

# Metaleptea

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## THE CLASSIFICATION OF THE "GRYLLACRIDIDAE"

by Theodore H. Hubbell

The Pan American Acridological Society is an international scientific organization with members in 16 different countries. Its purpose is to promote collaborative research and control programs in New World Acridology by bringing interested persons into closer association.

The PAAS held its first meeting at San Martin de los Andes, Neuquen, Argentina, in 1976. The Constitution and By-Laws were approved in 1977. The present Governing Board consists of President S. K. Gangwere, of Detroit, Michigan, U.S.A., President-Elect R. A. Ronderos, of La Plata, Argentina, North American Representative J. E. Henry, of Bozeman, Montana, U.S.A., Central American Representative C. Marquez Mayaudon, of Mexico City, Mexico, South American Representative C. S. Carbonell, of Montevideo, Uruguay, Executive Secretary I. J. Cantrall, of Ann Arbor, Michigan, U.S.A., Co-Editors N. Lafuente Indo, of Valparaiso, Chile, and M. Tyrkus, of Detroit, Michigan, U.S.A., and Clerical Secretary, S. C. Hicks of Detroit, Michigan, U.S.A.

The next of the society's triennial meetings is scheduled to be held at Montana State University, Bozeman, Montana, U.S.A., in July of 1979. Subsequent meetings are to alternate between South America and North America.

The publications of the PAAS include a semiannual newsletter entitled Metaleptea and a triennial Proceedings.

PAAS membership is open to all persons, professional or amateur, who have an interest in New World Acridology by virtue of their research, teaching, or other activities. Inquiries may be addressed to Prof. S. K. Gangwere, Department of Biology, Wayne State University, Detroit, Michigan 48202, U.S.A.

When asked to review the current status of the classification of the "Gryllacrididae" I was at first reluctant, for it seemed that there was little to be said except that confusion prevails. But it may be worth while to discuss why this is so, and what needs to be done to establish a reliable phyletic classification of the Ensifera that will include the "gryllacridids."

I said "will include" rather than "of" because the Gryllacrididae (sensu Karny), or Gryllacridoidea, as they are usually ranked nowadays, are not universally accepted as constituting a natural group. There is, in fact, good reason to regard them as a polyphyletic assemblage - a grouping of convenience. The accompanying series of phyletic diagrams (figs. 1-7) illustrates successive attempts to determine relationships within the Saltatoria, beginning with Karny (1921). The first four of these phylogenies were based primarily on wing-venation, and those of Handlirsch (1929-30) and Zeuner (1935) very largely on the venation of fossil forms. In these diagrams the groups assigned by Karny (1931, 1937) to his Gryllacrididae s.l. and related fossil forms are shown in caps.

In Karny's 1921 phylogeny the first fork separates a branch leading to the gryllacridids and gryllids from one giving rise to the tettigoniids and acridids. Except for its treatment of the Tridactylidae and Cylindrachaetidae Handlirsch's scheme essentially anticipated Ander's separation of Caelifera from Ensifera, assigned the Gryllacrididae s.s. to an indeterminate position near the base of the tree, and treated other "gryllacridid" groups as independent families. Zeuner in 1935 placed some of the "gryllacridids" on the same branch as the

Gryllidae and Tettigoniidae and others as offshoots from the line leading to the Acridoidea; he derived both lineages from primitive "stenopelmatooids" that would by Karny have been placed in the Gryllacrididae. In his later (1939) work he elaborated upon but did not essentially change his earlier views.

In 1931 and again in his 1937 Genera Insectorum work Karny put all of what he considered the more primitive Saltatoria into his comprehensive family Gryllacrididae (s.l.) as subfamilies - Lezininae, Stenopelmatinae, Gryllacridinae, Henicinae, Prophalangopsinae, Schizodactylinae, Deinacridinae and Rhaphidophorinae. This sequence indicates his idea of their relative degree of advancement. In a considerable shift from his 1921 concept he derived not merely the gryllids but also the acridids from unspecified "gryllacridid" ancestors (fig. 4). Because of Karny's prestige as the leading student of the group, and the convenience of following a major monographic treatment, his 1937 classification has long remained standard.

Kjell Ander's admirable 1939 study of relationships among the Ensifera was based largely on the results of his investigations of the internal anatomy of numerous species representing nearly all the higher taxa. External characters, excluding wing venation, were also used. From his abundant data he developed what future work is likely to show to be the most satisfactory of the classifications proposed thus far (fig. 5). Its most controversial feature is the early separation of the Ensifera into grylloid and tettigonioid lineages, implying the independent development in the two stocks of tegminal stridulatory apparatus and tibial sound receptors. All the "gryllacridoids" are placed in the Tettigoniioidea, with the Rhaphidophoridae, Schizodactylidae and Gryllacrididae s.s. separate and only distantly related families and the Prophalangopsidae, Stenopelmatidae and

Tettigoniidae more closely allied and constituting the superfamily Tettigoniaemorpha.

Chopard (1949), in a general survey of the Orthoptera, used a classification of the Ensifera (not here diagrammed) in which the "gryllacridids" were treated essentially as Karny had done, but with raised rank; as was proposed by Zeuner, Gryllacrididae became Gryllacridoidea, with Karny's subfamilies raised to families, except for a few that were combined; the Prophalangopsidae became the Prophalangopsoidea. Ragge (1955) presented a phylogeny of the Saltatoria based on wing-venation. In his diagram (fig. 6) he has the Gryllacrididae s.s. coming off the Ensifera stem much before the split between the tettigonioid and gryllid lines; and shows the Schizodactylidae arising from the base of the latter. But in his tabular classification Ragge includes both these families and the wingless Rhaphidophoridae in the Tettigoniioidea, and assigns the Stenopelmatinae to the Gryllacrididae.

Lastly, Blackith & Blackith (1968; fig. 7) performed a computerized taxonomic analysis of the relationships of the orthopteroid insects, using 92 characters classed as present or absent. Most of these were anatomical features not used in conventional taxonomy. The resulting diagram includes some associations that will appear ridiculous to most students of Orthoptera; thus the Saltatoria are broken up, with the Caelifera forming one branch of an early furcation and the other leading to the point where the Dictyoptera (blattids and mantids) separate from the stalk of the Ensifera. The latter, as in Ander's classification, divides into Grylloidea and Tettigoniioidea, with the Gryllacridae (sensu Karny) and Tettigoniidae included in the last-named superfamily. The more bizarre features of this phylogeny are in large part attributable to the fact that character states found in a very few species were taken as representative of whole subfamilies, families and superfamilies. Thus in

the Ensifera the Gryllacridoidea were represented by one gryllacridid and one rhabdiphorid, the Tettigonioida by one species of Saginae, and the Gryllodea by two species of Gryllinae; sometimes only a single specimen was examined. Only 24 of the tabulated 92 characters show differences between these major groups, and of these at least 10 are known to be variable within one or more of them. Inability to rate characters for consistency within groups tends to vitiate any conclusions drawn from their distribution.

Inspection of the accompanying diagrams in the light of the above notes will amply demonstrate the confused state of gryllacridoid taxonomy. What needs to be done to improve the situation?

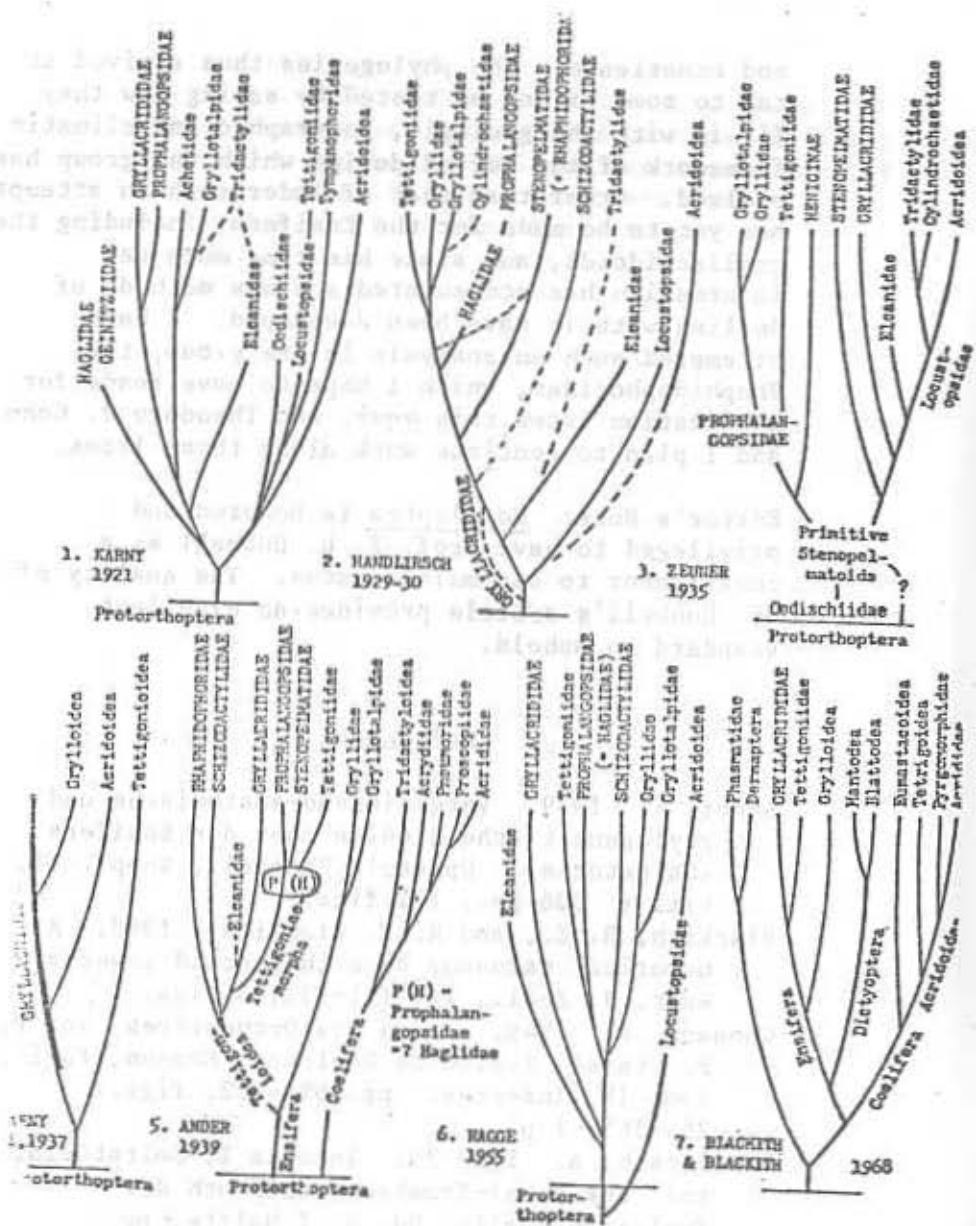
First, I believe that multicharacter analysis is the best means of arriving at an approximation to a true phyletic classification of a group of organisms, in spite of the fact that many pitfalls beset its use, as illustrated in the last of the studies cited above. In theory, if one could be sure that he was dealing with homologous structures and that similarity in detail was the result of common descent, he could arrive at a consistent and accurate phylogeny by taking up one character at a time, in a sequence determined by the extent of the group(s) within which its state is constant. But things are never that simple. There are uncertainties about homologies, about the universality of a character state within a group, about what actually constitutes a character state (fineness of subdivision of differences), and (most subjective of all) what is important and what trivial. No taxonomist of the old school, such as myself, can really persuade himself that all characters should be given equal weight; it goes against all his experience and training. Yet we know that subjective judgement is unreliable and leads to such irreconcilable results as those illustrated in the first six diagrams. One apparent solution is to use as many characters as possible, to determine their states in as many

and experience. The phylogenies thus arrived at can to some extent be tested by seeing how they fit in with the geologic, geographic and climatic framework of the period during which the group has evolved. Other than that of Ander such an attempt has yet to be made for the Ensifera, including the gryllacridoids, and since his time much new information has accumulated and new methods of dealing with it have been developed. I have attempted such an analysis in one group, the Rhabdiphoridae, which I hope to have ready for publication later this year, and Theodore J. Cohn and I plan to continue work along these lines.

Editor's Note: Metaleptea is honored and privileged to have Prof. T. H. Hubbell as a contributor to our maiden issue. The quality of Dr. Hubbell's article provides an excellent standard to uphold.

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#### WHY METALEPTEA ?

When faced with the task of naming the Newsletter, the editors laboriously sought out some aspect of New World Acridology that would be symbolic of the goals of our society. To these ends, the name Metaleptea was chosen from a host of suggestions. One species of the genus Metaleptea is found distributed from Canada southward all the way through Chile, encompassing a major portion of the New World. What better symbolism of the PAAS and its unifying purpose than the animals shared by all New World Acridologists!

#### EDITORIAL NOTE

This first number of Metaleptea is being presented in an English edition. Future numbers will, hopefully, include either an accompanying Spanish text or a separate Spanish Edition.

#### REPORT FROM THE PRESIDENT'S DESK

This is a truly auspicious moment in the

history of PAAS! With the appearance today of this first number of our newsletter, Metaleptea, the society has moved a little closer toward its proclaimed goal of improved communication among New World grasshopper specialists and thereby furthering the discipline Acridology.

The object of any society is to bring together its members. To do so, it has at its disposal two primary vehicles: meetings and publications. Let me address myself briefly to these two. Scientists can be brought together most effectively at formal meetings during which information is exchanged, the possibilities of collaboration explored, and the participants become acquainted with one another and with their respective research activities. Toward this end, the society held the San Martin, Argentina, seminar in December of 1976; it has scheduled the next seminar for Bozeman, U.S.A., during July of 1979; and it already has the succeeding seminar under active consideration. Progress has been made.

However desirable scheduled meetings may be, no international society can rely solely upon them for all exchange. The geographic distance rules out participation by many members who would like to attend but lack the required funding. Hence the importance of the second vehicle mentioned above, publications. Publications are really the "glue" that binds a society together. We now have this "glue" in the form of the San Martin Proceedings (in press) and in our newsletter, Metaleptea. We have made a beginning on which we may now build. The only question is whether we have all the kinds of "glue" that we need.

Our members presently may turn to any number of fine research journals from throughout the world. However, none (with one exception) focuses on grasshoppers; none is devoted to New World grasshoppers; and most are rapidly pricing themselves beyond the financial means of their contributors and subscribers. This suggests there

is a genuine need for a quality New World acridological journal in which publication is sufficiently inexpensive that all can avail themselves of it whatever their personal financial status or that of their institution. Accordingly, I have named a Publications Committee, chaired by Dr. Roger Bland, of Central Michigan University, charged with the responsibility of, among other things, investigating the desirability of instituting a formal PAAS journal. This committee has been instructed to report its findings to the membership at Bozeman.

In my Annual Report of 1977, mailed to the membership on February 2, 1978, I outlined some of the progress PAAS has made since its inception. Many things have happened since then, but I shall let the report stand for purposes of today's Metaleptea column.

Respectfully submitted,  
S. K. Gangwere  
President  
PAAS

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#### REPORT FROM THE EXECUTIVE SECRETARY'S DESK

To date, the activities of the Executive Secretary have been rather minimal compared to what may be expected in the future. Quite frankly, a good deal of what has been accomplished has been through the auspices of the President's Office where secretarial help and mailing facilities exist. It is often easier to do something than to take the time and energy to seek out the services of another person. For this reason, President Gangwere has carried a good share of my duties as well as his own. This situation speaks to the functional need for the active President to be in close proximity to the active Executive Secretary.

Although just what an Executive Secretary does

depends upon who that person is and who the President at the time happens to be, as well as where both of these officers are located, I envision the activities of the former office much as follows:

- To serve as the main contact for day to day activities of the Society.
- To maintain and keep current the membership roster.
- To handle the finances of the Society.
- To conduct the details of balloting.
- To properly distribute the journal of the Society, if one should eventually develop.
- To maintain a record file of the historical course of the Society.

I am certain that in the future other activities will be assigned by the Executive Committee. Eventually the Office of the Executive Secretary will settle down to fulfill its basic function as the center of the Society's activities.

Respectfully submitted,  
Irving J. Cantrall  
Executive Secretary

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#### EDITORIAL COLUMN

After several months of preparation the editorial staff has finally succeeded in distributing this first issue of Metaleptea. Though admittedly a little rough at the edges, it is a start and we shall press on from here. The format of this first number will be generally followed in succeeding issues, with additional items added. In future numbers, other distinguished orthopterists will be contributing feature articles in the tradition begun here by

The editorial staff welcomes all comments, suggestions, and criticisms of newsletter content and policy, as well as all contributions (which will be accepted with open arms).

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#### 1979 MEETING INFORMATION UPDATE

Plans for next year's meeting (July 23 - August 3, 1979, Bozeman, Montana) are progressing satisfactorily. Since little response was received to the announcement sent to members on November 7, 1977, we hope that you will take a few moments to respond to this. Your input will definitely be valuable to the meeting's success, even though you may not as of yet finalized plans to attend. We hope that everyone will make a determined effort to participate because this will be an interesting and informative meeting.

For those who did not receive the last announcement, we will restate some important points. Bozeman, a small town of nearly 25,000 people, is the home of Montana State University which has an enrollment of about 10,000 students. The meetings are to be held on campus with living facilities (rooms and meals) made nominally available for participants and their families. Commercial housing (motels) is available a short distance off campus with prices somewhat higher. Also for those desiring to camp, excellent public (Forest Service) campgrounds are within 20 to 25 km of campus and private campgrounds are within several minutes drive from campus. Bozeman is served by both Northwest Airlines and Frontier Airlines. The weather is expected to be warm (about 27-29°C daytime, down to 13°C nighttime (during the meetings).

Below is a suggested list of symposia and discussion topics. Please select the 4 topics you prefer. The two topics receiving the most votes will be symposia topics and the next two will be

discussion topics. An attempt will be made to have the symposia proceedings published. After these topics are decided by your votes, we will arrange for convenors and chairpersons for organizing these sessions. The final topic selections will be reported in the next issue of Metaleptea along with a call for submitted papers. Provisions will be made for as many open paper sessions as required (papers should be 12 minutes in length).

Also on this sheet please indicate if you desire to participate in the field trips. At this time final transportation arrangements are not firm, but we are attempting to provide government vehicles in which event there will be no transportation costs. Any meal and lodging costs encountered on these field trips will be at the participant's expense. Excursions tentatively planned include: a one-day collecting trip to a montane habitat for high elevation species, a full day at Grasshopper Glacier (a mountainous area where migrating grasshoppers have been frozen for many years in the glacial ice), and an extended 5 - 6 day trip visiting different grasshopper regions, such as the inter-mountain shrub-type of Idaho, the short grass prairie-types of Wyoming and Nebraska, and the grassland-types of the Northern Great Plains Region (also on this trip we will observe on-going grasshopper research programs, possibly visit field stations, one or two other Universities, and observe on-going large-scale grasshopper control programs).

Finally, arrangements are under way for a trip through Yellowstone National Park. The park is noted for geothermal attractions (mainly geysers and thermal mud formations) as well as other spectacular natural attractions. This will be either Saturday or Sunday immediately following the meeting and prior to the extended field trips. Transportation costs, which are expected to be very nominal, will depend on the number of persons taking part in the trip.

Please return these forms at your earliest convenience. Also, we would appreciate any additional ideas or suggestions. Use the reverse side of the ballot sheet for comments and suggestions.

#### MEMBER NEWS AND ACTIVITIES

Irving J. Cantrall, of the University of Michigan, is busy organizing his activities to a full-retirement status. He hopes then to continue research in the short-winged Melanoplina.

William Chapco, University of Regina, is continuing his research into the genetics of grasshoppers, and recently published "Comparison sur la biologie de trois especes de Criquets du genre Ailopus: simulatrix, thalassinus, strepens" (C.R. Acad. Sc. Paris 285:705-8) jointly with S. Fugeau-Braesch.

Theodore J. Cohn, San Diego State University, has completed (with I.J. Cantrall) the Conalcaeni of northwestern Mexico and is in conjunction with T. H. Hubbell about to embark on a major revision of the classification of the Rhaphidophorinae.

Dra. Lucrecia Covelo de Zolessi, Facultad de Humanidades y Ciencias, Montevideo, is continuing to serve as Professor and Director of the Departamento de Artropodos at Montevideo, a post she has held for some years. Her current acridological interests involve the anatomy, ecology, and ethology of the Uruguayan fauna.

S. K. Gangwere, of Wayne State University, is teaching courses in general entomology and insect natural history and, from time to time, is doing a little work for the PAAS. He is also completing the final draft of a textbook in general entomology. He reports this schedule leaves him little time for research. He is looking forward to next year when, upon completion of the book, he will be able to return to his feeding studies on



the orthopteroid insects.

Ashley B. Gurney, Systematic Entomology Laboratory (USDA), attended the 1977 meeting of the ESA. He is awaiting publication in 1978 of an extensive report dealing with the lava-tube Gryllidae of Hawaii and has just recently (along with Frank W. Fisk) completed a review of the cockroaches likely to infest food.

Herbert Knutson, Kansas State University, is currently investigating the physical and phytochemical factors which restrict the acridid Hypochlora alba to Artemisia ludoviciana (Louisiana Sagewort) (no other acridid species can mature when restricted to this plant). In 1977 A. H. Bajoi and he published on this problem: "Effect when restricting an acridid species to a specific plant species" (Acrida 6:219-229).

Dr. Miguel A. Monne, of the Museu Nacional, Rio de Janeiro, informs us that he was able to publish a notice of the foundation of PAAS in the last number of the Revista brasileira de Entomologia. We are glad to learn of this extra publicity and acknowledge his kindness in helping us. Dr. Monne also mentions that Dr. Campos Seabra and he are amassing a collection of Brazilian Acridoidea in collaboration with PAAS members C. Carbonell and M. Descamps. Presently it is comprised of numerous species with especial emphasis in its representation of the tree-dwelling Omattolampinae and Ophthalmolampinae. The collection is temporarily housed at Dr. Seabra's residence but, when ready, will be incorporated into the collection at the Museu Nacional.

Owen Olfert, University of Saskatchewan, is pursuing doctoral study into the assessment of grasshopper feeding on small grain crops in Saskatchewan.

Prof. Luiz Soledade Otero, Universidade Federal do Rio de Janeiro, is engaged in research on the systematics, biology, and ecology of the rich fauna of Neotropical Phaneropterinae.

H. R. Roberts, Academy of Natural Science of Philadelphia, has completed "A revision of the Tribe Leptysmini, except the genus Cylindrotettix (Orthoptera: Acrididae: Leptysmini) (Proc. Acad. Nat. Sci. Phila., 129:33-69). Dr. Roberts recently returned from a mid-winter collecting trip to the Dominican Republic.

Dr. D. C. Rentz recently left the California Academy of Sciences to take a new position in the Division of Entomology, CSIRO, Australia. Accordingly, Dr. Rentz is shifting his systematic investigations to the Australian fauna at the same time as he winds up his vigorous program of general orthopterological studies on the United States fauna.

Hugh Fraser Rowell, University of California, is conducting detailed neurophysiological and behavioral studies of Schistocerca compound eyes and ocelli, in addition to in depth studies into the systematics and ecology of acridids found in neotropical rain forests.

Ernest R. Tinkham, College of the Desert, is continuing his research on Stenopelmatine crickets, Decticine katydids, and other desert orthoptera. He is intimately involved in teaching two unique courses entitled Desert Life and Exploring the Legends of Lost Treasures and Mines. In addition Dr. Tinkham's busy schedule included participation in the first Sand Dune Symposium held at Sacramento, California (1977).

Thomas J. Walker, University of Florida, is studying geographic variation in the life cycles of the cricket genus Gryllus as a part of his ongoing investigation into the systematics of North American and West Indian Gryllidae and Tettigoniidae.

Prof. Sergio Zapata Cerda, who teaches invertebrate zoology at the Departamento de Biología, Universidad de Chile, is continuing with the development of a new collection of Chilean Acridoidea to replace the collection that was

Zapata's current research is mostly with the biology of the grasshopper Moluchacris cinerascens (Ph.) Rehn, but he is continuing with his general work on the acridoids and the phasmids of Chile.

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#### ANNOUNCEMENT

D. Keith McE. Kevan, of McGill University, informs the editors that his "Suprafamilial classification of orthopteroid and related insects, applying the principles of symbolic logic—a draft scheme for discussion and consideration," which he read at the XVth International Congress of Entomology, Washington, D.C., U.S.A., in August, 1976, is still available in limited quantity and may be obtained by writing him at the Department of Entomology. He also notes that the entire symposium of which his paper was a part is available through the Lyman Entomological Museum and Research Laboratory, Macdonald Campus, McGill University, Ste. Anne-de-Bellvue, Quebec, Canada, HOA 1C0. This symposium, entitled "The Higher Classification of the Orthopteroid Insects," and appearing as Memoir 4, includes contributions by V. R. Vickery, D. R. Ragge, N. D. Jago and himself.

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#### Research Requests

Wanted: Live eggs of local Melanoplus sanguinipes populations and reprints or informal observations of genetics of Acridids. Please contact William Chapco, Department of Biology, University of Regina, Regina, Saskatchewan, Canada.

Wanted: Correspondence on and specimens of conalcaeine grasshoppers and camel crickets. Would particularly like to learn of plans of orthopterists for field

work during which they might collect these for us. Will be happy to furnish information on localities, habitats, special collecting techniques and methods of preservation. Please contact Theodore J. Cohn, Department of Zoology, San Diego State University, San Diego, California 92182, USA.

Wanted: Jerusalem crickets of the genus Stenopelmatus and related genera such as Ammopelmatus Tinkham from sand dune areas, desert Acrididae and Decticinae - of rare sorts. Please contact Ernest R. Tinkham, 81-441 Date Palm Avenue, Indio, California, 92201, USA.

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#### Logo Request

A society is judged by and remembered by the image it projects. One way that we can aid granting agencies, other organizations, institutions and prospective members is by creating and circulating an appropriate emblem that can be identified with us. To these ends we invite the artistically inclined among us to try their hand at the design of a suitable logo. In the words of our president, Dr. S. K. Gangwere, "One can visualize, for example, a locust straddling the new world, a grasshopper on a blade of grass, etc. The possibilities are limitless."

The cover of this issue of Metaleptea is adorned with an artistic design submitted by Dr. Daniel Otte.

Designs should be submitted to the Executive Secretary Irving Centrall, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109, U.S.A.

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# 1978 PAAS MEMBERSHIP LIST

Dr. Dr. Claudio Juan Bideu\* \*  
Facultad de Ciencias Exactas y Naturales  
Universidad de Buenos Aires  
Ciudad Universitaria, 1.428 Buzes  
Capital Federal, ARGENTINA

Dr. E. C. Bland\* \*  
Department of Biology  
Central Michigan University  
Mount Pleasant, Michigan 48859

Dr. Merlyn A. Brusven\* \*  
Department of Entomology  
University of Idaho  
Moscow, Idaho 83843

Ing. Roberto Buchuc\* \*  
Escuela Forestal  
Universidad Nacional del Comahue  
San Martin de los Andes  
Neuquen, ARGENTINA

Dr. George N. Suxton \*  
Bureau of Entomology  
Department of Agriculture  
1220 N. Street  
Sacramento, California 95814

Sr. Dr. Miguel Caspodónico\* \*  
INTA  
Rivadavia 1439  
Buenos Aires, ARGENTINA

Dr. Irving J. Centrali\*\*\*\* \*  
Museum of Zoology  
University of Michigan  
Ann Arbor, Michigan 48109

Ing. Carlos S. Carbonell\*\*\*\* \*  
Casilla de Correo 490  
Montevideo, URUGUAY

Dr. Horacio Cardoso\* \*  
Instituto de Investigaciones  
Biologicas "Clemente Estable"  
Avenida Italia 3318, P.O. Box 2363  
Montevideo, URUGUAY

Sr. Dr. Pedro G. Aguilar F. \*  
Departamento de Biología  
Universidad Nacional Agraria  
Apartado 456  
La Molina, Lima  
PERU

Prof. Fariduddin Ahmad\* \*  
Department of Plant Protection  
Jinnah Avenue --- Malir Halt  
Karachi 27, PAKISTAN

Prof. Mohammad Karimuddin Ahmad\* \*  
Department of Plant Protection  
Jinnah Avenue --- Malir Halt  
Karachi 27, PAKISTAN

Ing. Pedro Alcalá Calagua\* \*  
Estación Experimental Agraria de La  
Sierra Central  
Calle Real, 507 El Tambo  
Apartado 411  
Huancayo, PERU

Dr. W. L. Anderson\* \*  
Dept. of Biology  
Montana State University  
Boteman, Montana 59715

Srta. Dna. Mirta Olga Arriaga\* \*  
Facultad de Ciencias Naturales y Museo  
Universidad Nacional de La Plata  
Paseo del Bosque 1.900  
La Plata, ARGENTINA

Dr. A. B. Barnum, Director \*  
Division of Biological Sciences,  
Dixie College  
St. George, Utah 84770

Dr. W. Y. Barr \*  
Department of Entomology  
University of Idaho  
Moscow, Idaho 83843

Sr. Dr. Mauricio Barrera\* \*  
Servicio Nacional de Sanidad Vegetal  
Inspección Regional SEPRA  
Haiti 117-4000  
San Miguel de Tucumán, ARGENTINA

Dr. Francisco Carrasco Z. \*  
Facultad de Agronomía  
Universidad Nacional del Cuzco  
Cuzco, PERU

Prof. Francisco Cerdá \*  
Instituto de Zoología Agrícola  
Facultad de Agronomía, U.C.V.  
Apartado 4,579  
Maracay, Aragua, VENEZUELA

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Dr. William Chapco\* \*  
Department of Biology  
University of Regina  
Regina, Saskatchewan  
CANADA

Dr. Eric L. Charnov\* \*  
Department of Biology  
University of Utah  
Salt Lake City, Utah 84112

Jose Blas Cintron\*\* \*  
Department of Life Sciences  
San Houston State University  
Huntsville, Texas 77340

Dr. Theodore J. Cohn\* \*  
Department of Zoology  
San Diego State University  
San Diego, California 92182

Dr. Stanley Coppock Jr.\* \*  
Extension Entomologist  
Department of Entomology  
Oklahoma State University  
Stillwater, Oklahoma 74074

Sra. Dna. Lucrecia Covelo de Zolassi\* \*  
Departamento de Artrópodos  
Facultad de Humanidades y Ciencias  
Casilla de Correos 1240  
Montevideo, URUGUAY

Dr. Matt E. Dakin\* \*  
Box 4-1435  
University of Southwestern Louisiana  
Lafayette, La. 70504

Dr. H. Descamps\*\*\* \*  
Laboratoire d'Entomologie générale  
et appliquée  
Muséum national d'Histoire naturelle  
45 bis Rue de Buffon  
Paris 75005, FRANCE

Division Director \*  
Division of International Programs  
National Science Foundation  
Washington, D. C. 20550

Ing. Enrique Durón Aviles\* \*  
OIRSA  
Calle a Santa Yecia  
Apartado Postal (01) 61  
San Salvador, EL SALVADOR, C.A.

Anthony Dajnowicz\*\* \*  
Department of Pediatrics  
School of Medicine  
Wayne State University  
3901 Beaubien  
Detroit, Michigan 48201

Mr. Martin A. Erlanson\*\* \*  
Department of Biology  
Rm. 325 W. P. Thompson Bldg.  
University of Saskatchewan  
Saskatoon, Saskatchewan S7N 0W0  
CANADA

Ing. Leopoldo Esquivel\* \*  
Secretaría de Agricultura y Ganadería  
de la Nación  
Paseo Colón 922  
Buenos Aires, ARGENTINA

Dr. Al S. Ewen\* \*  
Research Branch, Agriculture Canada  
107 Science Crescent  
University of Saskatchewan  
Saskatoon, Saskatchewan S7N 0X2  
CANADA

Sr. Dr. Oscar de Ferrariis\* \*  
Museo Regional de Ciencias  
Naturales y Humanas  
Universidad Nacional del Comahue  
Ar. Buenos Aires 1400  
Neuquen, ARGENTINA

Dr. Amilton Ferreira\*  
Departamento de Morfologia Animal  
Faculdade de Filosofia,  
Ciencias e Letras  
Ca. P. 178  
13,500 Rio Claro, S. P.  
BRAZIL

Dr. James J. Friesuf\*  
Department of Biology  
Vanderbilt University  
Nashville, Tennessee 37203

Dr. S. E. Gangwere\*  
Department of Biology  
Wayne State University  
Detroit, Michigan 48202

Sr. Dr. Mario Gentili\*  
Museo Patagónico de Ciencias Naturales  
San Martín de los Andes  
Neuquén, ARGENTINA

Dr. J. S. Gill\*  
ACFP c/o FAO  
Via delle Terme di Caracalla  
Rome 00100  
ITALY

Dr. Cedric Gilloitt\*  
Department of Biology  
University of Saskatchewan  
Saskatoon, Saskatchewan S7N 0W0  
CANADA

Sra. Dna. Margarita de González  
Bibliotecaria  
Instituto Zoológico Agrícola  
Facultad de Agronomía, U.C.V.  
Apartado 4579  
Meracay, Aragua, VENEZUELA

Srta. Dna. Rosa Guerra Muñoz\*  
Facultad de Matemáticas y  
Ciencias Naturales  
Universidad de Chile  
Casilla 130-V  
Valparaíso, CHILE

Dr. A. E. Gurney\*\*\*\*  
Systematic Entomology Laboratory  
USDA c/o U. S. National Museum  
Washington, D. C. 20560

Dr. J. E. Henry\*  
USDA Rangeland Insect Laboratory  
c/o Montana State University  
Bozeman, Montana 59715

Prof. G. S. Hewitt\*  
U. S. D. A., A. E. S.  
Rangeland Insect Laboratory  
Montana State University  
Bozeman, Montana 59715

Dr. John W. Hilliard Jr.\*  
Department of Life Sciences  
San Houston State University  
Huntsville, Texas 77340

Dr. Theodore H. Hubbell\*\*\*  
Museum of Zoology  
University of Michigan  
Ann Arbor, Michigan 48109

Mr. Pal Huber\*\*  
Uri utcs 38  
H-1,014, Budapest  
HUNGARY

Dr. W. D. Jago\*  
Centre for Overseas Pest Research  
College House  
29 Wrights Lane  
London W. 8 5BJ, ENGLAND

Dr. J. W. Kemp\*  
Science Education Department  
University of British Columbia  
Vancouver 8, British Columbia  
CANADA

Dr. Alan Roy McCaffery\*  
Centre for Overseas Pest Research  
College House, 29 Wrights Lane  
London W. 8 5BJ, England

Dr. D. Keith McE. Kevan\*\*\*  
Department of Entomology and  
Lyman Entomological Museum  
Box 268, Macdonald College  
Ste. Anne-de-Bellevue RD0  
P. Q., CANADA H9A 1C0

Dr. Herbert C. Knutson\*  
Department of Entomology  
Kansas State University  
Manhattan, Kansas 66506

Dra. Nelly Lafuente Indo\*  
Facultad de Matemáticas y  
Ciencias Naturales  
Universidad de Chile  
Casilla 130-V  
Valparaíso, CHILE

Dr. R. Lavigne\*  
University of Wyoming  
Box 3354, University Station  
Laramie, Wyoming 82071

Dr. José Liebermann\*\*\*  
José Hernández 2450 64B  
Buenos Aires, ARGENTINA

Mr. C. N. Lietzsu\*  
Department of Biology  
Wayne State University  
Detroit, Michigan 48202

Srta. Sonia Maria Rodriguez Lopes\*  
Museu Nacional  
Universidade Federal do Rio de Janeiro  
Rio de Janeiro, BRAZIL

Srta. Dna. Georgina Cecilia Luna\*  
Facultad de Ciencias Naturales y Museo  
Paseo del Bosque s/n  
La Plata, ARGENTINA

Srta. Dna. Graciela Mareggiani de Sialer\*  
Departamento de Patología Vegetal  
CICA, INTA 1712  
Castelar (Villa Udondo), ARGENTINA

Dr. Carlos Márquez Maysaudon\*  
Instituto de Biología  
Universidad Nacional Autónoma  
Apartado Postal 70 - 233  
México 20, D. F.  
MEXICO

Dr. Alejo Mesa\*  
Faculdade de Filosofia,  
Ciencias e Letras  
Rio Claro 13,500, S. P.  
BRAZIL

Mr. T. P. Monaghan\*\*  
Department of Biology  
Wayne State University  
Detroit, Michigan 48202

Dr. Woodrow W. Middlekuff\*  
Department of Entomology  
University of California  
Berkeley, California 94720

Dr. Miguel A. Monzó\*  
Museu Nacional  
Quinta da Boa Vista  
Rio de Janeiro 20,000  
BRAZIL

Sr. Dr. E. Morales Agacino\*  
Instituto Nacional Investigaciones  
Agronomicas  
Avenida de Puerta de Hierro  
Madrid 3  
SPAIN

Dr. Mukul K. Mukerji\*  
Research Station, Agriculture Canada  
107 Science Crescent  
Saskatoon, Saskatchewan S7N 0X2  
CANADA

Dr. G. B. Mulkern\*  
Department of Entomology  
North Dakota State University  
Fargo, North Dakota 58102

Dr. B. Nagy\*  
Research Institute for Plant  
Protection  
H - 1525 Herman Otto u. 15  
Budapest, HUNGARY

Dr. M. L. Nelson\*  
31161 Old Stage Road  
Birmingham, Michigan 48010

Mr. Owen O. Olffert\*\* e  
Department of Biology  
University of Saskatchewan  
Saskatoon, Saskatchewan S7N 0W0  
CANADA

Dr. J. A. Ossager\* e  
Rangeland Insects Laboratory, A. R. S.  
Montana State University  
Bozeman, Montana 59715

Sr. Dr. Reynaldo Orrego Aravena\* e  
Museo Provincial  
6300 Santa Rosa  
La Tapa, ARGENTINA

Dr. Luiz Soledade Otero\* e  
Av. Sernambetiba 4216, Q. 5, Casa 42  
Barra da Tijuca  
Rio de Janeiro, BRAZIL

Dr. Daniel Otte\* e  
Department of Entomology  
Academy of Natural Sciences  
19th and the Parkway  
Philadelphia, Pennsylvania 19103

Ing. Alfonso S. Paravano\* e  
Laboratorio Fitosanitario  
Ministerio de Agricultura y  
Ganadería  
Santa Fe, ARGENTINA

Dr. R. E. Pfadt\* e  
Entomology, Box 3354  
University of Wyoming  
Laramie, Wyoming 82071

Dr. R. Pickford\* e  
Canada Agricultural Research Station  
Saskatoon, Saskatchewan  
CANADA S7N 0X2

Ing. R. Quintanilla\* e  
Facultad de Agronomía  
Universidad de Buenos Aires  
Buenos Aires, ARGENTINA

Dr. Suresh Kumar Haina\* e  
Research Station, Agriculture Canada  
107 Science Crescent  
Saskatoon, Saskatchewan S7N 0X2  
CANADA

Dr. Robert L. Kendall\* e  
Matador Project  
G. P. Bldg.  
University of Saskatchewan  
Saskatoon, Saskatchewan  
CANADA

N. E. Rees\* e  
USDA Rangeland Insect Laboratory  
c/o Montana State University  
Bozeman, Montana 59715

Dr. D. C. F. Rentz\* e  
Division of Entomology  
CSIRO, Box 1,700  
Canberra, ACT, AUSTRALIA

Dr. P. W. Riegert\* e  
University of Regina  
Regina, Saskatchewan  
S4S 0A2, CANADA

Dr. H. R. Roberts\*\* e  
Academy of Natural Sciences  
19th and the Parkway  
Philadelphia, Pennsylvania 19103

Dr. Ricardo A. Ronderos\* e  
Facultad de Ciencias Naturales y Museo  
Universidad Nacional de La Plata  
Paseo del Bosque 1900  
La Plata, ARGENTINA

Sr. Dr. J. A. Rosas Costa\* e  
José Luis Cantilo 3722  
Buenos Aires 19, ARGENTINA

Dr. Hugh Fraser Rowell\* e  
Department of Zoology  
University of California  
Berkeley, California 94720

Srta. Dna. Norma Elba Sanchez\* e  
Facultad de Ciencias Naturales y Museo  
Paseo del Bosque s/n  
La Plata, ARGENTINA

Ing. Francisco H. Santoro\* e  
Departamento de Patología Vegetal  
CICA, INTA, 1712  
Castelar (Villa Udaondo), ARGENTINA

Dr. K. S. Sastry\* e  
2737 Roundtree Drive  
Troy, Michigan 48064

Janise T. Saucier\* e  
Agriculture Research Station  
107 Science Crescent  
University of Saskatchewan  
Saskatoon, Saskatchewan S7N 0X2  
CANADA

Dr. G. L. Schroeter\* e  
Department of Biology  
Texas A & M University  
College Station, Texas 77843

Dr. G. G. E. Scudder\* e  
Department of Zoology  
University of British Columbia  
Vancouver 8, British Columbia  
CANADA

Dr. Abdellahi Ould M. Sidia\* e  
Organisation Commune de Lutte  
Antiscridienne et de Lutte  
Antivieilles  
B. P. 1,066  
Dakar, SENEGAL

Sherilyn F. Smith\*\* e  
Department of Entomology  
Kansas State University  
Manhattan, Kansas 66506

Sr. Dr. J. Solervicens A.\* e  
Departamento de Biología  
Área de Matemáticas y Ciencias  
Naturales  
Universidad de Chile  
Casilla 130 - V  
Valparaíso, CHILE

Dr. J. D. Spooner\* e  
Aiken Campus  
University of South Carolina  
Aiken, South Carolina 29801

E. S. Thomas\* e  
4503 Winterset Drive  
Columbus, Ohio 43220

Dr. Ernest R. Tinham\* e  
81-441 Date Palm Avenue  
Indio, California 92201

Sr. Dr. S. de Toledo Pizsa\* e  
Escola Superior de Agricultura  
Luiz de Queiroz  
Universidade de São Paulo  
Piracicaba  
São Paulo, BRAZIL

D. W. Tonkyn\*\* e  
Department of Biology  
Princeton University  
Princeton, N.J. 08540

Srta. Dna. Sonia Z. Turk\* e  
Instituto Miguel Lillo  
Miguel Lillo 205-6000  
San Miguel de Tucumán, ARGENTINA

Dr. Michael Tyrkus\* e  
Department of Pediatrics  
School of Medicine  
Wayne State University  
3901 Beaubien  
Detroit, Michigan 48201

Dr. D. N. Ueckert\* e  
Agricultural Research &  
Extension Center  
Texas A. & M. University  
Rt. 1, Box 950  
San Angelo, Texas 76901

Dr. D. Van Horn\* e  
Colorado Springs Center  
Cragmor Road  
Colorado Springs, Colorado

Dr. Anthony Ventre \*  
9409 Dangerfield Road  
Clinton, Maryland 20735

Dr. Vernon R. Vickery\* \*  
Department of Entomology and  
Lyman Entomological Museum  
Ste. Anne-de-Bellvue 800  
P. Q., CANADA H0A 1C0

Sra. Dna. Leonor C. de Villalobos\* \*  
Facultad de Ciencias Naturales y Museo  
Universidad Nacional de La Plata  
Paseo del Bosque 1900  
La Plata, ARGENTINA

Dra. Hilda Elda Virla de Arguello\* \*  
Facultad de Ciencias Exactas,  
Físicas y Naturales  
Universidad Nacional de Córdoba  
Avda. Vélez Sarsfield 299  
5,000 Córdoba, ARGENTINA

Dr. Saralee Viasher\* \*  
Department of Biology  
Montana State University  
Bozeman, Montana 59717

Dr. T. J. Walker\* \*  
Dept. of Entomology  
University of Florida  
Gainesville, Florida 32611

Dr. R. B. Willey\* \*  
Department of Biological Sciences  
University of Illinois at Chicago Circle  
P. O. Box 4348  
Chicago, Illinois 60680

Dr. J. E. Willo \*  
Estación Experimental Agrícola de  
la Molina  
Apartado 2791  
Lima, PERU

Sr. Dr. Enrique Ramón Zamorano Ponce\*\* \*  
Facultad de Matemáticas y Ciencias Naturales  
Universidad de Chile-Sede de Valparaíso  
Cailla 130-V  
Valparaíso, CHILE

Sr. Dr. Sergio Zapata Cerda\* \*  
San Diego 245  
Depto. 205  
Santiago, CHILE

\* Active Member  
\*\* Student Member  
\*\*\* Honorary Member  
\*\*\*\* Emeritus Member

\* Spanish language preference  
\* English language preference

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