterns and the independence of local foci in individual wing cells, but experiments on the symmetry system in *E. kuehniella* and other moths shows that overall patterns are also important; indeed they would almost have to be postulated to account for the regular arrangement of eyelike spots in nymphaloid butterflies. Boundary effects between wing cells (or conversely the effects of wing veins on overall patterns), the alignment of homologous and nonhomologous pattern elements in adjacent wing cells, and the influence of foci in one cell on the patterns of adjacent cells are among the topics that will have to be considered in developing a comprehensive theory of lepidopterous wing patterns.

One of the strong lines of approach will certainly be the investigation of genetic differences. Such differences are capable of direct study in individual mutants, in sexes and polymorphs of a single population, in different populations of the same species, and in different species that are close enough in reproductive physiology to be hybridized. Goldschmidt (1938: 250) proposed a partial classification of genetic effects on wing pattern that is still useful. He recognized: (1) general effects on the chemistry of areas of one type, for example, yellow or orange vs. white in the wings of *Colias* butterflies (Howarth, 1973, pl. 5); (2) general expansion or contraction of areas of dark melanin, as in the magpie moth, *Abaxas grossulariata*, or various Arctiidae (Carter, 1982: 122, 148, 150); (3) intensification or bleaching of the whole of a given pattern, as in the normal vs. *valentina* forms of the silver-washed fritillary, *Argynnis paphia* (Howarth, 1973, pl. 29); (4) increase of melanic scales in particular pattern elements, e.g. aberrations of *A. paphia* (Howarth, 1.c.); (5) the whole unchanged pattern is overlaid by melanic pigment, as seen in the "industrial melanics" of the peppered moth, *Biston betularia* (Carter, 1982: 128) and the dark female form of the tiger swallowtail, *Papilio glaucus* (Howe, 1975, pl. 62); (6) the basic pattern is modified by change in the relative distance or size of elements, as in the symmetry-field mutants of *A. kuehniella*, already mentioned; (7) particular pattern elements are suppressed, e.g. the *lunata* form of the gypsy moth, *Lymantria dispar*, in which the zigzag bands of the symmetry field have been lost; (8) the whole basic pattern is replaced by or transformed into a quite different pattern, for example, in the *Heliconius* and *Papilio* forms referred to earlier. The genetic bases of the majority of these examples are known; they involve for the most part simple allelic systems at one locus or a few interacting loci. The white form in *Colias* is determined by a sex-limited dominant gene; its action is evidently by suppressing the formation of orange and red pterines, leaving bluish or greenish white kinds such as leucopterin to predominate. A similar

genetic system occurs in many species of the genus, and the frequency of the white morph increased in cooler climates, presumably because of environmental selection. White morphs occur rarely in the male, but they are believed to be genetically and chemically different. Yellow, orange, red, green and blue appear on the wings of many species of *Colias*; they are not sex-limited; so far as pigments that occur in *C. croceus*, but their genetics is largely unknown. The melanic areas of *Abraxas grossulariata* can be reduced by either an autosomal recessive or a sex-linked recessive (it was in this species that sex-linkage was discovered); the melanic areas can be expanded by another autosomal recessive; combination of this homozygote with the sex-linked gene produces an interesting variant (Ford, 1955, pl. XII). The dark morph *valesina* of *Argynnis paphia* is the product of a sex-limited dominant gene, but there are indications that the homozygous condition may be lethal (Ford, 1945: 234). *Argynnis* aberrants with expanded or fused postmedial dark markings are probably genetically determined at least in some instances, but the details are not known (Remington, 1958: 793, 794, as *Speyeria*). The industrial melanics of *Biston betularia* are produced mainly by the dominant *carbonaria* allele and by the graded series of *insularia* alleles; in other species melanic forms may be dominant or recessive and autosomal or sex-linked. The situation in the sex-limited dark female of *Papilio glaucus* is more complicated. The inheritance is thought to be controlled by a locus on the Y chromosome, so that females normally give rise to female offspring of their own color. Exceptions occur; these may be due to crossing over between the X and Y chromosome, though there are theoretical difficulties in this explanation. The related *P. rutulus* appears to have an allelomorph suppressing black. Intermediate forms appear, both in wild populations of *P. glaucus* and in experimental *glaucus-rutulus* hybrids (Clarke, Sheppard and Mittwoch, 1976; Clark, 1932). The investigations of Kühn and Henke (1936) on a dominant mutant affecting the symmetry system in *E. kuehniella* is summarized in Goldschmidt (1938). The *lunata* form of *L. dispar* depends on a recessive mutant (Goldschmidt, 1938 l.c.); similar pattern deficits are fixed in the wild types of various species, e.g. the papilionid *Cressida cressida* (Watson and Whalley, 1975, pl. 111a). Gross pattern changes are best known in polymorphic mimetic butterflies, in sexual dimorphs, and in certain species hybrids. Though the genetics of these differences has been studied in a number of cases and an impressive body of theory has been built up on the evolution of mimicry and protective coloration (Turner, 1977), the chemistry and ontogeny have been studied hardly at all in such cases, though they should provide very useful material. Heliconiinae have been reported to contain pterines (Baust, 1967) and 3-hydroxy-L-kynurenine (Brown, 1967); two different red pigments, one kynurenine-related, occur in model and mimic groups of Papilionidae (Ford, 1944, 1944a; Umebachli, 1978, 1979); the differences between mimetic and non-mimetic nearctic species of *Limenitis* reside partly in different melanins or melanin-like compounds and partly in structural colors; the genetic control is partly by simple allele differences and partly polygenic (Platt, 1975).

It would be a logical extension to carry this discussion forward to examine how patterns are adapted and transformed to meet various biological needs, but this would take us far beyond the available time and space. The economy of expression that develops pattern on exposed surfaces of the wings where it can be of use and suppresses it in areas where it is non-functional, the dislocation and realignment of pattern elements to misdirect the eye of the predator or to simulate the structure of a leaf or some other background element, the combination of pattern with resting position to develop completely unmothlike appearances, the coupling of pattern and actions to produce displays dazzling or frightening to predators, warning to territorial invaders, or attractive to potential mates, the evolution of garish aposematic presentations that advertise unpalatability, and the elaboration of complex mimetic structures in which the survival of many species depends on the finely balanced interaction of similar models as well as mimics, all these are fascinating not only in their bionomic aspects, but equally as problems in the structure, physics, chemistry, genetics and developmental physiology of wing patterns and their component colors.

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REPORTS FROM OFFICERS, TRUSTEES, AND COMMITTEES

Annual Report of the Secretary for 1982

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

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

H.G. Wylie

Report of the Treasurer for 1982

NSERC Publication Grant

This was submitted on 29 October. A major policy change was announced on 22 September and now societies may request a three-year grant. If so, then we would have to project our budget for the next three years instead of just the next year. This might be difficult to do in these times of inflation.

A covering letter to NSERC alluded to the fact that the Governing Board would discuss the three-year proposal, but in the meantime we would submit the usual one-year grant application. *Action: Governing Board*

Copyright for journals

I checked into this and there is no problem, at least as far as NSERC was concerned. I was advised that the copyright laws in Canada are currently under revision, but this may take a year or so, and that we should wait until this is finished. *No action at this time*

Financial report

As can be seen, we will definitely be in the red this year; the question is by how much? The projected figure of \$34,252 is very likely high because some committees have not used the budgeted amounts, however, I feel that I had to leave these amounts in the projected figures. On the other hand, the *Memoirs* and *Arctic Arthropods* are paid for and any sales would mean less of a deficit.

My guess is that we may be in the red by \$25,000 to \$30,000 in 1982. Therefore, we must consider additional revenue and/or reduced expenditures now. Even so, most of the additional revenue would be for 1984, not 1983. The Finance Committee report has a recommendation.

Memoirs, Arctic Arthropods, etc.

Sales of the *Memoirs* are slow, mainly because they are not "best sellers." Sales of *Arctic Arthropods* are better and hopefully more will be sold at this meeting. We have sold a total of \$2,283 by the end of September. Our brochures now include postage with the prices and this saves some work.

Scholarship Fund

As of 9 November, we have received \$982 during 1982. The fund is now at \$25,928. The obituary notice for John McLintock (in the *Ottawa*, *Saskatoon*, and *Vancouver* papers at least) requested donations to the Scholarship Fund in lieu of flowers. This has resulted in \$275 to date in John's memory. Others (especially the wives since statistically they outlive their husbands) should be informed more fully about this aspect. *Action: Everyone*

Clerical help

The auditor recommended that the job requires a full time clerk with perhaps some part time seasonal assistance. Compared to a few years ago, the job takes more time because of the contracts, sales of books and *Memoirs*, etc. Also the Society has grown in number of members and subscribers and our publications have increase in number of pages.

Mrs. Mary Lawson has worked more than the allotted 0.6 person/year. The Finance Committee (see their report) recommends that her time be increased from 0.6 to 0.8 person/year effective 1 September.

Cost of the Bulletin

We have a new printer in Winnipeg for the *Bulletin* starting with the September issue, which cost \$1,287.29 including shipping the *Bulletins* to *Ottawa* for mailing. Postage will vary depending on whether we enclose it with an issue of the *Can. Ent.*

Gold Medal

After the newspaper article about Gene Munroe receiving the Gold Medal, I had a call from a chap at the Public Archives. He wanted a sample medal for their collection; I suggested a meeting after I get the medal. It is possible that we can give a replica of less expensive metal. I will follow up on this. *No action at this time.*

Edward C. Becker
Treasurer

Report of the Finance Committee for 1982

The Finance Committee (FC) met on April 14 and November 1 and the following recommendations were presented to the Governing Board.

1. Recommended changes in fee structure of society.

The FC is extremely concerned about the deficits of the society. The society will lose about \$25-30,000 for 1982 and expects to lose east that amount for 1983. There have been

no increases in revenue since 1979, yet costs have continued to increase each year. To offset these losses, the FC has recommended to the governing board a series of changes to increase revenue and to reduce cost.

2. *1983 budget.*

The treasurer submitted a preliminary 1983 budget for approval. The proposed budget was modified and submitted to the governing board for approval.

3. *ESC investment fund.*

The FC strongly recommended that the society maintain an investment fund approximately equal in value to the society's expenditures for one year. At least 20% of this fund be kept in assets available at short notice.

This fund is essential to counterbalance the annual fluctuation of profits and losses caused by raising dues, page charges, and other sources of revenue once every four or five years. The fund also allows the society to support undertakings requiring advance funding where the revenue is recovered over long periods of time; to subsidize undertakings of the society of concern to the entomological community; to generate revenue to continue current relatively low membership fees; and to allow the society freedom from outside agencies, particularly government.

4. *Use of word processors for large manuscripts.*

It was recommended that a notice be inserted in the Bulletin and on the cover of the Journal requesting authors of long manuscripts typed on word processing equipment and submitted to the journal or the Memoirs notify the Managing Editor of the type of equipment used. If the disc used is compatible to the press computer, the author is requested to submit the disc(s) to the Managing Editor following incorporation of all changes and corrections suggested by reviewers. This would save authors considerable time in proof-reading of galley proofs and will reduce printers publication charges to the society.

5. *Memoirs.*

A subcommittee of the FC was appointed to examine the fee structure of the Memoir series to determine if an improved and more flexible system is feasible. This subcommittee is to report by March 1983.

6. *Arctic Arthropods*

This publication is not selling as well as expected. The society should provide additional publicity to increase sales.

7. *Purchase of Computers/Word Processors by business office.*

A subcommittee of the FC was appointed to determine ways in which computers or word processors can be used by the business office. This information will be used to determine if purchase of such equipment by the society is cost effective.

M.M. Campbell (Chairman)
H.V. Danks
R. Harmsen
J.A. McLean
E.G. Munroe
B.J.R. Philogène

Report of the Scientific Editor for 1982

In the 12 month period ending 13 September 1982, 252 manuscripts (4.85/wk) were received, up from 211 (4.04/wk) for an equivalent 1-month period last year. The disposition of these papers was as follows:

12-month period ending

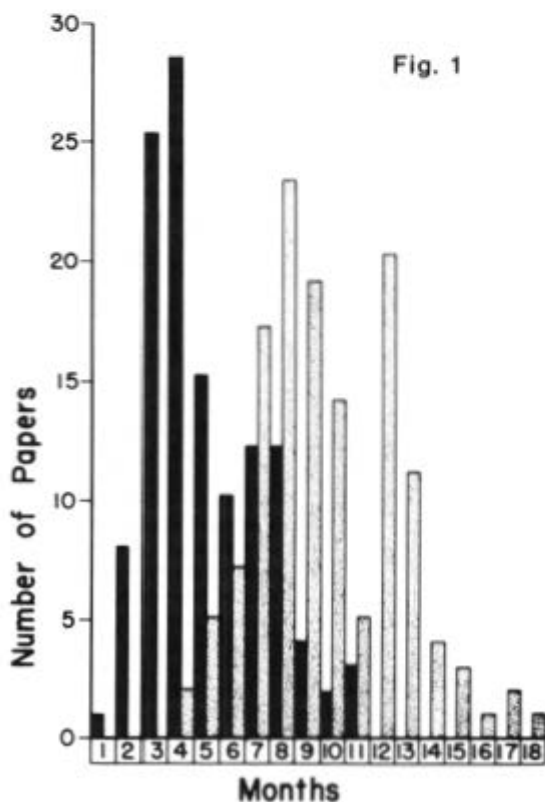
	13 September 1982	8 September 1981
Under review	37	42
Rejected	24	26
Combined with others	2	3
Withdrawn	5	3
To authors for revision	37	29
Accepted	83 (2)*	71 (2)*
Published	51	36
Total	252	210

*papers resubmitted after having been rejected.

Rejection rate

Based on rejections and known withdrawals in the above table, the apparent rejection rate was 9.52% compared with 13.8% last year. Both these figures would be considerably higher if the fate of manuscripts under review or under revision were considered. The lower apparent rejection rate this year may be a result of authors' discretion, because manuscripts seem to have been of higher quality. A truer estimate of 36% can be calculated from the number of papers published in the last 12 issues of the *Can. Ent. + contemporary Memoirs* (134) and the number of manuscripts received about a year earlier (210). The 36% still includes withdrawals and a few that still may come back in revised form.

Time to publication



Based on papers in the October 1981 to September 1982 *Can. Ent.* issues, the average time to publication was 9.34 months (range 4 to 18). This figure is not comparable with the average of 8.7 given last year which was estimated before the final disposition of the 210 manuscripts received last year. The frequency of the times to publication of the 134 papers published in the *Can. Ent.* during this time is bimodal (Fig. 1). The bimodality comes from the curve for time to acceptance (also shown), which is skewed because a proportion of papers was held longer by authors to effect major revision. The months from acceptance to publication describe a symmetrical curve (mean 5.14, median 5, range 2 to 9).

Only one of 12 issues in this sample was not issued during the month it is dated, a decided improvement over the service we have received in the past from the printer. Reasons for these delays between acceptance and publication are redaction which often involves correspondence with authors, delay in returning galley proofs, maintenance of sufficient manuscripts on hand to ensure a uniform flow, and printing time. Translation of summaries does not cause delay because other processes go on simultaneously.

Time in review

This is the chief concern of the Scientific Editor because it is the one process over which he has some control. A sample consisting of the most recent 100 papers accepted or rejected yielded the following:

Months in first review*	0	.5	1	1.5	2	2.5	3	3.5	4	4.5	5
No. of MSS	4	6	14	22	28	10	8	3	4	0	1

*Time from submission to return to author to nearest one-half month. This is not the same as "time to review" in the 1981 report.

Only 8 took longer than 3 months and of these, 6 were rejections, which require much more attention to detail because authors must be convinced rejections are valid. The discrepancy between the mean of 2.1 and the mean time to acceptance of 4.6 is due to authors' delay, which is often considerable.

Size of *Can. Ent.*

In 1981 I was asked to explain why the *Can. Ent.* had become thinner. A reexamination of the evidence leads me to reconsider my explanation. Papers do not arrive at regular intervals, nor do they seem to follow a seasonal arrival pattern. In July and early August we could hardly cope. Since then the flow has dropped substantially. Chance seems to be a major factor. Since the main criterion that decides whether a manuscript will be a *Memoir* or a paper in the *Can. Ent.* is length, it is not reasonable to consider the *Can. Ent.* alone because the scientific material published by the Society is the sum of the two. The usual number of pages published per year since 1977 is about 1950, and has not differed by more than about 150 pages from that, which is less than 8%. I did not examine the average length of papers, but I suspect they are shorter due to stricter editing.

Year	<i>Can. Ent.</i> pages	<i>Memoir</i> pages	Total pages
1982	1173est.	708to date	1881est.
1981	1143	761	1904
1980	1334	462	1796
1979	1423	795	2218
1978	1376	441	1817
1977	1636	444	2080

Quality of papers

The opinion of the readership is the only measure of the quality of the papers published. There is no good way to measure quality directly, but one can examine the proportion of papers that underwent revision before being accepted. There are no old data with which to but in a sample of 100 papers recently published, 49 underwent major revision and 40 minor. In most cases, major revision involves changes that are conditions of acceptance while minor revision does not.

Associate Editors

I acknowledge the excellent work of the Associate Editors, Bruce Heming, Bob Jaques, Robin Leech, Dave McMullen, Jeremy McNeil, Mukul Mukerji, Ian Smith and John Steele. I especially want to emphasize the long and capable service of Les Lyons, who resigned during the year because he is no longer working in entomology and felt out of touch, and Ray Morris, who resigned because of the demands of his new duties as 2nd Vice-President. Both have been highly effective and deserve the full gratitude of the Society.

Conrad Cloutier is not an Associate Editor, but in interpreting and translating abstracts, performs an important editorial function. His work is always thorough and prompt.

Assistant Editor

Contrary to a pessimistic forecast in last year's report, Charlie Miller has remained very much in touch and has given excellent service this year. If anything, he has done more, better. This has been a big help to me. Among other things it has made it possible to accept obviously acceptable and reject obviously unacceptable manuscripts without sending them out, while still satisfying the authors' right to two reviews.

Managing Editor

I thank Margaret McBride for another year of outstanding work. That issues have appeared on time is largely due to the good rapport she has developed with the printer.

Reviewers

I especially thank those people, who anonymously spend many hours studying manuscripts ranging from excellent to awful. I would like to list them all, but suffice it to say they live in all parts of North America and sometimes Europe, Latin America, the Far East and the Antipodes. Many are not members of the E.S.C. The conscientiousness and integrity of these people constantly amazes me. Despite the experiences in other disciplines, I know of no cases where reviewers have attempted to suppress or delay manuscripts to their own advantage or in any way exploited this privileged information. Nearly all see themselves as the ally of the author who is returning a favor done him on his own manuscripts, past or future.

The work load of the Scientific Editor has increased substantially in recent years in order to provide faster service and to enforce higher standards. Also, office space and services have always been available free or at low cost to the Society. Because either situation could change very rapidly, I *strongly recommend* that the Society instruct the Publications Committee, in consultation with the Finance Committee, to study the position of Scientific Editor and devise plans to guide the Society for the next 5 to 10 years in the event that the position cannot be filled by volunteers and that physical facilities and services without cost are no longer available. Such plans should consider the implications for the financial structure of the Society.

I thank you for the privilege of serving you another year. You always have my offer of resignation before you should you find a better appointee at any time. I still believe the dissemination of scientific and technical information the most important task the Society performs.

Respectfully submitted,

D.C. Eidt
Scientific Editor

Publications Committee Annual Report 1982

This Report deals with the period since May 1982 when R.J. Lamb took over from R.P. Bodnaryk as Chairman. At that time there was no outstanding business except four books submitted for review.

Membership

Members of the Publications Committee are:

P. Benoit; C. Cloutier; C. Dondale; T. Galloway (New Appointment); R. Lamb (Chairman).

Editorial Staff — Can. Ent.

Resignations:

L.A. Lyons, Associate Editor (Forest Entomology), and R.F. Morris, Associate Editor (Economic Entomology). New appointments are being considered by the Chairman and Editor.

Publication of Symposia in Can. Ent.

A request has been received from J.A. Downes to publish a Symposium from the forthcoming ESA/ESC as a unit in *Can. Ent.* The Committee agrees in principle with the proposal providing that all papers meet standards enforced by the Scientific Editor. As is the case for other submitted papers, requests for waiving of page charges will be considered on the merits of individual applications.

Waiver of page charges for Can. Ent.

The Chairman, in consultation with the Scientific Editor, has waived page charges for two manuscripts. One application for Page Charge Waiver was rejected since the applicant had not investigated alternative publications.

Book Reviews

In the first two volumes of the Bulletin, 16 Book Reviews and Notices were published. Twelve Reviews and Notices have been submitted and eight are in preparation. The Chairman and C. Dondale locate reviewers and submit the reviews, with C. Dondale processing taxonomic books.

Associate Editor—responsible for French translations.

The Scientific Editor has recommended that Dr. Conrad Cloutier be named as Associate Editor of *Can. Ent.* to recognize the important role he is now playing in translating abstracts into French and ensuring that they are accurate, literate renderings. The Publication Committee fully supports this recommendation and urges the Board to make this appointment.

Promotion of ESC Publications.

T. Galloway was appointed to the Publication Committee in May and given the added responsibility of investigating ways to promote the sales of *Arctic Arthropods*. A preliminary report on his activities is appended. A more detailed report will be submitted for the Board's consideration at the annual meeting. It is evident that Dr. Galloway has invested considerable thought and time to this matter. If further such ESC publications are planned it will be necessary to anticipate the problem of promoting sales and assign promotion duties to a member of ESC on a continuing basis. It is evident from Dr. Galloway's experience that promotion of books will be a demanding job and this fact should be considered as a factor in the decision on whether or not to publish other books.

Printing Costs of the Bulletin.

H. Liu, Editor of the Bulletin recommends that future issues of the Bulletin be type-set rather than produced from camera-ready copy as is presently the case. Her cost estimates indicate that type-setting would be marginally more expensive. However, the print quality of a type-set version would be superior. The most important benefit of type-setting would be reduced labor by the Editor. The Publication Committee strongly endorses the Editor's recommendation that the Bulletin be type-set. It is the view of the Committee that a moderate increase in cost is justified if the heavy work load of the Editor can be reduced.

Responsibilities of the Publications Committee.

At the request of the President, the Committee has considered its present workload and whether the affairs of the Committee might be more effectively conducted by some other form of committee organization. It is the view of the Committee that the present organization is satisfactory. One member of the Committee (C. Dondale) routinely processes a substantial portion of the books submitted for review; the Chairman processes the remainder. One member (T. Galloway) is responsible for developing a promotional program for ESC publication. The remaining members are available to assist with Committee business and advise on policy recommendations. If the Committee's responsibility for promoting ESC publications were expanded, it might become necessary to change the organization of the Committee.

Respectfully submitted,
R.J. Lamb (Chairman)

Report of Bulletin Editor for 1982

I visited the President and the previous Editor in April 1982 to become more acquainted with the policies of the Society regarding the Bulletin and with the duties of the Editor, prior to my assuming this position in June 1982.

I requested that an Assistant Editor be appointed by the President, and this appointment has been made.

I arranged for a new printer of the Bulletin. After investigating several possibilities in Alberta, I decided upon Hignell Printing Ltd. of Winnipeg.

The September 1982 issue was prepared in camera-ready format. The preparation, printing and delivery schedule was longer than anticipated, and was as follows:

15 August	- deadline for submissions
26 August	- camera-ready copy mailed to printer
15 September	- Proof received from printer (after having spent one week in the mail).
16 September	- Proof returned to printer
8 October	- copies sent to Ottawa by printer
14 October	- copies received in Ottawa
29 October	- copies mailed out to membership together with the Canadian Entomologist.

I concur with the President that advertising ESC publications should assume a higher profile in the Bulletin.

Guest Editorials, to commence with the December 1982 issue, have been solicited.

All suggestions for improving the Bulletin are welcome.

Respectfully submitted,

Helen J. Liu,
Editor, Bulletin of the ESC

Report to the Governing Board Re. Joint Meeting

Eight hundred and ninety one papers were submitted prior to the deadline for receipt of titles. Of these 127 were submitted for the President's Prize and these were presented in eight concurrent sessions on Wednesday morning. About 40 late submissions were rejected. This year a relatively large number of papers (54) were presented by Display Presentation.

In addition to submitted papers 28 symposia and formal conferences were scheduled and 41 workshops, conferences and special meetings were held.

F.L. McEwen

Report from the 1983 Annual Meeting Committee

The next Annual Meeting of the Entomological Society of Canada will be held on 3—5 October 1983, at the Sheraton Centre in Regina, Saskatchewan.

The theme will be "Integrated Pest Management", and several guest speakers have agreed to make presentations. The lead-off speaker will be S.B. Vinson of Texas A & M University. Others will address specific aspects of the theme. They include R.J. Whitman and G. Wilson (forestry), J.A. Shemanchuk (veterinary and medical), A.P. Arthur (field crops), R.J. McClanahan (greenhouse), and A.K. Watson (weed control).

It appears that one of our Prairie provinces will be hosting an interesting Annual Meeting.

P.W. Riegert (Chairman)

Science Policy Committee Report for 1982

At its annual meeting, held at the Embassy West Motor Hotel, on April 26 and 27, 1982, the Committee reviewed its projects and procedures, and previous reports requiring action, its contacts with other organizations, and considered new initiatives.

Jeremy McNeil, chairman of a sub-committee that is preparing a brief showing the need in federal government for a continuing entomological research component in relation to natural resources in Canada, submitted a preliminary report illustrating that the federal government's role in conducting entomological research is unlikely to be taken over by any other private organization. The report will be extended to include information illustrating economic importance and role of insects, which data will support the contention that entomological research is vital to the country. A final report will be submitted to the Governing Board in the near future.

Neil Holliday, chairman of a sub-committee to review entomology curricula in Canadian Universities, submitted a first draft of a final report, summarizing information about available programs, and assessing if these are sufficient to meet requirements for continued development of entomology in Canada. A second draft, revised according to advice from the Science Policy Committee, will be submitted to the Governing Board at the annual meetings, with the recommendation that, if approved, a synopsis be published in the Bulletin, and copies of the complete document be made available to those institutions that contributed information.

The Science Policy Committee reviewed results of contacts with the Task Force on Biotechnology (established by MOSST) concerning registration of microbial insecticides, and with the Minister of MOSST, concerning government policy for funding of research and development (R&D). The Chairman was directed to write again to the Task Force, and to the Minister, to secure additional information about points raised, and to reaffirm interest in the topics of concern.

Reports were received from Society representatives (D.E. Bright, and S.B. Hill) to the "umbrella" organizations, Biological Council of Canada (BCC) and SCITEC. The committee was satisfied that the interests of the Society were being served by continuing association with BCC. However, because so much of the effective action of BCC seemed to result from largely personal efforts of the two former presidents, some concern was expressed about the ability of the organization itself to maintain such level of achievement.

SCITEC has undergone some major changes in direction and organization, with a new focus on making science popular, and proposed opening of membership to individuals, with consequent reduction in importance of membership by societies. Consequences of these changes to ESC are as yet unclear, but for the present Science Policy Committee recommends continued support of SCITEC, but with careful scrutiny by the Society's representative.

Matters of organization and operation centered around preservation of records and procedures for dealing with the "Dossier of Important Entomological Subjects in Need of Research in Canada", and "List of Neglected Areas of Research in Entomology" (see ESA Bulletin, 1981, 13(3): 76-77). The Chairman was instructed to have prepared loose leaf binders for the Minutes, Dossier, and List. The Committee decided to accept for inclusion in the Dossier and List any item put forward by a Society member. These will be reviewed annually, and from time to time, on recommendation of the Science Policy Committee, one or more items from the Dossier, with supporting documentation, will be forwarded to the Governing Board, for action. One such item in the Dossier, "Biological Control of Insects Pests and Noxious Weeds", went to the Board as a result of a resolution put forward at the annual meeting, in 1981.

Future initiatives of the Science Policy Committee were considered. If the present projects have reached a satisfactory stage of completion by the time of the annual general meeting, the Science Policy Committee will take action to begin review of microbial insecticides, with a view to preparation of a brief intended to enlighten politicians, the public, and interested government agencies, about value and hazards of such materials.

George E. Ball, (Chairman)

SCITEC Report for 1982

The Association of the Scientific, Engineering and Technological Community of Canada has during the past year been undergoing a difficult metamorphosis to the Association for the Advancement of Science in Canada. (AASC). A new constitution has been drawn up and will be voted on at the Council meeting on November 29, 1982. The new Association will differ from SCITEC in several important ways. It is primarily an individual membership organization that depends for its success on the majority of scientists in Canada becoming members. While Societies may apply for Corporate Membership their representative will have only observer status and may neither vote nor hold office. Membership dues have not yet been set. While one of SCITEC's most effective functions was improving communication between scientists and government, with the formation of the Committee of Parliamentarians, Scientists and Engineers, this communicative function has been dropped from the objectives of AASC. The remaining objectives are to improve communication between the scientists and the public, among scientists of different disciplines and to foster the application of science and technology in the service of the Canadian and world community.

The question that looms over all those who have been associated with SCITEC is "will Canada's scientists join and play an active role in such a society?" If they do not join it will certainly reflect badly on our scientific community. If AASC is to obtain a larger membership than SCITEC it will need an attractive journal. Such a journal is planned but it will have to be much more attractive than its predecessor, Science Forum or the SCITEC Bulletin. In this connection, AASC would do well to examine Quebec Science, which has quickly established itself as a high quality popular scientific periodical.

As one of the previous President's of SCITEC noted: "if AASC fails to become established it won't be long before we will be once again going through the laborious process of trying to establish another National Scientific Association—why not build on the foundation that we already have built?"

I believe that the Entomological Society of Canada should offer moral support to AASC and nominal financial support by becoming a Corporate Member, if the fee structure is acceptable, but more important than this I believe that our Society should actively encourage our members not only to join AASC but to play an active role in solving the problems that AASC aims to address.

Respectfully submitted

Stuart B. Hill

The Biological Council of Canada Representatives Annual Report

During the past year, the BCC/CCB has been concerned with a number of initiatives and has prepared and circulated several Briefs. The highlights of them are mentioned below.

A Brief entitled "Biological Research in Federal Laboratories" was completed, published and circulated to a large number of research laboratories, officials in administrative positions related to government research and other interested parties. The Public Service Commission and the Canadian Agricultural Research Council Advisory Committee have both expressed interest in the report. The Brief discusses the present conditions of biological research in federal laboratories and establishes priorities for future consideration. One item that received considerable comment concerned the dissatisfaction of the BCC toward federal government hiring procedures. These will be dealt with later in this report. Unfortunately, a copy of that report is not at hand and I cannot comment further.

Another Brief that is in final preparation is concerned with the hiring policy for scientists in the federal government, being prepared by Dr. G.B. Wiggins. This report originates from the practice of the federal government of not always advertising research positions widely so that every qualified Canadian has the opportunity to apply. Current procedure is to 1) Search within the federal government; 2) then check files on deposit at the Public Service Commission; 3) then to advertise in whatever means seems appropriate; 4) if all else fails, to hire at the M.Sc. or B.Sc. level and send the incumbent to a graduate school to obtain the Ph.D. degree. Hiring can take place at the conclusion of any step. Advertising widely in journals such as Science or Nature is not a requirement. It is the position of the BCC that to maintain

excellence in science that such advertising should take place for all research positions for which a Ph.D. is a requirement, and that every effort should be made to find the best candidate as opposed to simply a "qualified" candidate. This position paper is now being redrafted in final form and should be finished and ready for distribution early next year.

The president of the BCC, Dr. Ken Davey, pointed out that the BCC could do a great service to Canadian biology by considering in some detail the situation concerning field stations. Items to be considered would be financial support, current needs, types of stations needed (permanent vs. mobile) etc. It was decided to approach the Science Council to seek funding for a project that would gather information about the biological field stations in Canada. The intent of this study would be to identify critical field stations to make them available to biologists and to enlist support from both Federal and Provincial governments. This project will begin as soon as possible.

Some discussion during the Fall meeting of the Council was directed to the problems of NSERC. There appears to be a chronic problem that biology and biologists are woefully under-represented on the National Research Council. This problem seems to originate in the Prime Minister's Office and appears to be unsolvable. Other NSERC items of concern included: making recommendations concerning field station support and should the BCC assist NSERC in preparing a Biology Advisory Committee. NSERC would appreciate guidance in the matter of making priority judgements about the funding of biology, but would not welcome another lobbying committee. This will be considered further in future Council meetings.

Other matters of business at the Fall meeting of Council included a brief discussion of the new "face" of SCITEC, e.g. change itself into an association for the advancement of science with individual memberships; a discussion of the upcoming meeting "Canadian Congress in Biology" to be held 23-29 June 1985 at the University of Western Ontario and sponsored by the BCC.

The officers elected or continuing for 1982/83 were as follows:

President	G.R. Smith Memorial University
Vice-Presidents	G.B. Wiggins Royal Ontario Museum J.R. Nursall University of Alberta
Treasurer	L. Lapierre Université de Moncton
Secretary	M.B. Fenton Carleton University
Member-at-Large	G.M. Faubert MacDonald College
Past President	K.G. Davey York University D.E. Bright Nov. 1982

CNC/IAWPR Representative's Report for 1982

At the last annual meeting of the Canadian National Committee to the International Association for Water Pollution Research (CNC/IAWPR) a merger between it and the Joint Editorial Board, which publishes the Water Pollution Research Journal of Canada was approved. The new organization will be called CNC/IAWPR and will carry out the functions of both founding organizations. Of interest to Canadian entomologists is the creation of a new type of member—individual members—in the new organization.

John F. Flannagan

Public Education Committee Report for 1982

The activities of the P.E.C. have been channelled into 3 areas since last October. They are a) assembly of an annotated directory of Canadian entomologists which would be made available to the Science Writers Assoc. of Canada, b) sponsorship and organization of a symposium, for the joint ESA/ESC/ESO meetings in Toronto, entitled "To Spray or not to Spray: The Debate over Forest Insect Control", and c) responses of the P.E.C. to request for grants from the regional societies, and public relations correspondence.

a) The Chairman of the P.E.C. sent out letters to each of the regional directors (and hence members of the P.E.C.) on October 22/81 requesting that they submit lists of about four to ten entomologists from their societies, who have both research projects and expertise which would be of use or interest to the Science Writers Association of Canada (SWAC), and who felt comfortable working with the media. All regional societies, except Quebec, responded positively within 2 months with several names from each society.

The directory was assembled by the P.E.C. and annotated by the P.E.C. chairman and was made available to ASWAC in April, 1982. As an aside, one of the scientists who agreed to be in the directory suggested that, in return, it might be a good idea for ASWAC to present us with a directory of its members. I thought this was an excellent idea and the P.E.C. followed it up. As of November, 1982, the P.E.C. still awaits the SWAC directory.

b.) In January the Chmn. of the P.E.C. suggested that an open symposium on forestry spraying at the Toronto meetings in 1982 might be timely. Dr. McEwen, 1982 Program Chmn. and Dr. Sears, Publicity Chmn. both agreed provided that the P.E.C. did the organizational work. The outline of this symposium was sent to Dr. S.L. Poe, Chmn. of Section F of the ESA for consideration for inclusion in the program of the Toronto meetings. The symposium was approved for the meeting in July.

c) The P.E.C. has received request for grants from both the E.S. Manitoba and E.S. B.C. for \$200 each to promote public education projects in their respective regions. The P.E.C. recommended both grants be paid by the Treasurer of the E.S.C. The E.S. Manitoba requested additional funds to support its commendably ambitious program. The Interim Meetings of the Governing Board Executive approved extending further funds.

On behalf of the ESC I also wrote a congratulatory letter to Mr. David Schneider of Nepean, Ontario for his remarkable achievement in winning the North American Science Fair Grand Award on *Bacillus thuringiensis* in spruce budworm. I recommended to the Board that the ESC consider paying Mr. Schneider's way to attend at least part of the Toronto meetings this fall. By any measure his was an outstanding achievement. The interim meetings of the executive approved this expenditure. Mr. Schneider will be attending the joint meetings as a guest of the ESC.

Respectfully submitted,

A.D. Tomlin (Chairman)

Scientific Committee of the Biological Survey of Canada (Terrestrial Anthropods) Report for 1982

Committee meetings were held in Ottawa on October 29-30, 1981 and April 22-23, 1982. Details have been published in the Bulletin in December 1981 (Vol. 13(4): 148-150) and June 1982 (Vol. 14(2): 37-39).

An account of the Survey's project on "Aquatic Insects of Freshwater Wetlands" was published in December 1981 (Bulletin 13(4): 151-153) and that on the "Aquatic Insects of Newfoundland" in March (Bulletin 14(1): 7).

The Committee's report on the "Status and Research Needs of Canadian Soil Anthropods" was issued as a Supplement to the March 1982 issue of the Bulletin.

An unsolicited proposal for a review of insect dormancy submitted by the Society on the recommendation of the Committee, had to be withdrawn, because of a change in the status of Dr. Danks from a contract to a full-time Biological Survey staff position within the National Museum of Natural Sciences.

Finally, it should be noted that the Survey has started publishing a Newsletter. Two issues have appeared to date.

G.G.E. Scudder, Chairman
Scientific Committee
Biological Survey of Canada
(Terrestrial Arthropods)

Report of By-Laws, Rules and Regulations Committee for 1982

The By-Laws, Rules and Regulations Committee met to consider the matter of the proposed changes to the Guidelines for the Insect Common Names and Cultures Committee. The Committee made a number of changes to the Guidelines and then sent them to the Chairman, Insect Common Names and Cultures Committee, for approval. The Chairman of that Committee agreed with the changes made by the By-Laws, Rules and Regulations Committee. *The By-Laws, Rules and Regulations Committee recommends that the proposed Guidelines, with the revisions made by the By-Laws, Rules and Regulations Committee, be accepted.*

These changes to the Guidelines for the Insect Common names and Cultures Committee require that the Standing Rules governing the Activities of this committee also be changed. The Standing Rules should read as follows (changes are italicized).

XIII. Common Names

1. The society shall maintain a list of English *and French* common names of insects and related arthropods.
2. The Society recognized the English common names of insects in the latest edition of "*English Common Names of Insects and Related Arthropods of Canada*" prepared and published by the Entomological Society of Canada."

These changes to the Standing Rules requires the approval of the Governing Board and the Members at the Annual General Meeting.

N.D.G. White
G.H. Gerber (Chairman)

Report of the Membership Committee

The documents required for the membership drive have all been prepared and mailed out early in October. Each Canadian member received 2 information sheets and 2 application forms. Each chairman of appropriate life sciences departments at universities in Canada received between 8-15 information sheets and application forms and a poster to advertise the membership drive.

The documents were prepared in both English and French and every effort was made to send the appropriate material to each member or Department. It is hoped that this membership drive will produce new members for the Society. I believe it will if we all go out and promote the membership drive. Think what it would do for the Society if each member could get one additional member.

W.G. Friend (Chairman)

Report of the Fellowship Selection Committee for 1982

Nineteen names were considered by the Committee for Fellowships in the Society. From these candidates, five were selected and ratified by the E.S.C. Executive. They are:

W.J. Turnock
H.V. Danks
A.R. Forbes
C.B. Wiggins
J.A. Shemanchuk

There are now 76 Fellows of the Society. The Committee appreciates the assistance received from the Governing Board and Trustees and the ratification of its selections by the Executive.

B.J.R. Philogène
M.E. MacGillivray
R.A. Brust
W.G. Wellington
A.W. MacPhee
H.F. Madsen (Chairman)

Report of the Nominating Committee 1982

The Committee met November 10, 1981 to select for nomination, two candidates for the office of 2nd Vice President, three for two Directors-at-Large, and three for two members of the Fellowship Selection Committee. Many strong candidates were considered. A final selection was made after careful deliberation. On November 12, letters were sent to the prospective candidates. Letters of consent were received between November 24 and December 16. On December 30, the Nominating Committee met to read the letters and biographical data. The list was submitted to the Secretary and the Editor of the Bulletin for inclusion in the March 1982 Bulletin. Accompanying the list was a notice that additional nominations from the membership must be received by the Secretary before April 30, 1982. No other names were submitted.

The enthusiastic response by candidates reflects the interest by members in participating in Society activities and is a testimonial to the viability of the Society. The members of the Nominating Committee were confident that whoever were elected to the various offices, the interests of the Society would be well served.

Respectfully submitted
R. Brust
G.H. Gerber
S.R. Loschiavo (Chairman)

Report of the Elections Committee for 1982

The Secretary mailed 888 ballots to members. Of these, 404 were received on or before July 15, 1982. On July 19, these ballots were opened and counted and these are the results. For Second Vice-President: S.B. McIver is elected.

For Directors-at-Large: J.M. Campbell and J.A. McLean are elected.

For the Fellowship Selection Committee: J.A. Downes and D.K. McE. Kevan are elected.

On the Honorary Membership ratification vote: M.D. Proverbs and A.G. Robinson were ratified.

On the matter of the By-Laws: The proposed revision was approved by a majority greater than $\frac{2}{3}$ of the total votes cast. One ballot was spoiled.

F.M. Barrett (Chairman)
D. Barnes
D.L. Gibo

Report of the Achievement Awards Committee for 1982

The Achievement Awards Committee received five nominations for the 1982 Gold Medal and four nominations for the C. Gordon Hewitt Award. All nominations, for both awards, were well documented, and the candidates themselves were considered outstanding.

After careful consideration of all nominees, the committee recommended Dr. E.G. Munroe and Dr. S.S. Tobe receive the 1982 Gold Medal and the C. Gordon Hewitt Award, respectively. This action was approved at the mid-term Executive Council Meeting held at Ottawa, Ontario, 27-28 April 1982. An announcement to this effect was published in the June issue of the ESC Bulletin.

Biographical sketches of the two award recipients were prepared and submitted with photographs to the Editor, Dr. Helen J. Liu, on 15 July 1982 for publication in the September 1982 issue of the ESC Bulletin. Similar outlines with photographs were submitted to the Treasurer for preparation of suitable brochures for distribution at the Joint Meeting at Toronto, 29 November—3 December, 1982.

Press releases on both award recipients were prepared and circulated to the Editors of ten scientific publishing organizations and appropriate local news media.

A call for nominations for the 1983 Gold Medal and C. Gordon Hewitt Award was placed in the June issue of ESC Bulletin. One nomination for the 1983 Gold Medal was received on 24 August 1982. This could be an early record, and hopefully an indication of members interest in our Achievement Awards.

Respectfully submitted,

Ray F. Morris (Chairman)

Scholarships Committee Report to the Governing Board 1982

Six applications were received for the 1982 Post-Graduate Scholarships. Unfortunately, one application arrived three weeks after the deadline and was disqualified. The top two candidates were judged as clearly superior to the others, receiving 30 and 27 points out of a possible 35. The others received 23, 16 and 9 points.

The Scholarships Committee recommends that scholarships of \$1000 each be awarded to Martha J. Farkas who was in the Zoology-Entomology program at Macdonald College of McGill University, and Elizabeth Neilsen, in the Department of Biological Sciences, Simon Fraser University.

For 1982 the terms of eligibility, tenure and deadline for application were modified with the intent of increasing the number of applicants and synchronize better the tenure of the scholarship with varying university terms. The first goal was not attained.

Respectfully submitted,

R.D. McMullen (Chairman)

Report of the Employment Committee for 1982

The Employment Committee has compiled and published the fourth edition of a booklet containing the resumes of E.S.C. members in search of employment. A total of 62 resumes (4 BSc, 25 MSc, 33 PhD) were returned of 200 that were distributed. Two hundred and eighty copies were printed of which 180 were sent to employers across Canada and, on request, abroad. The remaining booklets were made available to potential employers at the annual meetings in Toronto.

In Toronto, the Employment Committee in conjunction with the Local Arrangements Committee helped organize the student-employer mixer. The communication between potential employees and employers was promoted through the distribution of 400 questionnaires to employers and students. The returned Position Wanted or Position Available questionnaires were posted at the meetings.

A proposal to conduct a survey of entomological manpower was submitted to the Government of Canada for funding.

We would like to acknowledge the help of all those who have aided the work of the Employment Committee.

D.J. Madder
R.S. MacDonald
S.M. Smith
G.B. Kinoshita

Report of the Heritage Committee for 1982

This committee can once more report that some progress was made in the past year. Submissions of archival material were few but they nevertheless, were significant contributions to our repository in the Public Archives of Canada. Items that were sent to Ottawa were:

1. One photograph of the logo of the "Young Entomologist Group" of the Entomological Society of Manitoba.
2. Three volumes of the Proceedings of the Annual Meetings of the Entomological Society of Saskatchewan (1978-1980).
3. Biographical sketches of the Gold Medal recipients for the years 1971-1977, and 1979-1981; C. Gordon Hewitt Award winners for the years 1975-1977; and 1979-1981.
4. Programs of Annual Meetings of 1977 and 1980.
5. Two volumes of the Proceedings of the Annual Meetings of the Acadian Entomological Society (1979-1981).
6. 119 photographs of the staff, buildings, and work of the Dominion Parasite Laboratory, Belleville, Ontario, and of its successor, the Entomology Research Institute for Biological Control. Also submitted were newspaper clippings, programs, and pamphlets describing these institutions (1929-1971).

Nine large cardboard boxes of records of the Society were shipped to Regina by the former Secretary, Dr. Laing. These are being sorted and evaluated for their archival value. Suitable material will be sent to the Public Archives.

The Committee, enlisting the help of the Regional Directors, attempted to have each member of the Society complete a personal information sheet. This was done to fulfill the Committee's obligation "... to service requests for information ... to prepare information of members ...". Many members of the four western and the Acadian, Entomological Societies have responded but further submissions are required to keep the project viable.

The Committee wishes to thank all those who have made contributions to our archival accessions in the past. Hopefully many more will find, or take time to add to the collection.

Respectfully submitted,
P.W. Riegert (Chairman)

Report: The Costs and Benefits of Controlling Destructive Insects On Onions, Apples and Potatoes in Canada, 1960-1980

The results of the Ontario section of the report on insect losses are dramatic and the cost-benefit figures for insect control in Canada on the crops chosen for the initial study will demonstrate that over the period 1960-1980 insect control on these crops resulted in increased value in excess of a billion dollars. This is hard data, the kind that will benefit us greatly when, as entomologists, we argue for our share of the national research effort.

The three crops, onions, apples and potatoes, are a start and the procedures to evaluate costs and benefits seem pretty good. We should now turn to a second group of crops and I suggest field crops with a rather different geographic impact than the crops chosen for the first part of this study.

I recommend that the Society now moves to the next phase of this study and seek support for a contract to look at costs of destructive insects on wheat, canola, field corn and tobacco.

F.L. McEwen

Report of the Representative to the Committee of Parliamentarians, Scientists and Engineers (COPSE)

The third meeting of COPSE was held in Ottawa on 3 February 1982. Prior to this meeting, the Scientific and Engineering Group had a business meeting. Elected to the Executive Committee were Vivian Abrams (Chairman), and G.L. Bata, C.M. Johnson-Lussenburg, Gilles Perron (members). The executive committee also includes one representative from each of the following organizations: Science Council, SCITEC, Royal Society of Canada, and the Council of Professional Engineers. Fees for membership by professional organizations were discussed but will be given further attention at the executive committee meeting of 14 April 1982. The S & E Group then joined the Parliamentarians for a meeting of COPSE which consisted of a visit to the David Florida Space Laboratory at Shirley Bay and a dinner in the West Block of the Parliament Buildings. At Shirley Bay the visitors were greeted by Dr. B.C. Blevis, Director General, Space Technology and Application. After brief explanatory talks, there was a tour of the Laboratory during which satellite-testing equipment was exhibited. At the dinner, Dr. Colin Franklin, Director General (Space Program), Dept. of Communications, spoke on the Canadian space program. The COPSE meeting was attended by 17 Members of Parliament, 5 Senators, and 49 scientists and engineers.

The fourth meeting of COPSE was held on 9 June 1982. The program began with a discussion of the Scientific Aspects & Implications of Biotechnology, led by Dr. Gordon Kaplan, Vice President (Research), University of Alberta, and Dr. Bertram Shelton, Director of Research and Development, John Labatt Ltd. The presentations by the discussion leaders and comments from participants exposed the opportunities and problems of developing a viable biotechnology industry in Canada. The lack of consistent government policy and of trained manpower were frequently cited. Several Members of Parliament participated in the discussion and, I believe, the resulting exchanges of information and opinion were useful to all attendees. Unfortunately, participation by M.P.s was interrupted by the division bells from the House.

A report of this meeting has not yet been received from the Secretary of COPSE so I do not have a list of attendees. My impression is that the same few interested M.P.'s and Senators attended.

My assessment of COPSE remains unchanged, that this organization provides an excellent forum for the exchange of views and information among the participants. It is well supported by the attendance of scientists and engineers but has not yet attracted many parliamentarians. The hope that it will do so, plus the undoubtedly excellent exchanges that occur among those who do attend, make COPSE a worthwhile organization.

Recommendation: That the ESC continue to send a representative to COPSE meetings and that this representative be appointed by the President from amongst members of ESC, with residents of Ottawa being given primary consideration to minimize costs.

W.J. Turnock

COMMITTEES OF THE ENTOMOLOGICAL SOCIETY OF CANADA Proposed Members for 1982-83

<i>Nominating</i>	G.B. Wiggins (chrmn) W.G. Wellington E.G. Munroe	Toronto Vancouver Ottawa
<i>Fellowship</i>	R.A. Brust (1983) (chrmn) W.G. Wellington (1983) A.W. MacPhee B.J.R. Philogène (1984) J.A. Downes (1985) D.E. McE. Kevan (1985)	Winnipeg Vancouver Kentville Ottawa Ottawa Ste. Anne de Bellevue
<i>Achievement Awards</i>	S.B. McIver	Toronto
<i>Annual Meeting</i>	P.W. Riegert (chrmn) R.H. Storch	Regina Toronto

<i>By-Laws, Rules and Regulations</i>	G.H. Gerber (chrnm) N.D. White D.M. Rosenberg	Winnipeg Winnipeg Winnipeg
<i>Employment</i>	R.S. MacDonald (co-chrmn) D.J. Madder (co-chrmn) G.B. Kinoshita S.M. Smith	Guelph Guelph Toronto Toronto
<i>Finance</i>	J.M. Campbell (chrnm) D. Barnes H.V. Danks R. Harmsen J.R. McLean B.J.D. Philogène	Ottawa Toronto Ottawa Kingston Vancouver Ottawa
<i>Heritage</i>	P.W. Riegert (chrnm) A.M. Harper W.W. Judd	Regina Lethbridge London
<i>Insect Common Names and Cultures</i>	W.Y. Watson E.M. Belton J.S. Kelleher G.B. McNeill P. Benoit A.G. Robinson L.S. Thompson Open (E.S. Ont.)	Waterloo Burnaby Ottawa Indian Head Quebec Winnipeg Charlottetown
<i>Membership</i>	B.D. Frazer (chrnm) J.L. Auclair (S.E. Que.) J. Weintraub (E.S. Alta.) H.F. Madsen (E.S. B.C.) O. Olfert (E. S. Sask.) J.C. Conroy (E.S. Man.) H.B. Specht (Acad. Ent. Soc.) Open (E.S. Ont.)	Vancouver Montreal Lethbridge Summerland Saskatoon Winnipeg Kentville
<i>Public Education</i>	A.D. Tomlin (chrnm) B.D. Frazer (E.S. B.C.) T.D. Galloway (E.S. Man.) P.P. Harper (S.E. Que.) P.W. Riegert (E.S. Sask.) J.S. Shemanchuk (E.S. Alta.) J.D. Shorthouse R.W. Storch (Acad. E.S.) Open (E.S. Ont.)	London Vancouver Winnipeg Montreal Regina Lethbridge Sudbury Orono
<i>Publications</i>	R.J. Lamb P. Benoit C. Cloutier C.D. Donale T.D. Galloway	Winnipeg Quebec Quebec Ottawa Winnipeg
<i>Scholarships</i>	R.D. McMullen (chrnm) C. Gillott (E.S. Sask.) J.P. Bourassa (S.E. Que.) W.A. Charnetski (E.S. Alta.) L. Safranyik (E.S. B.C.) M.M. Chance (E.S. Man.) R.H. Storch (Acad. E.S.)	Summerland Saskatoon Trois-Rivières Lethbridge Victoria Winnipeg Orono

Science Policy

R.F. Morris (chrn)
S.B. McIver (v-chrmn)
D.E. Bright (BCC)
S.B. Hill
N.J. Holliday
A.W. Thomas
A.D. Tomlin (Public Education)

St. John's
Toronto
Ottawa
Ste. Anne de Bellevue
Winnipeg
Fredericton
London

Representatives

Biological Council of Canada

D.E. Bright
R.G.H. Downer
S.B. McIver

Ottawa
Waterloo
Toronto

CALL FOR NOMINATIONS

Nominations for Elections

The Nominating Committee (G.B. Wiggins, Chairman) will prepare a slate of nominations for Second Vice-President, two Directors-at-large and two members of the Fellowship Selection Committee.

Nominations from the membership may be submitted in writing over the signatures of at least three active members of the Society, with a signed statement from the nominee indicating his willingness to accept office if elected. Such nominations shall be submitted to the Secretary, Dr. H.G. Wylie, Research Station, Agriculture Canada, 195 Dafoe Road., Winnipeg, Manitoba, R3T 2M8, not later than 30 April, 1983.

Les nominations pour les postes de 2ème Vice-Président, deux Administrateurs-libres et trois membres du Comité de Sélection des Compagnons devront parvenir au Secrétaire de la Société à l'adresse ci-dessus, sous la signature d'au moins trois membres actifs de la Société, en plus d'une déclaration du candidat exprimant son acceptation d'une telle nomination, et le postes s'il est élu.

Nominations for Fellowships, 1983

The Entomological Society of Canada Fellowship Selection Committee invites nominations for ESC Fellowships. To help the Committee with their selection, please supply as much pertinent information about the nominee as possible, on not more than 4 typed pages. The nomination must be signed by four members of the Entomological Society of Canada.

Please send by March 1 to Reinhart Brust, Chairman, E.S.C. Fellowship Selection Committee, Department of Entomology, University of Manitoba, Winnipeg, Manitoba R3T 2N2.

MISCELLANEA

Retrieved from a Waste-Paper Basket

Cricket balls are red and round,
So make the cricket skip and bound;
Moth balls, however, are six-sided¹
So walks the moth its legs astrided!

So now you know the reason why
Moths mostly will prefer to fly,
Whilst crickets generally are found
Merrily chirping on the ground!

P.G.K.²

¹On account of the benzene rings?

²Post-dated 3rd October, 1992!

Submitted by
D. Keith McE. Kevan
Department of Entomology
Macdonald Campus
of McGill University

RETIREMENT

Robert H. Burrage



Dr. Bob Burrage retired as Head of the Integrated Pest Management Section of the Saskatoon Research Station on 28 July 1982, after 29 years of service with Agriculture Canada. Bob joined the Entomological Section of the Research Station in 1953 and after 1967 served as Head of the Ecology Section, the Entomology Section and more recently of the Integrated Pest Management Section.

Bob took his early schooling in Saskatchewan and British Columbia and after a period of war service with the R.C.A.F. entered the Ontario Agriculture College. He graduated in 1949 in the entomology option and went to earn a PhD degree at Cornwall. His thesis research on the European chafer prepared him for the work he later undertook on wireworms at Saskatoon. His published research and miscellaneous papers cover a wide field of study on the ecology, biology and control of wireworms. More recently he has made substantial contribution to developing IPM strategies for insect pests of oilseed crops.

Bob is a member of the Entomological Societies of Saskatchewan, Canada and America and also of the Saskatchewan Institute of Agrologists and the Agriculture Institute of Canada. He served as a Director of the Entomological Society of Canada and was elected as a Fellow of that Society in 1975.

Bob is a seasoned tennis and badminton player and a keen hunter and fisherman. Along with various community activities, he hopes to have more time now to indulge in these favorite sports. We all wish him well in his future endeavours.

J.F. Doane
Agriculture Canada Research Station
Saskatoon, Saskatchewan

PERSONALIA

The Entomological Society of America has made *A. Grant Robinson*, University of Manitoba, an Honorary Member (1982). Congratulations to this ESC Honorary Member.

Freeman L. McEwen has been appointed Dean of the Ontario Agricultural College, University of Guelph. Freeman is a Past-President of ESC (1979) and has been directly involved in Society affairs for many years. Previously, he served as Chairman of the Department of Environmental Biology, University of Guelph. We send him our best wishes.

S. Cameron Jay, University of Manitoba, is on sabbatical leave in Tauranga, New Zealand, where he is studying honeybee pollination of kiwi fruit. He will be returning to the Northern Hemisphere in May.

Our Past-President, *Glenn B. Wiggins*, Royal Ontario Museum, has been elected a Vice-President of the Biological Council of Canada, for a 2-year term.

The Seychelles, a group of tropical islands off the east coast of Africa, were visited by *Stuart B. Hill* of Macdonald College, McGill University. Stuart participated in a CUSO program to improve the local agricultural management procedures. He collaborated with the insect pathologist, Christopher Lomer, on a Rhinoceros beetle control program using viruses, and refined monitoring techniques for the beetle. During his 3-month stay, he was able also to evaluate various cultural practices which could be used to improve controls for household, garden vegetable, and coconut insect pests.

Israel Ben Ze'ev spent 2 years on a Visiting Fellowship of NSERC at the Agriculture Canada Research Station in Harrow, Ontario, where he collaborated with *R.P. Jacques* on a study of fungal diseases of insects. During his stay, he succeeded in mass-producing fungi of the alfalfa weevil, the first time that this had been accomplished for some of these pathogens. He returned to Israel recently to work in development of microorganisms for industrial use.

Peter E.A. Teal has been appointed Assistant Professor in the Department of Environmental Biology, University of Guelph, Ontario, where he will be responsible for teaching and research in insect physiology and morphology. Peter obtained his Ph.D. degree from the University of Florida.

NEWS OF ORGANIZATIONS

Biological Council of Canada's Gold Medal Award

The B.C.C. is inviting nominations for the Gold Medal Award. The Terms of Reference are as follows:

1. The Biological Council of Canada shall annually consider the award of a gold medal to be known as the 'Gold Medal Award of the Biological Council of Canada'.
2. The medal will normally be awarded to a member of one of the constituent societies of B.C.C. and shall be awarded for outstanding contributions to the advancement of Biology in Canada. The award, however, is not intended solely to recognize outstanding scholarship in one of the sub-disciplines in biology.
3. The medal shall be awarded by Executive decisions on the recommendation of a Standing Committee established by the Executive Board.
4. The award shall be announced by the President at the Spring Meeting of the Council and be presented to the recipient by the President, or Vice-President, at the next Annual Meeting of the recipient's scientific society.
5. The Standing Committee, known as the B.C.C. Medal Committee, shall be appointed by the Executive Board and shall consist of a Vice-President (who will serve as chairman) and three present or former members of Council. Membership on the committee shall be rotated in such a manner that at least one new member is appointed annually and no member may serve more than three years on the committee.

6. The Standing Committee shall solicit nominations for the Gold Medal Award from the Executive Committees of all B.C.C. constituent* societies.
7. A nomination for the award must contain a citation describing the nominee's outstanding contributions to the advancement of Biology in Canada. Supporting documents should include a list of the nominee's publications and an up-to-date curriculum vitae.
8. All nominations for the award must be submitted in writing to the Chairman of the Gold Medal Committee by February 15 of each year. Nominations shall stand for three years, but should be revised annually and shall be renewable. An award may not necessarily be made every year.
9. All nominations and supporting documents shall remain confidential to members of the Medal Committee and the President of B.C.C.

*constituent societies of B.C.C.: Canadian Botanical Association, Canadian Phytopathological Society, Canadian Society of Plant Physiologists, Entomological Society of Canada, Canadian Society of Zoologists, Canadian Committee of University Biology Chairmen, Genetics Society of Canada.

The Western Society of Naturalists

The Western Society of Naturalists may interest some ESC members, especially those who are involved with the marine environment. The Society, founded in 1911, is the second oldest organization of Natural History on the Pacific Coast. Its objectives are the stimulation of general interest in the fields of Biological Science and the provisions of opportunities, through its Annual Meetings and International Symposia, for the presentation and discussion of problems of common interest to the biologist.

About 1800 of the 2100 members are marine scientists. Persons interested in the Society's objectives are eligible for membership upon the recommendation of two active members. Annual dues are \$3.00 for students and \$5.00 for other members. No journal is published, but abstracts of symposia and contributed papers are distributed to those attending the Annual Meetings. Proceedings of the International Symposia, presented during the Summer, have been published by various journals and are available from the Society's Secretary: David H. Montgomery, Department of Biological Sciences, California Polytechnic State University, San Luis Obispo, CA. 93407.

The 1982 Annual Meeting was held at California State University at Los Angeles in December. The 1983 meeting will be at Simon Fraser University, British Columbia, December 17-30. Details of these and other activities are available from the Secretary.

International Commission on Zoological Nomenclature

Reference ITZN 11/4 (A.M. (S.) 123

4 October, 1982

The commission hereby gives six months notice of the possible use of its plenary powers in the following cases, published in the *Bulletin of Zoological Nomenclature*, volume 39, part 3, on 30 September 1982, and would welcome comments and advice on them from interested zoologists. Correspondence should be addressed to the Secretary at the above address, if possible within six months of the date of publication of this notice.

Case No.

- 2384 *Nymphula* Schrank, 1802 (Insecta, Lepidoptera): proposal to designate a type species.
 2296 *Hybosorus illigeri* Reiche, 1853 (Insecta, Coleoptera): proposed conservation by use of the plenary powers.
 2380 *Anthalia* Zetterstedt, 1838 (Insecta, Diptera): request for designation of type species.

Reference: ITZN 59

4 October 1982

The following Opinions and Directions have been published by the International Commission on Zoological Nomenclature in the *Bulletin of Zoological Nomenclature*, volume 39, part 3, on 30 September, 1982:

- 1221 (p. 175) *Baeocera* Erichson, 1845 (Insecta, Coleoptera): designation of type species.
 1222 (p. 178) *Campylostera* Fieber, 1844 (Insecta, Hemiptera): type species designated.
 112 (p. 194) PIERIDAE Duponchel, [1835] (Insecta, Lepidoptera): protected.
 113 (p. 196) MORPHIDAE (Insecta, Lepidoptera): further correction to Official List entry.

The Commission regrets that it cannot supply separates of Opinions.

R.V. Melville (Secretary)
 British Museum (Natural History)
 London SW7 5BD
 England

MEETING ANNOUNCEMENTS

Acadian Entomological Society Annual Meeting on 18-20 April 1983.

CONTACT: G. Boiteau, Secretary, Agriculture Canada Research Station, Fredericton N.B. E3B 4Z7

Entomological Society of Canada Annual Meeting, at the Sheraton Centre, Regina, Saskatchewan, on 3-5 October 1983.

CONTACT: P.W. Riegert, Department of Biology, University of Regina, Regina, Saskatchewan S4S 0A2. Tel. (306) 584-4224

Canadian Federation of Biological Societies Annual Meeting, at the University of Ottawa, on 13-27 June 1983.

CONTACT: G.R.F. Davies, CFBS, P.O. Box, Sub. 6, Saskatoon, Saskatchewan S7N 0W0. Tel. (306) 343-7384.

Joint Meeting *American Mosquito Control Association* and *Florida Anti-Mosquito Association*, at the Contemporary Hotel, Lake Buena Vista, Florida, on 27 February—3 March 1983.

CONTACT: Florida Anti-Mosquito Association, P.O. Box 06005, Fort Myers, FL 33906, U.S.A. Tel. (813) 694-2174

North American Benthological Society Annual Meeting, at the University of Wisconsin, La Crosse, Wisconsin, on 27-29 April 1983.

CONTACT: Albert C. Hendricks, Secretary, Biology Department, Virginia Polytechnic Institute and State University, Blacksburg, VA 24601, U.S.A. Tel. (703) 961-5256

Society for Invertebrate Pathology Annual Meeting, at Ithaca, N.Y., on 7-11 August 1983.

CONTACT: Donald W. Roberts, Insect Pathology Research Centre, Boyce Thompson Institute, Tower Road, Cornell University, Ithaca, NY 14853, U.S.A. Tel. (607) 257-2030

Joint Meeting *American Phytopathological Society*, *Society of Nematologists*, *Mycological Society of America*, at Iowa State University, on 26-30 June 1983.

CONTACT: APS Headquarters, 3340 Pilot Knob Road, St. Paul, MN 55121, U.S.A. Tel. (612) 454-7250.

IV International Symposium on Trichoptera, at Clemson University, South Carolina, on 11-16 July 1983.

CONTACT: J.C. Morse, Department of Entomology, Fisheries and Wildlife, Clemson University, SC 29631, U.S.A.

VIII Beltsville Symposium in Agricultural Research, Agriculture Chemicals of the Future, at Beltsville, Maryland on 16-19 May 1983.

CONTACT: Beltsville, Symposium VIII Office, Room 233, Building 001, BARC-West, USDA, Beltsville, MD 20705. Tel. (301) 334-3029

VII International Symposium of Odonatology, in Calgary, Alberta, on 14-21 August 1983.

CONTACT: Dr. Gordon Pritchard, Department of Biology, University of Calgary, Calgary, Alberta T2N 1N4

VIII *European Ecological Symposium, Plant-Animal Interactions*, at University of Lund, Sweden, on 22-26 August 1983.

CONTACT: III *European Ecological Symposium, Ecology Building*, S-223 62 Lund, Sweden.

An *Interdisciplinary Biological Control Research Conference*, at the Imperial Palace Hotel, Las Vega, on 14-17 February 1983.

CONTACT: Mrs. E. Gabriel, Worldwide Travel, Inc., 2631 E. Broadway, Tucson, AZ 85716, U.S.A. Tel. (800) 528-7171

International Conference on Insect Neurochemistry and Neurophysiology, at College Park, Maryland, on 1-3 August 1983.

CONTACT: ICINN, Insect Reproduction Laboratory, Agricultural Research Center, USDA, Building 306, Beltsville, MD 20705, U.S.A.

XVII *International Congress of Entomology*, in Hamburg, W. Germany, on 20-26 August 1984.

CONTACT: Dr. Thomas Tischler, Zoologisches Institut der Universität, Abt. Angewandte Ökologie Küstenforschung, Biologiezentrum, Olshansenstr. 40/60, D-2300 Kiel 1, W. Germany.

XV *Pacific Science Congress (Conservation, Development and Utilization of the Resources of the Pacific)*, in Dunedin, New Zealand, on 1-11 February 1983.

CONTACT: Secretary-General, Pacific Science Congress, P.O. Box 6063, Dunedin, New Zealand.

III *International Mycological Congress*, in Tokyo, on 28 August - 3 September 1983.

CONTACT: Professor K. Tubaki, Secretary-General, c/o International Congress Service Inc., Chikusen Building SF, 2-7-4 Nikombashi, Chuo-ku, Tokyo, Japan.

IV *International Congress of Plant Pathology*, in Melbourne, on 17-24 August 1983.

CONTACT: Dr. G. Weste, Department of Botany, University of Melbourne, Parkville, Victoria 3052, Australia.

X *International Congress of Plant Protection*, in Brighton, Sussex, U.K., on 20-25 November, 1983.

CONTACT: Mrs. R.A. Bishop, Frank Bishop (Conference Planners) Ltd., 144/150 London Road, Croydon, Surrey CRO 2TD, U.K.

XI *International Congress for Tropical Medicine and Malaria*, in Calgary, Alberta, on 16-22 September 1984.

CONTACT: Secretariat, XI ICTMM, University of Calgary, Calgary, Alberta T2N 1N4.

COURSES

The following courses: *Control of Mosquito-Borne Diseases, Surveillance and Identification of Mosquitoes of Public Health Importance, Epidemiology and Control of Vector-Borne Diseases, Advanced Epidemiology and Control of Vector-Borne Diseases*, will be presented in Atlanta, Georgia, in 1983.

For application forms and further information, please contact: Centers for Disease Control, Attention: Parasitic Diseases Division (C-23), Center for Infectious Diseases, Atlanta, Georgia 30333, U.S.A. Tel. (404) 452-4055.

4th *Parasitic Hymenoptera Training Session*, at University of Maryland, on 6-12 June 1983.

CONTACT: Charles Mitter, Department of Entomology, University of Maryland, College Park, MD 20742, U.S.A.

4th *Training Session in Coccidology*, at University of Maryland, on 13-25 June 1983.

CONTACT: Charles Mitter, Department of Entomology, University of Maryland, College Park, MD 20742, U.S.A.

PUBLICATIONS

Book Reviews

Foelix, Rainer F. 1982. *Biology of spiders*. Harvard University Press, Cambridge, Mass. and London, England. VII + 306 pp. Cloth bound. \$U.S. 30.00.

This is a definitive work on spider biology by an impressive young researcher in sensory physiology. It stands in the same class as earlier books by Savory, Nielsen, Bristowe, Kaestner, and Gertsch, being a translation, with some up-dating, of "Biologie der Spinnen" (R.F. Foelix, 1979, Georg Thieme Verlag, Stuttgart). Foelix himself did the translation.

The book is meant for "anybody interested in biology, especially for those who already find spiders particularly intriguing creatures." It is succinct, highly accurate, and readable; the text is supported by 180 black-and-white photos or drawings of excellent quality.

There are 10 chapters. The introduction is a stimulating taste of what follows on functional anatomy, metabolism, neurobiology, webs, locomotion and prey capture, reproduction, development, ecology, and phylogeny.

Most chapters are beyond criticism, both in coverage and interpretation. Chapters that in my opinion need improving are those dealing with anatomy, where some inappropriate (albeit traditional) terms such as clypeus and maxilla have crept in from insect anatomy and where the pedicel is not recognized as the first opisthosomal segment; ecology, where the information is almost entirely from the fields of behaviour or physiology and leaves untouched many significant population studies of the last decade; and phylogeny. Regarding phylogeny, Foelix is unmoved by Platnick and Gertsch's arguments in favour of Pocock's proposal to divide the spiders into two suborders, Mesothelae (Liphistiida) and Opisthothelae, in sister-group relationship. Instead he adheres to what he regards as the majority position, i.e., three suborders of equal rank (Mesothelae, Orthognatha, Labidognatha), and concludes lamely with H.W. Levi that "spider classification at the present is in chaos."

Foelix uses up-to-date nomenclature, and his spelling errors are few and inadvertent. He gives a wealth of inviting literature titles to pursue. His index covers scientific and common names and the non-nomenclatural topics in an integrated way. The book deserves wide reading.

C.D. Dondale,
Biosystematics Research Institute
Ottawa, Ontario

Furman, D.P. and E. Paul Catts, 1982. *Manual of Medical Entomology*, Fourth Edition. Cambridge University Press. 207 pp.

The fourth edition of this widely used manual is a markedly improved, and practical set of taxonomic keys to the arthropods of medical and veterinary importance. The keys include many more families, genera and species common to North America, than the previous edition. The keys go even beyond the North American fauna. Mosquito genera of the Western Hemisphere and the kissing bug genera of the world are included here.

Nearly all the illustrations have been redrawn, and more than 200 new ones have been added. The illustrations still lack the quality one would like to see in a publication of this type, but the cost of the book would be greatly increased if the quality of the illustrations was up-graded in a substantial way. However, the magnification of each illustration, or a millimeter scale next to the figure is inexpensive, yet extremely important. This would be a worthwhile addition.

The manual is written primarily for university students taking their first or second course in medical entomology. It is useful for medical doctors, entomologists in the field of pest control, and public health workers in various types of occupations. Each chapter ends with a bibliography of current reference works, so the reader can seek further help as needed.

The first obvious change from the third edition is seen in the illustrations. The measurements have gone metric. Other changes include enlarged drawings, and more drawings per page. The figures are easy to follow, even if some are diagrammatic.

The manual has 24 "chapters", 18 of which consist of taxonomic keys to different groups of arthropods. Chapters 1-3 are improved over the third edition, by having bold type to identify techniques, equipment, and structures. The key to arthropod classes is finally where

it belongs, in the chapter on classification. The key to the orders of Arachnida is a useful addition to students and professionals alike. More of the common species of cockroaches have been included in the Blattaria. The authors list 29 species of 55 known from North America.

Except for additional illustrations, the key to Coleoptera has not been changed from the previous edition. Stored product beetles are very common problems for health inspectors and health protection agencies, yet none of the common species of *Tenebrio*, *Tribolium*, *Dermestes*, *Oryzaephilus* or *Cryptolestes* are mentioned. It is important to identify the species of pest causing the problem, in order to prescribe proper treatment. I would have liked to see species keys here.

The key to Hemiptera has been updated, and expanded. Common members of the family Reduviidae and the subfamily Triatominae worldwide can now be identified to species. This has been possible because of a recent revision of the Triatominae by Lent and Wygodzinsky (1979).

The key to Mallophaga has not changed, but the key to Anoplura identifies 15 families and some 20 genera and species. Kim and Ludwig's 1978 revision of the Anoplura was adapted here.

Identification of immature insects is never easy, however this chapter in the manual makes a difficult job relatively easy. Beginning students can now separate out Coleoptera, Hymenoptera, Diptera and Siphonoptera with ease. This will give them the confidence they need to tackle families, genera and species which are dealt with in the same chapter.

The key to Culicidae now includes a key to the genera of Chaoboridae (larvae only). A pupal key for Culicidae has also been added, but I am not convinced of its usefulness. Even if sufficient drawings were present to make definitive judgements, which is not the case, it would only be used by an experienced Culicidologist in my opinion. Two important references are omitted from this chapter: "The Mosquitoes of Canada", Wood, D.M., P.T. Dang and R.A. Ellis, 1979 and "The Mosquitoes of North America", Darsie, R.F. and R.A. Ward, 1981. The latter reference should have been added as a footnote if this manual went to press before Darsie and Ward 1981 was available.

A key to larvae and adults of the genus *Psorophora* has been added, a bonus few Canadians may appreciate. These mosquitoes are found only in the southern regions of Ontario and Quebec (except for 1 specimen of *P. signipennis* which for some strange reason was collected in Regina, Saskatchewan; D.M. Wood, P.T. Dang and R.A. Ellis, 1979, The Mosquitoes of Canada).

The Tabanid key is not very useful for Canadian material, and it is difficult to know if it is very useful for the American Tabanidae. Species keys to common genera would be much more valuable.

Except for mite suborders, the chapters on ticks and mites have not been changed in any significant way. The authors have not included in the references "How to know the mites and ticks" by Burruss and McDaniel, 1979, which includes keys to major groups, families, genera and selected species.

An important addition to the manual, is the improved and expanded key to venomous arthropods. Common families of spiders, scorpions, ants and bees and wasps may be identified.

The chapters on mosquito dissection, pathogen descriptions, rearing and blood meal identification add a great deal of important information to this edition. The figures are very good and the text is easily understood.

Overall, this manual is the best one I have seen for students in medical entomology.

R.A. Brust
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Winnipeg, Manitoba R3T 2N2

Book Notices

Berridge, J.J., J.E. Treherne and V.B. Wigglesworth. (Eds). 1982. *Advances in Insect Physiology*, Vol. 16. Academic Press, London. 368 pp., US\$61.00

This volume contains five review articles titled: Microclimate and the Environmental Physiology of Insects; Control of Food Intake; Biology of Eye Pigmentation in Insects; The

Physiology of Caste Development in Social Insects; Chemoreception: The Significance of Receptor Numbers. As is usual with these volumes the reviews are up to date summaries of research specialties written by respected authorities.

R.J. Lamb
Agriculture Canada
Winnipeg Research Station

Carter, C.I. and N.R. Maslem. 1982. *Conifer Lachnids in Britain*. Forestry Commission Bulletin No. 58. London: Her Majesty's Stationery Office, 75 pp, £3.50.

This is an interesting and well illustrated bulletin dealing with 27 species of aphids of the family Lachnidae known to occur on conifers in Britain. Chapter headings are: the association of conifer lachnids and the host plant, honeydew, glossary of terms used in the life cycle of conifer lachnids, field key to conifer lachnids commonly occurring in Britain, morphological keys, and in the final chapter there is approximately a page for each of the species outlining their present status in Britain.

Most of the species occur elsewhere in Europe and some are found also in Asia, North America, and elsewhere, so the bulletin is of much wider interest than in Britain only. The style is sufficiently technical to be scientifically useful, and also sufficiently non-technical so that it can be used by non-aphidologists.

A.G. Robinson
Department of Entomology
University of Manitoba

Finnamore, Albert T. 1982. *The Sphecoides of Southern Quebec (Hymenoptera)*. Lyman Ent. Mus. and Res. Lab. Mem., No. 11. Published by the Lyman Entomological Museum and Research Laboratory, Macdonald Campus of McGill University, Ste. Anne de Bellevue, Quebec, H9X 1C0. X + 348 pp. Paper bound. \$17.00

Finnamore has drawn together a great deal of information on the 158 species (or subspecies) of sphecoid wasps found to date in the Province of Quebec. The included families are Sphecidae (18 spp.), Pemphredonidae (33 spp.), Astatidae (4 spp.), Larridae (16 spp.), Crabronidae (50 spp.), Mellinidae (1 sp.), Nyssonidae (21 spp.), and Philanthidae (15 spp.). More than 40% of the forms are newly recorded for the Province.

This appears to be an excellent manual of the (mainly) predatory mud daubers, thread-waisted wasps, digger wasps, sand wasps, and related forms. The author has studied all the important collections, and his range maps, which cover most of eastern Canada, reflect this. The classification, synonym, and terminology are largely taken from Bohart and Menke. The line drawings are large and clear.

C.D. Dondale
Biosystematics Research Institute
Ottawa, Ontario

Marshall, A.G. 1981. *The ecology of ectoparasitic insects*. Academic Press. London, U.K. 459 pp. \$90.00 (Cdn.)

The title of the text accurately reflects the subject matter within. The author is to be congratulated on his excellent treatise of the subject. Over 1,000 references have been utilized including all pertinent Canadian references of which I am aware. The literature review extends into 1980.

The text consists of 12 chapters including such headings as: 1) The Ectoparasite's Habitat, 2) Field and Laboratory Methods, 3) Life Cycle, 4) Food and Feeding, 5) Host Location and Dispersal, 6) Population Dynamics, 7) Ectoparasites and Host Health. Each chapter is subdivided into subheadings for easy access to particular topics. The author thoroughly compares each ectoparasitic group under each subject heading. The following groups are discussed: Phthiraptera, Siphonaptera, Hippoboscidae, Nycteribirdae, Streblidae, Cimicidae, Polycetenidae, as well as ectoparasitic Dermoptera, Lepidoptera, and Coleoptera (including Leptinidae and Platypyllidae). A brief and useful synopsis precedes each chapter.

My only negative comments towards the text are its cost \$90.00 Canadian and that although of interest, many groups discussed in detail, i.e. Streblidae, Nycteribridae are tropical and not directly pertinent to Canadian researchers. I would, however, concur with Miriam Rothschild who in her forward described the text as "indispensable" for anyone interested in ectoparasitic insects.

G.A. Surgeoner
Department of Environmental Biology
University of Guelph
Guelph, Ontario

Kimsey, Lynn Siri. 1982. *Systematics of the genus Eufriesea (Hymenoptera, Apidae)*. University of California Publications in Entomology, Vol. 95. U. of California Press, Berkeley, Los Angeles, London. X + 125 pp. Paper bound. \$U.S.11.50

The stated purposes of this book are to review the Neotropical orchid-pollinating bees of the tribe Euglossini, and to revise the included genus *Eufriesea* Cockerell. The tribe contains five genera and about 200 species. *Aglae* and *Exaerete* are "nest parasites" of two of the others, namely, *Eufriesea* and *Eulaema*; *Euglossa* is the largest, with about 100 species.

The genus *Eufriesea* comprises 52 species, which Kimsey arranges in eight species-groups (the eighth containing three that really belong in separate groups owing to possession of unique characters). Species are discussed under the headings Male (if known), Female (if known), Distribution, and Systematics. Biology is summarized in six pages in a separate section and in tables showing (1) plants visited for pollen or nectar and (2) aromatic chemicals collected by the males.

The line drawings and range maps are clear, the literature references and index helpful.

C.D. Dondale
Biosystematics Research Institute
Ottawa, Ontario

Pedgley, D.E. 1982. *Windborne Pests and Diseases*. Ellis Horwood Ltd., Chichester, England. 250 pp. \$U.S.59.95

This book is a fine example of the U.K. tradition for excellent research on windborne organisms. It deals with pests and diseases in general, but draws many examples from the insects. The first chapter describes the effects of "Weather at Take-off." Pedgley then proceeds to "Downwind Drift; Insect Flight Within the Boundary Layer; Insect Flight Above the Boundary Layer; Swarms; Dispersion and Concentration; Forecasting."

The book should be of interest to both insect ecologists and researchers in pest management.

R.J. Lamb
Agriculture Canada
Winnipeg Research Station

Perkins, J.H. 1972. *Insects, Experts and the Insecticide Crisis: The quest for new pest management strategies*. Plenum Press, New York and London. 304 pp. \$U.S.29.50

This is quite a different type of entomological book, not only because it examines the strategies that entomologists in the U.S.A. have adopted to solve the changing problems of the past and present but also because it attempts to fit these strategies into changing socioeconomic situations. Therefore, the major entomological initiatives, particularly the impact of new classes of insecticides on insect control and on farm economics, the "insecticide crisis", and the recent emphasis on "total pest management" (TMP) and "integrated pest management" (IPM) are examined in relation to administrative and political processes, and to the philosophies and loyalties of the entomologists. While the details of the bureaucracy and the personalities will be most relevant to entomologists in the U.S.A., those from other countries will find it useful to search for similarities and differences in their past and current responses to the changing panorama of entomology. The author's experience with the National Science Foundation gives him a firm basis for discussing the bureaucratic processes

and his interviews with 10 prominent entomologists are used to provide some personal insights to the actions and motives of the entomological profession. However, the latter may be the weakest part of the book. Since his sample size was small and biased, it may not adequately represent the views of the many research and extension entomologists who have responded to the pressures and solved the problems of the series of "entomological crisis".

W.J. Turnock
Agriculture Canada
Winnipeg Research Station

Saunders, D.S. 1982. *Insect Clocks*. Second edition. Pergamon Press. Oxford, New York, Toronto, Sydney, Paris and Frankfurt. \$U.S.48.00 soft cover.

In the preface to the second edition, the author indicates that the purpose of this edition was to update and incorporate the significant advances in the field of Insect Chronobiology since the time the first edition was written (1974). The author has added a new chapter on "The Multioscillator Circadian System" and has reorganized the chapter on "The Photoperiodic Clock." Apart from these 2 major changes, the remainder of the book follows the same organization as the first edition. The people working on insect clocks should find this a very worthwhile book.

George H. Gerber
Agriculture Canada
Research Station
Winnipeg, Manitoba

Van den Bosch, Robert, P.S. Messenger and A.P. Gutierrez. 1982. *An Introduction to Biological Control*. Plenum Press, New York and London. 247 pages. \$18.95 hard cover.

This book prepared by Dr. A. Gutierrez is a revision of the 1973 book "Biological Control" by Robert Van den Bosch and P.S. Messenger. Written primarily for undergraduates rather than for professional entomologists, it provides an extensive review of the field of biological control, including its nature, ecological basis, history, procedures, successes, limitations and future possibilities. The book includes new sections on microbial control, life table studies and economics of pest control, and has been updated with some examples from recent biological control programs. In Chapter 9 the list of insect pests that have been substantially or completely controlled by introduced parasites is based on reports up to 1971, so readers seeking more up-to-date analysis of classical biological control should consult the review by Luck (in Handbook of Pest Management in Agriculture, Volume 2, 1980). Each chapter has a list of references and there is a list of scientific and common names of pests and beneficial insects and an index at the end of the book.

H.G. Wylie
Research Station, Agriculture Canada
Winnipeg, Manitoba

New Books and Publications

Advances in Odonatology. Volume 1. Proceedings of the Sixth International Symposium of Odonatology, Chur, 1981. International Odonatological Society, Utrecht, The Netherlands, 1982. Hfl. 95.00

Advances in Turfgrass Entomology. H.D. Niemczyk and B.G. Joyner, Eds. H.G. Inc., Piqua, Ohio, 1982. 150 pp.

Biological Control of Plant Pathogens. Second Printing. K.F. Baker and R.J. Cook. American Phytopathological Society, St. Paul, Minnesota. 433 pp. \$U.S. 32.00

Biometeorology in Integrated Pest Management. J.L. Hatfield and I.J. Thomson, Eds. Academic Press, N.Y., 1982. 512 pp. \$U.S. 35.00

Flies of the Nearctic Region, Volume VIII, Part 2, No. 1, Anthomyiidae. G.C.D. Griffiths, E. Schweizerbart'sche Verlagsbuchhandlung (Nägele u. Obermiller), Stuttgart, 1982. 160 pp. \$U.S. 54.60

Forest Pest Management in the People's Republic of China. M.W. McFadden, D.L. Dahlsen, C.W. Berisford, F.B. Knight, and W.W. Metterhouse. Society of American Foresters, Washington, D.C. 1982.

Insect Ultrastructure. Volume 1. R.C. King and H. Akai, Eds. Plenum, N.Y., 1982. 486 pp. \$U.S. 55.00

La Famille des Xiphocentronides (Trichoptera: Annulipalpia). F. Schmid. SEC Mémoire 121, 1982. 127 pages. \$9.50 (membres, \$7.90) port payé.

Manual on Environmental Management for Mosquito Control. WHO Offset Publication No. 66, 1982. WHO Geneva. \$U.S. 13.50.

Plant Protection: an Integrated Interdisciplinary Approach. W.H. Sill, Jr. University of Iowa Press, Ames, 1982.

Population Biology of Tropical Insects. A.M. Young. Plenum, N.Y., 1982. 512 pp. \$U.S. 57.50.

Revision des Trichoptères canadiens. II. Les Glossomatidae et Philopotamidae (Annulipalpia). F. Schmid. SEC Mémoire 122, 1982. 78 pages. \$6.50 (\$4.80 membres) port payé.

Social Insects, Volume 4. H.R. Hermann, Ed. Academic Press., N.Y., 1982. 416 pp. \$U.S. 52.00

The American Cockroach. W.J. Bell and K.G. Adiyodi, Eds. Chapman and Hall, London, 1982. 529 pp.

Use of Aircraft for Mosquito Control. American Mosquito Control Association Bulletin No. 1, Airspray. N.B. Akesson and W.E. Yates. AMCA, Fresno, California. 108 pp. \$U.S. 10.00

Update on Publications

The following ESC Memoirs are now available:

No. 119.: *A revision of the genus Lordithon Thomson of North and Central America (Coleoptera: Staphylinidae)*. J.M. Campbell, 116 pages. Price: \$8.50 (members, \$6.40) postpaid.

No. 120: *Revision of the subfamily Xantholininae of America north of Mexico (Coleoptera: Staphylinidae)*. A. Smetana, 394 pages. Price: \$26.00 (members, \$19.00) postpaid.

No. 121: *La famille Xiphocentronides (Trichoptera: Annulipalpia)*. F. Schmid, 127: pages. Prix \$9.50 (membres, \$7.90) port payé.

No. 122: *Revision des Trichoptères canadiens. II. Les Glossosomatidae et Philopotamidae (Annulipalpia)*. F. Schmid, 78 pages. Prix: \$6.50 (membres, \$4.80) port payé.

Also available:

Arctic arthropods. A review of systematics and ecology with particular reference to the North American fauna. H.V. Danks. Hard covers, 608 pages. Price: \$37.00 (members, \$26.50) postpaid.

Bibliography of the arctic arthropods of the nearctic region. Compiled by H.V. Danks. 125 pages. Price: \$6.00 (members, \$4.50) postpaid.

The following ESC Memoir is in press:

A catalogue of the eggs of some Canadian Geometridae (Lepidoptera), with comments. E.H. Salkeld.

An annotated Bibliography of Musca Domestica Linnaeus by Dr. Luther S. West until recently was being offered by publisher Dawsons of Pall Mall, England at \$U.S.82.00. The Northern Michigan University Press, which cooperated with Dawsons in publication of the monumental work in 1973, has purchased the 90 copies remaining in stock from Dawsons which is ending publishing after 173 years in business. The NMU Press is now offering *Musca Domestica* at \$U.S.38.95. The 743-page book is an unusually comprehensive achievement, representing over 25 years of continuous labor on the part of Dr. West, long recognized as a world authority on the literature. The volume lists 5,800 complete references, in addition to some 2,000 joint author entries. (Canadian orders please add \$U.S.2.25 postage-handling; USA, \$1.55. All orders add \$1.60 Mich. Sales Tax. NMU Press, Marquette, MI 49855).

ARTICLE

Research in Biological Control at the University of British Columbia

by

Judy Myers*

Introduced insects make fascinating subjects for ecological studies. The study of biological control agents allows us to investigate the population dynamics of introduced insects, as well as their impacts on unwanted hosts. Major projects on biological control are in progress in the Plant Science Department and the Institute of Animal Resource Ecology at U.B.C. The aim of these studies is to evaluate the effect of insects on knapweed and to predict what will happen in the future. We are also studying an old and mostly successful biological control program - the control of goat weed or St. John's Wort by two *Chrysolina* beetles, *hyperice* and *quadrigemina*. In the early 1950's, St. John's Wort was considered to be a threat to grazing land in the Okanagan. But the beetles have now limited the distribution of the weed to small patches. In the east Kootenay, however, large patches of St. John's Wort still exist, even though beetles are common. We are testing the hypotheses about soil quality, plant and insect phenology and winter beetle mortality, as possible explanations for the lack of success of biological control in these areas. This work is being carried out by post-doctoral fellow, Kathy Williams and graduate student, Linda Edwards.

Another classical biological control study, in a new situation, is that of the winter moth, *Operophtera brumata*, on Vancouver Island. Studies of the winter moth in England and Nova Scotia have been used by Mike Hassell of Imperial College, London, to develop computer simulation models. These models need to be tested with information from a new area, and this is the aim of the doctoral research of Jens Roland. Details of parasitism and moth population dynamics will be studied in two rather different situations—apple orchards and oak trees. We hope, in addition, to do some comparative work on the winter moth on Vancouver Island and in Nova Scotia.

While biological control is a popular solution to both weed and insect pest problems, we find there is little understanding of the principles of biological control by farmers, ranchers, rangeland managers and agriculturalists. This summer, two release sites for biological control agents of knapweed were almost eliminated or seriously damaged by herbicide spraying. In one area near Westwood, knapweed density, in terms of the number of seed heads, had declined to about 20% of its original density since the introduction of a seed feeding moth, *Metzneria paucipunctella*. But very few moths survived the spraying program. In a second site, near to the White Lake Observatory, it was judged that preservation of several hundred square meters of diffuse knapweed was sufficient to protect *Sphenoptera jugoslavica* as a biological control agent. This decision did not consider that to be effective, biological control agents must have food plants available for the populations to increase in number and spread to other infested sites.

The scientific aspects of biological control are exciting. The practicality of biological control can be discouraging. Biological control can be slow and it's not always successful, but if successful it is cheap and permanent. A fact of life is that chemicals provide expensive and temporary weed control. Until people in British Columbia become more sympathetic to biological control and give it priority when making decisions about spray programs, for this province both biological and chemical control will be expensive. For biological control, the largest cost occurs with the screening and introduction of agents. If releases continue to be eliminated by spraying, burning, cutting and bull-doing, any value of these releases will be very shortlived.

*Institute of Animal Resources Ecology, University of British Columbia, Vancouver, B.C. V6T 2W5

POSITIONS AVAILABLE

University Positions

The Department of Plant Science, University of British Columbia invites applications for a tenure-track position in *applied entomology/toxicology*. The position may be filled at the Assistant or Associate Professor rank. Duties include teaching a senior undergraduate level course in pesticide toxicology and use, and participating in the teaching of integrated pest management. The successful candidate will be expected to develop a research program and supervise graduate students in some related aspect of insect physiology. PhD. required; post-doctoral and teaching experience desirable. Salary negotiable. The position is to be filled by June 1, 1983. Candidates should send curriculum vitae, reprints and the names and addresses of three references to Dr. V.C. Runeckles, Head, Department of Plant Science, University of British Columbia, Vancouver, B.C. V6T 2A2.

The notice is directed to Canadian citizens and permanent residents.

Assistant/Associate Professor of Livestock Entomology. The Department of Entomology at the University of Maryland invites applicants for a tenure-track position available 1 July 1983. Incumbent will develop basic research programs to support livestock and poultry IPM, and will serve as Extension resource for agents, and producers of livestock and poultry. Candidates should possess the Ph.D. in entomology or a related field, and should document training or experience with insects affecting man and animals. Candidate should forward letter of application, curriculum vitae, and names and addresses of three references to Dr. F. E. Wood, Department of Entomology, University of Maryland, College Park, Md. 20742.

Opportunities for Retired Entomologists in International Development

CESO (Canadian Executive Service Overseas) was founded in 1967 by a group of Canadian businessmen to enable recently retired professionals to visit developing countries to help them strengthen their industrial and economic base. In addition to this "Overseas Program", in 1969 the "Canadian Native Program" was added, and in 1979 the "Trade Development Program". The Head office is in Montreal and there are offices in nine other Canadian cities. Funding (\$3.5 million in 1972) is obtained from the Canadian International Development Agency, the Department of Indian Affairs and Northern Development, and from non-governmental sources.

CESO presently has a roster of over 3,000 volunteer consultants, including entomologists. Over 3,000 projects have been completed overseas and 3,000 in the Native Program. Currently there are 416 and 684 active projects in these two programs respectively. Volunteers are required to have professional or technical skills, experience, and be in good health. Proposals for overseas projects originate with clients, who may be governments, institutions and private enterprises (but not multinational corporations or companies with access to commercial consultants). Most overseas projects last three months, although some may take six months. CESO provides an economy class air fare to and from the project site for the volunteer, and for a spouse if the project lasts longer than two months. The client provides local transportation, accommodation, food, office facilities and services. CESO provides a small allowance for incidental expenses, but no salary. Once the volunteer is selected a contract is entered into between CESO and the client. CESO provides the volunteer with a brief orientation concerning the socio-economic and political conditions in the host country.

Interested retired entomologists should write for a Personal Information Form and additional information from CESO, Public Relations, Suite 200, 1867 Yonge Street, Toronto, Ontario. M4S 1Y5 - (416) 485-5490.

Graduate Research Assistantships

Lab and field research on the *ecology and/or taxonomy of black flies* in montane environments leading to M.Sc. degree. Interest in aquatic biology desirable. Available July 1, 1983. U.S.\$6,260/yr. plus tuition waiver. Admission to Graduate School required. Send CV, GRE scores, transcripts and 2 letters of recommendation to Dr. J.F. Burger, Dept. Entomology, Nesmith Hall, Univ. of New Hampshire, Durham, NH 03824.

Research toward M.Sc. degree in area of *apple insect pest management*. Available July 1, 1983. U.S.\$6,260/yr. plus tuition waiver. Admission to Graduate School required. Send C.V., GRE's, transcripts and 2 letters of reference to: Dr. Paul C. Johnson, Dept. Entomology, Univ. of New Hampshire, Durham, NH 03824.

OBITUARIES

John James Reid McLintock 1912-1982



John McLintock, a greatly respected entomological colleague, died on 14 October 1982 at Victoria, British Columbia. John had served Agriculture Canada from 1948 until his retirement in 1977. He received his B.Sc. in 1939 from the University of Manitoba, and his Ph.D. in 1951 from McGill University. His first job after receiving his B.Sc. was as an agricultural assistant for a few months at the Brandon Laboratory of Agriculture Canada. He then worked for the city of Winnipeg as Field Manager for mosquito control for three years, followed by six years as an entomologist with the Manitoba Department of Health.

At Lethbridge, where he began his permanent career with Agriculture Canada in 1948, he worked on insect pests of livestock, and particularly on horn flies. In the early 1950's he transferred to the Veterinary-Medical Unit of the Entomology Division in Ottawa to work on mosquitoes. In 1965 he transferred back to the west to Saskatoon where he attacked the problem of western equine encephalitis, a serious virus disease of horses and humans that is transmitted by mosquitoes. He made substantial contributions in the understanding of outbreaks of this disease, the alternate hosts of the virus and the role and biology of vector mosquitoes. In this work he cooperated closely with colleagues in the Department of Biology and the Western College of Veterinary Medicine of the University of Saskatchewan. In the midst of these studies at Saskatoon, John found time also to work as a medical entomologist with the World Health Organization in Iran for two years.

John served on a variety of committees of the Entomological Society of Canada, and was elected President of the Society in 1973. He was also a Fellow and an Honorary Member of the Society. He was author of some 34 scientific papers when he retired in 1977 and had an international reputation in his field.

He is survived by his wife, Marion, son Garvin, daughters Ann, Mary and Sheila, and grandchildren.

L. Burgess
Saskatoon, Saskatchewan

In Memory of Dr. John McLintock

Those who wish to continue the influence Dr. McLintock had on medical and veterinary entomology in Canada are asked to do so by contributing to the POST GRADUATE SCHOLARSHIP FUND, Entomological Society of Canada, 1320 Carling Avenue, Ottawa, Canada K1Z 7K9. Please indicate that the contribution is in memory of Dr. J. McLintock, and the next-of-kin will be informed of the donations received.

Robert Herbert Carcasson 1918-1982

Bob Carcasson, former Curator of Entomology at the B.C. Provincial Museum, died on September 28, 1982 in Victoria. He had been suffering from cancer for several years.

Bob's interest in natural history began at an early age, and in his teens he became a friend and collaborator to Roger Verity, the author of the classical work on Italian butterflies. In 1938 he received his diploma in tropical agriculture from the University of Florence, Italy.

During World War II, Bob served in armoured cars and anti-tank artillery in Ethiopia, Somalia, North Africa and Italy. After the war, until 1955, he farmed in Rhodesia.

Under the direction of Louis Leakey, Bob became Senior entomologist in the National Museum of Kenya, at Nairobi, and from 1961 to 1968 he was the director of the museum. During this period he worked on his doctorate, and received the degree in 1968 from the University of East Africa for researches into the Sphingidae (Sphinx Moths).

In 1969 he came to Canada and became Chief Curator at the Centennial Museum in Vancouver where he stayed until 1971. Bob was Curator of Entomology at the B.C. Provincial Museum from 1973 to 1979, when he retired.

Bob was an inveterate traveller and in his biological researches visited much of Africa, India, Southeast Asia, Australia, northern South America and the Pacific Islands as well as Europe and North America.

His best-known works are "The Swallowtail Butterflies of East Africa", J.E. Afr. Nat. Hist. Soc., Special Supplement No. 6 (1960), reprinted by Classey, 1975; "A revised catalogue of the African Sphingidae with descriptions of the East African species", J.E. Afr. Nat. Hist. Soc. 26:1-148 (1968), reprinted by Classey, 1976; "A field guide to coral reef fishes of the Indian and west Pacific Oceans", Collins, London (1977) and "A handguide to the butterflies of Africa", Collins, London (1981). Many of his publications are illustrated with his own exquisite colour paintings.

Active until his death, Bob was preparing "A synonymic catalogue of the African butterflies" and the Sphingidae section of "The Checklist and Atlas of the Neotropical Lepidoptera".

R.A. Cannings
British Columbia Provincial Museum

RECENT DEATHS

Maurice T. James. On 15 April, 1982. Age 76. Professor at Washington State University. Former member ESC.

George Hammond. Spring of 1981. Formerly of Marmora, Ontario, with Agriculture Canada. Worked on apple insects and June beetles.

John J.R. McLintock. On 14 October 1982 in Victoria, British Columbia. Honorary Member, Past-President and Fellow of ESC, member ESO. Worked on mosquitoes in Agriculture Canada at Ottawa and Saskatoon. (See Obituary in this issue).

EDITOR'S REMARKS

This issue of the Bulletin begins with our first Guest Editorial, a request to all of us to conserve our entomological heritage in Canada. The report of the President, Glenn B. Wiggins, starts the series of reports and articles arising from the Annual Meeting held recently in Toronto. In particular, I would like to draw your attention to the address of the Gold Medallist, Eugene Munroe, which I am happy to print in its entirety. The Actions of the Governing Board and Minutes of the Annual General Meeting will be included in the March issue.

The printers, Hignell Printing Ltd., Winnipeg, have produced this issue by phototypesetting, rather than by working from camera-ready copy. This change has eliminated the need to re-type manuscripts, and has made it possible for the Editor to work less with scissors, tape and glue, and more with aspects of entomology. Any comments and suggestions regarding the new process are welcome.

In future issues we may look forward to articles on topics of immediate concern to professionals and students, for example, hiring in the Federal service, and to Guest Editorials embracing various aspects of insect studies and their application, such as evolution, pheromones, pesticide registration.

H.J. Liu
Alberta Environmental Centre
Vegreville, Alberta

REMARQUES DU REDACTEUR

Ce numéro du Bulletin a, pour commencer, notre premier éditorial invité, a nous tous de conserver notre héritage entomologique au Canada. Le rapport du président, Glenn B. Wiggins, entame la série des rapports et des articles survenants de la réunion annuelle de fraîche date au Toronto. En particulier, j'aimerais diriger votre attention vers le discours du titulaire d'une médaille d'or, Eugene Munro, qu'on a fait imprimer ici. Le numéro publié au mois de mars comprendra les actions du conseil d'administration et les procès-verbaux de la réunion annuelle.

Les imprimeurs, Hignell Printing Ltd., Winnipeg, ont produit ce numéro par la photocomposition au lieu de travailler avec une "appareil-pret" copie. Ainsi on a éliminé le besoin de taper des manuscrits deux fois à la machine et le rédacteur peut s'occuper plus souvent de l'entomologie et peut travailler à coups de ciseaux moins souvent. On invite tous commentaires et toutes suggestions qui se rattachent à ce nouveau processus.

À l'avenir on attend des articles qui se rapportent premièrement aux professoiraux et aux étudiants - par exemple, l'engagement au service fédéral - et aux éditoriaux invités comprenant des divers aspects des études des insectes et leurs applications, telles que l'évolution, phéromones et l'enregistrement des pesticides.

H.J. Liu
Alberta Environmental Centre
Vegreville, Alberta