AMERICAN ARACHNOLOGY

The Newsletter of the American Arachnological Society

No. 40 November 1989

1990 ANNUAL MEETING IN OTTAWA

The 1990 Annual Meeting of the American Arachnological Society will be held at the Carleton University Conference Centre in Ottawa, Ontario, June 18-23. Ottawa is the capital of Canada and holds many attractions including several National Museums, the National Gallery, Parliament Hill, and enough ethnic restaurants to satisfy any palate. We are planning a full day's outing to sample a large sphagnum bog and other collecting spots, and work is underway on the scientific program. Members who may wish to organize or participate in a symposium should contact the Program Chairman, Dr. Robert Holmberg, Sciences Department, Athabaska University, Athabaska, Alberta TOG 2RO, Canada. Members from the U.S.A. should note the high premium (currently about 22%) in favor of the U.S. dollar in this country. We hope you will attend the meeting, and that you will encourage other arachnologists to come.

Charles Dondale
Biosystematics Research Centre
Research Branch, Agriculture Canada
Ottawa, Ontario K1A 0C6 CANADA

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Society Elections

The ballot included with this newsletter is to provide for the election of a President-Elect and Treasurer. Ballots should be returned by January 31, 1990 to: Robert Wolff, Trinity Christian College; 6601 W. College, Palos Heights, IL 60463

PRESIDENT-ELECT

Allen R. Brady - Professor of Biology, Hope College; Holland, Michigan
Ph.D. Biology, Harvard University, 1964
Has served as Chairman of the Biology Department at Hope and has served AAS as a Director. Recent Publication: 1987. Nearctic species of the wolf spider genus Gladicosa (Araneae: Lycosidae). Psyche 93:285-320.

Norman V. Horner - Professor of Biology and Director of the Division of Science, Midwestern State University; Wichita Falls, Texas
Ph.D. Entomology, Oklahoma State University, 1971
Served from 1981 to 1987 as AAS Treasurer. Recent Publication: 1987. The jumping spiders of the Virginia Peninsula. Ent. News 98:235-245.

TREASURER

Gail E. Stratton - Associate Professor of Biology, Albion College; Albion, Michigan
Ph.D. Biology, University of Cincinnati, 1982
Has served as AAS Treasurer since 1987. Recent Publication: 1987. The inheritance of behavior in Schizocosa wolf spiders. In: 'Evolutionary Genetics of Invertebrate Behavior'. Huettel, M. Ed.; Plenum Press, NY., pp. 63-77.

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Back issues of all numbers (some copies are original and some are photocopies) of **American Arachnology** are available at US$2.00 per copy. Send your request and payment in US currency to the editor of the newsletter: Jim Berry; Department of Biological Sciences; Butler University; Indianapolis, Indiana 46208

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SPIDER COURSE

Fred Coyle and Bill Shear are again offering their course on the **Biology of Spiders** at the Highlands Biological Station in the southern Blue Ridge mountains at Highlands, NC. It will meet July 23 - August 3, 1990. The course will focus on all aspects of the biology of spiders. Lectures and discussions will be held daily in the mornings and/or evenings. Afternoons will be devoted to field work. The main objective of the field work will be the assemblage of a significant collection of the local spider fauna, which is extraordinarily rich. In the field attention will inevitably be drawn to ecology and behavior. Most evenings will be available for students to work on identification. The only prerequisite is General Zoology. Costs will be a course fee of $210 and $25 a week for housing. Three semester hours of credit are available through either Western Caolina University or the University of North Carolina - Chapel Hill. Registration fees are $64.25 at WCU and $50 at UNC-CH. For further information please contact the Highlands Biological Station; P.O. Box 580, Highlands, NC 28741. Phone (704) 526-2602.

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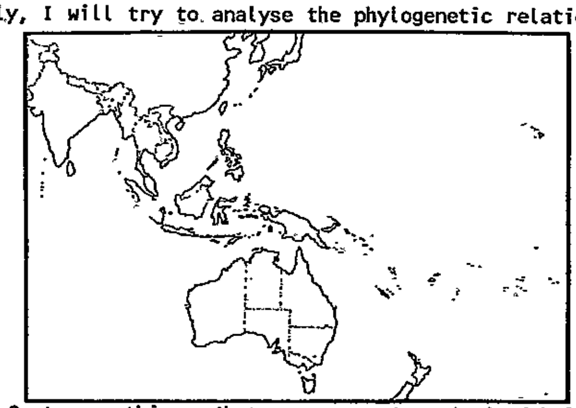
REQUEST FOR GASTERCANTHINE MATERIAL from the West Pacific area

\- Nikolaj Scharff -

I recently started a postdoctoral project on the spiny orb weavers (Araneidae, Gasteracanthinae). The objectives of the project are twofold. First, I will revise the West Pacific (see the map for a delimitation of the area) Gasteracanthines and, secondly, I will try to analyse the phylogenetic relationships



within Gasteracanthinae (between genera) and should in this connection, hopefully, be able to define the spiny orb weavers more precisely and revise and examine the type species of all genera.

The project is carried out in the Zoological Museum in Copenhagen and is estimated to take 3 years. Part of the study will take place at the Smithsonian Institution, Washington (February-July, 1990) and American Museum of Natural History, New York (August, 1990 - February 1991).

I will search for material for the revision in major museum collections, and will be happy if I can borrow additional material from private collections. Male specimens are particularly important to see and are very rare in museum collections. The male gasteracanthines are often small and less conspicuous than the female and have therefore been overlooked.

If you have any material that I may borrow please send it to: Nikolaj Scharff, Zoologisk Museum, Department of Entomology, Universitetsparken 15, DK-2100 Copenhagen, Denmark. All material will be identified and returned after study. After February 1990, material should be sent to Smithsonian Institution or American Museum of Natural History.

News from the International Commission on Zoological Nomenclature

Nominations for new members: Prof. O. Kraus (Fed. Rep. Germany, Arachnology) will reach the end of his term of service on the Commission in July 1991, and nominations for new members are requested. Nominations made since September 1987 will be reconsidered automatically and need not be repeated. Send new nominations (giving qualifications) to The Executive Secretary, International Commission on Zoological Nomenclature, c/o British Museum (Natural History), Cromwell Road, London SW7 5BD, U.K.

Opinions Published:

Case 1542 - **Chelifer Geoffroy**, 1762 (Arachnida, Pseudoscorpionida) - conserved.

Applications Published:

Case 2656 - **Chira Simon**, 1902 (Arachnida, Araneae): proposed conservation of spelling of the generic name; by Maria Elena Galiano, Museo Argentino de Ciencias Naturales, 'Bernadino Rivadavia', Av. Angel Gallardo 470, 1405 Buenos Aires, Argentina.

Case 2647 - **Heliophanus kochi Simon**, 1875 (Arachnida, Araneae): proposed conservation of the specific name by supression of the unused synonym albosignatus L. Koch; by Jerzy Proszynski, Zaklad Zoologii WSRP, ul. Prusa 12, 08-100 Siedlce, Poland.

Case 2648 - **Attus penicillatus Simon**, 1875 [currently Sitticus penicillatus] (Arachnida, Araneae): proposed conservation of the specific name by J. Proszynski (address above).

Case 2649 - **Thyene Simon**, 1885 (Arachnida, Araneae) proposed conservation of the generic name Thyene for a large group of jumping spiders by J. Proszynzki (address above).

Case 2662 - **Aphonopelma Pocock**, 1901 (Arachnida, Araneae) proposed precedence over **Rhechostica Simon**, 1892; by H.W. Levi, Museum of Comparative Zoology, Harvard University Cambridge MA 02138, and O. Kraus, Zoologisches Institut und Museum, Martin Luther King Platz 3, Universtitat Hamburg, D-2000 13, F.R.D.

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FINANCIAL STATEMENT

Third Quarter, Oct. 25, 1989

Balance from June 8, 1989		**$10,394.33***
Deposits		
Donation, John Kaspar, Vince Roth, Auction		65.00
Sales, slides		24.45
Membership		2600.00
Page charges		1157.00
Sale, Platnick Volume		498.49
Return from 1989 Meeting		100.00
Interest, 4 months		284.11
Payment from Cokendolpher, for A.S.J.		77.00
	Subtotal	**$4,806.05**
Expenses		
D.A. Books, Return of double payment		50.00
State of CA, Filing fee		2.50
Manchester Press, payment for Platnick's volume		1163.49
Texas Tech Press, envelopes		353.10
	Subtotal	**$1,569.09**
	Total Assets	**$13,631.29**

* Please note that an arithmetic error was made in the last quarterly report. The balance on June 8, 1989 was $10,394.33, not $10,294.33 as reported.

Respectfully Submitted,

Gail E. Stratton, Treasurer
American Arachnological Society

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1989 Field Trip Report
Indianapolis, Indiana

by
Martin J. Blasczyk
Southern Illinois University

On the afternoon of June 22 about 50 arachnologists departed for Eagle Creek Park, the first of this year's field trips. The park was located approximately 9 miles northwest of Indianapolis in Marion County. A variety of habitats was encountered including second growth deciduous forest, open field, aquatic areas and a few stands of introduced conifers. Immediately upon arrival we split up into smaller groups and started collecting spiders. At this time we were joined by reporter Greg J. Borowski and photographer John Warner from the Indianapolis newspaper (an article and several photographs of arachnologists in action resulted from this meeting).

G.B. Edwards beat bushes for salticids and took a Maevia inclemens. Another salticidologist (and fellow Wisconsinite), Dean Faber swept vegetation along the forests edge for Zygoballus (Dean was "caught in the act" by photograher Warner). We ambled along the trails for a few more hours and then converged upon a picnic shelter for a refreshing snack provided by Jim and Betsy Berry (refreshing is not an overstatement, it was about 90 degrees along with high humidity).

While eating, proud collectors showed off their booty. Charles Dondale, Gail Stratton, and Allen Brady examined lycosids that were taken, including Pirata, Schizocosa, and Pirata. Jim Cokendolpher took Castianeira and G.B. Edwards showed some North American salticids to Lyn Forster, including Tutelina elegans, Thiodina sylvana, Phidippus clarus, and Zygoballus rufipes.

Andy Penniman demonstrated his acrobatic skill by assisting Barbara Moore in capturing a Platycryptus undatus from the rafters of the shelter, and William Beachly demonstrated the use of his modified fiber-optic "urethrascope" to peer down into burrows. The break ended and we boarded the bus back to Butler University.

The second trip on the morning of June 24 took 37 spider enthusiasts to Pine Hills Nature Preserve and the adjacent Shades State Park, located on State Road 234 near Waveland, Indiana in Montgomery County. The area had deciduous and coniferous forest habitats as well as open fields. We did not have permission to collect in Pine Hills so we split up into two groups. One group (the larger of the two) walked through Pine Hills on the way to collecting sites, and the other group entered Shades State Park to collect spiders. (I was in this second group, along with Jon Coddington, Allen Brady, G.B. Edwards, Ray and Lyn Forster, Nikolaj Scharff, Dave Corey and Joe Beatty, so I can only report on our escapades.)

Jon Coddington showed us his beating sheet constucted out of flexible fiber glass tent poles (sturdy, yet lightweight) and took a Peckhamia picata from a dead grape vine. He also demonstrated the use of his cornstarch blower to highlight webs on bark (it worked much better than other techniques I have seen). Collecting was poor in the forested area but improved as the trail lead to open field habitat. We swept this area and took Xysticus sp., Tutelina elegans, Metaphidippus sp., Phidippus clarus, Maevia inclemens, Oxyopes salticus, and Theridion sp.. Allen Brady took a female Pisaurina mira from below its nursery web full of spiderlings.

Being somewhat behind schedule, we hurried along to our lunch area at a picnic shelter and met the rest of our group just as they arrived (talk about timing!). Once again Jim and Betsy Berry provided a well appreciated lunch as we talked about our collecting (which incidentally didn't stop during lunch, as a Habrocestum decided to join us). Dave Corey, Joe Beatty, and I had to get back to Carbondale Illinois, so we departed during the lunch break as the rest of our band finished lunch and then moved on to more sites to track down the elusive Araneae.

I wish to thank everyone who provided me with information on what they collected (and put up with me in the field). I especially thank Jim and Betsy Berry for hosting such an excellent meeting and planning the field trips.

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An Ancestral Chelicerate?

William A. Shear
Hampden-Sydney College
Hampden-Sydney, VA 23943

Though chelicerates have been highly successful, dominant animals since they first appeared in the fossil record, their origins are quite unknown. That may be changing, as a new fossil discovery in Canada has given us our first glimpse of what an ancient chelicerate may have looked like.

Derek Briggs and Desmond Collins (Palaeontology 31:779; 1988) have described a new arthropod from a spot not far from the famous Walcott quarry in the Burgess shale, but from a stratum below (and therefore older) than that remarkable fossil assemblage. When first discovered in the field the fossil was given the nickname "Santa Claws", hence its formal Latin designation, Sanctacaris uncata. The assignment of this fossil animal to Chelicerata, argued at length by Briggs and Collins, will be controversial among neontologists.

The five known examples range from 46 to 93 mm long. The animal consisted of a head shield (cephalothorax), trunk (abdomen) and a broad, paddle-shaped telson. The head shield was fitted with large side lobes, a pair of (probably compound) lateral, forward-directed eyes, and six pairs od biramous appendages. The inner rami of the first five appendages were similar -- segmented, spinose, and curved inward. They increased in size posteriorly, and may haave had spiny gnathobases used to process food. The sixth appendage had the inner ramus reduced to a spiny, perhaps sensory, lobe. The outer rami of all the head shield appendages were antenna-like; it is not clear that they were segmented. The trunk evidently consisted of eleven segments with broad paratergal folds on each side. Each trunk segment (except possibly the last) carried a pair of biramous appendages, the inner rami of which were segmented and bore short spines. The outer rami were broad, fringed with setae, evidently served as swimming paddles, and probably also as organs of respiration. The anus occurred ventrally on the last segment, below the articulation of the telson. The telson was a broad, horizontal paddle.

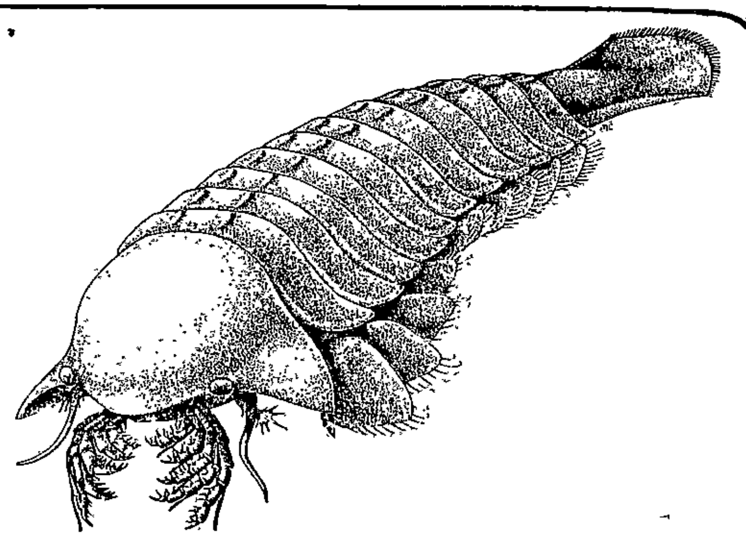
As shown in the reconstruction by Briggs and Collins, Sanctacaris is supposed to have swum above the substrate with its raptorial anterior limbs extended forward, actively searching for food.

Sanctacaris is assigned to the Chelicerata, yet it may not have chelicerae. No chelicerae were visible on any of the five specimens, but these appendages are not a frequently preserved feature on, for example, even very complete eurypterid fossils. Briggs and Collins base their assignment on six points of evidence, all of which are similarities with eurypterids and/or xiphosurids: (1) There are at least six pairs of head appendages. No other arthropod group aside from the chelicerates has this many. In all extant chelicerates, we see chelicerae and five or six additional pairs of limbs. (2) The raptorial nature of the head appendages, and the possibility that they could have been used in walking, makes them like those of eurypterids. As in eurypterids, the size of the appendages increases posteriorly, and they bear distal spines. (3) The presence of a cardiac lobe on the head, which also occurs in eurypterids and xiphosurids. (4) The pattern of tagmosis: a head region for prey-handling and a trunk for swimming and respiration. (5) The ventral position of the anus on the last trunk segment, below the articulation of the telson. (6) Presence of an undivided telson without appendages.

As there are no unequivocal synapomorphies with the chelicerates, Briggs and Collins designate Sanctacaris as a plesion with generic rank, a primitive sister group of all other cheilcerates. This step avoids the nercessity of creating a new taxon of equivalent rank to Chelcerata on a single fossil species in which some crucial features may not have been preserved.

After noting the rarity of Sanctacaris fossils, Briggs and Collins conclude their paper with the following paragraph:

"Why have the chelicerates been so successful while most of their Middle Cambrian arthropod contemporaries have died out? Chance probably played a role, particularly during mass



Text-Fig. 6. Restoration of Sanctacaris uncata seeking prey, with its raptorial limbs thrust forward aand its lamellata trunk limbs moving in a metachronal wave. (reprinted with permission)

extinctions, by sparing the chelicerates and eliminating the other arthropods. Alternatively, chelicerates may have some unique morphological characters that have contributed to their success. The most obvious are the large number and morphological flexibility of the head appendages, shown by the raptorial limbs in Sanctacaris and the grasping, walking, balancing, and swimming prosomal appendages of the eurypterids and xiphosurids. However, whether or not these were significant factors in the success of the chelicerates, the basic pattern evident in Sanctacaris has persisted to the present while those in most of the other Cambrian arthropods have long since disappeared".

Briggs and Collins have rightly emphasized the primitive naure of Sanctacaris, especially the biramous prosomal appendages. But it is important to also note that Sanctacaris has certain specializations which exclude it from the direct ancestry of living chelicerates. Sanctacaris may or may not have had chelicerae. The presence of six pairs of limbs on the prosoma opens a number of possibilities. Perhaps the chelicerae were present but not preserved, and the earliest chelicerates actually had seven pairs of prosomal appendages, a priomitive number retained in the peculiar Devonian "merostome" Weinbergina, which appears to have six postcheliceral walking limbs (Sturmer, W., Bergstrom, J. Palaont. Z. 55:237, 1981) and still present in Limulus if the chilaria (small, curved flap-like appendages behind the last pair of real legs) are accepted as homologues to the legs. In eurypterids, this appendage forms the metastoma, a broad plate which extends forward to cover the gnathobases of the legs. One specimen of Sanctacaris shows the possible trace of an appendage posterior to the sixth preserved appendage. If this is so, then the first preserved appendage may be homologous to the chelicera, and the six remaining to the six postcheliceral appendages of Weinbergina, Limulus, and the eurypterids. However, both the sixth and the possible seventh appendage are already reduced and modified (specialized) making it unlikely in either case that Sanctacaris could be an actual ancestor of Weinbergina, where the last appendage is a leg, or of xiphosurids or eurypterids, where the specializations are very different from the possible specializations in Sanctacaris.

An evident second specialization of Sanctacaris is the absence of the median ocelli, which remain in eurypterids, xiphosurids, and arachnids (except where secondarily lost). The preservation of Sanctacaris is such that the median ocelli, if present, would be easily seen. This specialization would likewise preclude Sanctacaris from the direct ancestry of any known living chelicerate.

Thus Briggs and Collins are, in my opinion, correct in referring to this fossil animal as a plesion, and, at our present state of knowledge, the sister group of all other Chelicerate, living and fossil. But it is probably not a candidate ancestor for any other known chelicerate group.

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MILWAUKEE PUBLIC MUSEUM ARACHNID COLLECTION

MPM and especially the Invertebrate Section owe a deep debt of gratitude to Vince Roth for sorting and identifying hundreds of spiders from our collections. On his way to the 1989 meetings in Indianapolis, Vince found time to visit MPM and worked at a concentrated pace to significantly increase the percent of MPM spiders sorted to a state where they would now be available to loan to interested experts.

The MPM arachnid collection was transferred from the care of the former MPM Entomology department in 1975. Since then the collection has grown in size to 4948 lots when inventoried in June, 1989. In 1977 a summer collecting survey of Milwaukee County was conducted, resulting in a collection of over 2300 specimens. In 1978 an arrangement was negotiated with Dr. H.W. Levi who returned a historically important collection of Salticidae which had been collected by the Peckhams of Milwaukee and given to MPM but had been on loan to MCZ. Along with the return of this loan, MPM received a synoptic collection of spiders from North America in exchange for the MCZ's privilege of retaining the type specimens from the Peckham collection. In 1987 all Wisconsin spiders were loaned to Dr. Reichert to be used in updating the checklist of species of the state. All expertly determined spiders have been entered into one of two computer listings, Neotropical or North American. Arachnologists interested in corresponding about potential loans from this collection should contact: J.P.Jass, Assistant Curator; Invertebrate Zoology, Milwaukee Public Museum, 800 W. Wells, Milwaukee, WI 53233.

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Notes from the Annual Business Meeting

The President announced that the Executive Committee had voted to increase the 1990 **institutional** subscriptions to $70 for those requiring domestic postage and to $80 for requiring foreign postage. There will be **no** increase in dues for individual members.

Page charges for the Journal of Arachnology manuscripts will be increased to:

- $50 per page - - - - - Non-members
- $45 per page - - - - - Members, if support is acknowledged
- $25 per page - - - - - Members, not supported
- $20 per page - - - - - Student members

The Elections Committee reported the results of the Spring balloting. Petra Sierwald was elected as Director, and Jim Berry was re-elected Secretary.

The tentative sites for future annual meetings are:

- 1990 - - - Ottawa, Canada (with Charles Dondale)
- 1991 - - - Oxford, Mississippi (with Gary and Patricia Miller)
- 1992 - - - St. Alselm, New Hampshire (with Craig Hieber)
- 1993 - - - San Jose, Costa Rica (with Carlos Valerio)

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American Arachnology in the newsletter of the American Arachnological Society and is sent only to members of the Society. For information on **membership** in the Society, write: Dr. Norman Platnick, Membership Secretary, The American Arachnological Society; Dept. of Entomology; The American Museum of Natural History, Central Park West at 79th Street., New York, New York 10024 U.S.A. **The Journal of Arachnology** is the official publication of the American Arachnological Society. **Manuscripts** submitted for publication in the journal should be sent to: Dr. Jerry Rovner, Associate Editor, Dept. of Zoological Sciences, Irvine Hall, Ohio University; Athens, Ohio 45701 U.S.A.

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While being introduced to someone at a dinner party, I was identified as a spider specialist -- an **anarchist**. (ed.)

RESEARCH REPORT
(May, 1989)

Galiano, Maria Elena
Museo Argentino de Ciencias Naturales "Bernardino Rivadavia"
Av. Angel Gallardo 470
1405-Buenos Aires, ARGENTINA

I am carrying on with the systematic revision of the neotropical genera of Salticidae. Three papers have been sent to print: two about species of Sitticus of the palpalis and leucoproctus groups and one about Jollas. I have also finished a research on the biology of a species of Dryphias and the description of a new species. I am now working on the revision of Tacuna. For 25 years I have maintained living spiders in my laboratory, because few things give better understanding of a group than observing live animals' behaviour. Recently I found through the rearing of several generations of Tullgrenella serrana, that the females present phenotypic variants while the males are monomorphic.

But the subject that most interests me is the early development of spiders. The last six months were dedicated to observe the development of several species of Dysderidae, Theridiidae, Araneidae and Salticidae, from egg to dispersion. My principal aim is to corroborate previous unpublished findings and to compare them with those of recent papers (by Canard, Downes, Hallas) because I have found some discrepancies. A first remark could be that the postembryonic development must be observed directly step by step, because some techniques employed for fixing material could produce artifacts that lead to erroneous conclusions.

In order to obtain live specimens I made trips to the southern hills of Buenos Aires and to Entre Rios Province. In July, 1988 I paid a short visit to the Sao Paulo and Rio de Janeiro museums.

It was nice to meet old friends again. In turn, we received the visit of Dr. Vincent Roth and his wife Barbara. Dr. Roth was kind enough to determine part of our collections.

During a current study of an undetermined collection of Salticidae, I found a single male specimen of a new species which belongs to the group Hurieae. Its most striking feature is a dense tuft of stout setae on the bulb, covering the base of the embolus. I am almost sure that no other salticid species has a similar feature, and I would very much appreciate hearing from anyone who can provide information on something similar in any other spider species.

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Identification of Colombian Spiders Sought

As part of the Centro Internacional de Agriculture Tropical IPM program in Cali, Colombia, spiders attacking insect pests of rice were collected. They are now seeking help in identification of the specimens. If you are interested in looking at specimens from this area, contact Alberto Pantoja, Rice Entomologist, at the following address: CIAT; 1380 N.W. 78th Ave., Miami FL 33126-1606.

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Citing of Meeting Abstracts

Abstracts of presentations made at the annual meeting have traditionally been printed in the Fall newsletter for the benefit of those who did not atend the meeting. It is the opinion of the Executive Committee that these abstracts should printed as news items only, and they should not be cited as publications since they are not refereed, and often they do not represent what was actually said by the speaker.

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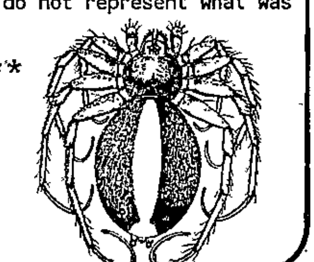

ABSTRACTS

OF PAPERS PRESENTED AT THE ANNUAL MEETING OF THE SOCIETY IN INDIANAPOLIS, JUNE 20-24, 1989

Whatever Happened to Antrodiaetus lincolnianus?

William M. Beachly
Department of Biology
Nebraska Wesleyan University, NE 68504

The burrowing Mygalomorph Antrodiaetus lincolnianus (Worley) was first collected and described in the 1920s near Lincoln, Nebraska. The description was based on 4 males found in March and April "on clay banks near deciduous forest" and "under logs in woods". In 1951 a male and 2 females were collected near Lincoln and in 1964 another male was found near Lawrence, KS. The paucity of specimens and lack of natural history information about this species stimulated my search which began in the fall of 1988. I was particularly interested in this species as an indicator of aboriginal oak forest "islands" in the forest-prairie ecotone of Eastern Nebraska. The discovery this April of a large (and possibly gravid) female in a totally unexpected habitat raises new questions about this species' life history and habits.

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Phalangiotarbid Ecology: Generating and Testing Hypotheses

Bret S. Beall
Dept. of Geology, Field Museum of Natural History
Chicago, IL 60605-2406

Phalangiotarbids are the most abundant arachnid order in Middle Pennsylvanian deposits. Evaluation of well-preserved fossil material facilitates a detailed understanding of phalangiotarbid morphology that permits generating ecological hypotheses. In particular, functional analyses of the appendages indicate that phalangiotarbids were probably ambush predators. Three lines of evidence suggest that these ambush predators lived cryptically upon the periderm of arborescent lycopsids: 1) leg orientation corresponds with furrows between leaf cushions; 2) arborescent lycopsids always occur with phalangiotarbids; and 3) morphometric overlap between phalangiotarbid prosomata and lycopsid leaf cushions. Phalangiotarbids with rhomboidal prosomata probably lived upon Lepidodendron, while those with semicircular prosomata lived on Lepidophloios.

This ecological hypothesis can be tested in part using a new phalangiotarbid locality in Britain. The Writhlington Geological Nature Reserve, near Radstock, has yielded about 100 phalangiotarbids, all with semicircular prosomata; the camouflage hypothesis predicts that Lepidophloios should be present. The presence of Lepidophloios at Writhlington partially corroborates the camouflage hypothesis.

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Linyphiids from Islands of the Pacific Plate

Joseph A. Beatty
Department of Zoology; Southern Illinois University
Carbondale, Illinois 62901

James W. Berry
Department of Biological Sciences; Butler University
Indianapolis, Indiana 46208

About 40 species of linyphiids are known from islands on the Pacific tectonic plate. Ten of these, 3 species of Eperigone, 4 of Erigone, and one each of the genera Coloncus, Ostearius and Tennesseellum are believed to be introduced, largely from North America. Descriptions of 10 new species have been prepared by Dr. Frank Millidge and will be published by us, along with diistributional information. Most of the remaining species have not been reviewed since their original publications in 1900 to 1942. Their generic and familial placements are often questionable or erroneous.

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Pores and Barrels in the Vulvae of Agelenid Spiders (Araneae, Agelenidae)

Robert G. Bennett
Environmental Biology, University of Guelph
Ontario N1G 2W1 CANADA

In various 'agelenid' spiders two morphological features penetrate the walls of the internal sclerotized parts (the vulva) of the female genitalia. Simple pores have been described in many spiders but rarely in the Agelenidae. The more complex 'barrel' structures may be new to science. The morphology and placement of pores and barrels are examined in a number of agelenid genera including Agelenopsis, Blabomma, Cybaeus, Cybaeota, Cybaeina, Cicurina, Cryphoeca, Coelotes, Coras, Dirksia, Ethobuella, and Wadotes. These data are used in an effort to homologize the different parts of the vulva in these genera.

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Foraging Behavior of the Orb-Weaving Spider, Philoponella republicana

Greta J. Binford and Ann L. Rypstra
Dept. of Zoology, Miami University
Hamilton, OH 45011

The foraging behavior of the spider species, Philoponella republicana (Araneae; Uloboridae), was observed in the tropical rain forest of SE Peru in June and July of 1988. These spiders were observed on the periphery of the webs of the social spider, Anelosimus eximius (Araneae; Theridiidae) and in communal-territorial colonies composed of members of their own species. When in association with A. eximius, P. republicana functions both as a competitor, and as a predator of the host spider. P. republicana in groups do not confine themselves to specific territories but tend to congregate in a small core area surrounded by orbs. The prey capture sequence of P. republicana consists of a long wrapping period which serves to subdue prey since this species lacks venom. Group members were observed cooperating in the wrapping process of prey capture. The circumstances of this cooperative behavior, which is very unusual among communal orb-weavers, is under further investigation.

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The Dynamics of Burrow-associated Behavior in the Sydney Brown Trapdoor Spider (Misgolas rapax, Ctenizidae).

Richard A. Bradley
Dept. of Zoology; Ohio State University
Marion, Ohio 43302

The brown trapdoor spider is perhaps the most abundant mygalomorph in the region of Sydney, Australia. It lives in silk-lined burrows in both dry and wet sclerophyll forests. Despite its abundance, little has been published on the biology of this species. Burrow-associated behavior was observed in the field as well as in the laboratory. Density estimates were obtained from 16 replicate plots at one study site in Brisbane Water National Park. These estimates were compared to habitat features and prey abundance information. Field and laboratory experiments were conducted to determine the influence of feeding history on activity and reproduction in adult females. There was little evidence for a causal relationship between prey abundance and the activity patterns of these spiders.

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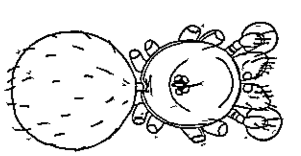

Kleptoparasitism in Social Spiders: Effects of Prey Availability and Host Colony Size

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Kleptoparasites of social spiders, which forage by stealing prey captured by their hosts, can take advantage of increased prey capture rates associated with large spider aggregations. This study investigated the relationship between the cooperatively social spider species, Anelosimus eximius, and its kleptoparasite, Argyrodes ululans, which specializes in foraging in their webs. Natural colony observations were performed together with experiments varying host spider number and kleptoparasite hunger level within enclosed field colonies in order to determine whether the impact of kleptoparasitism is affected by the number of social spiders in a colony and prey availability. In natural colonies, Ar. ululans stole 26% of prey captured by An. eximius. In enclosed colonies, Ar. ululans stole more prey in small vs. large colonies and a greater percentage of small prey items in all colonies. Also, starved kleptoparasites stole a greater percentage of prey than non-starved kleptoparasites. Therefore, low food availability and host colony size influence the rate of kleptoparasitism.

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Recognition of Video Generated Images by Jumping Spiders

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Jumping spiders (Araneae: Salticidae), are distinguished by their large anterior eyes and acute vision, used in stereotypic predatory and courtship behavior. The dimorphic jumping spider, Maevia inclemens, is capable of recognizing and discriminating prerecorded video images of 1) Prey; 2) Conspecifics; and 3) Potential predators. Maevia responds predictably to each video image, by stalking and attacking prey, exhibiting leg waving display to conspecifics, and retreating from predators. In addition, mature females display receptivity to the video image of a courting male and mature males court video generated females. This new method allows for investigation of elements of visual recognition in conspecific attraction, predator or prey discrimination and spider communication.

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Cladistics and Spider Classification: Araneomorph phylogeny and the Monophyly of Orbweavers

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Eighteen new characters pertinent to the phylogeny of Araneomorphae are reviewed and tested against a previous data set, using quantitative cladistic techniques. A preliminary outline of cladistic structure in Araneomorphae is presented in the form of a cladogram. Orb weaving spiders (Orbiculariae: Deinopoidea and Araneoidea) are confirmed as a monophyletic group (apparently sister to Dictynoidea) and Linyphiidae is confirmed as an araneoid family.

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Prey Capture Behavior of the Funnelweb Spider Genus Ischnothele (Araneae, Dipluridae)

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The diet and prey capture behavior of five morphs of Ischnothele funnelweb spiders from northern Argentina, the Peruvian Andes, the Peruvian Amazon Basin, and Jamaica were investigated. All morphs construct exposed, adhesive space webs. Field collected prey remains indicate that ants and beetles and lesser quantities of other ambulatory invertebrates comprise 95% or more of the prey intake of these morphs. These spiders approach prey in a series of short rapid advances alternating with pauses. During the capture, the pedipalps and anterior legs reach beyond, pull, and position the prey under the extended chelicerae, which then strike downward in typical mygalomorph fashion. The prey is held only by the chelicerae and fangs as it is carried to the retreat. Observations indicate that prey detection and approach orientation depend primarily, if not completely, upon prey-generated web vibrations and that the approach pauses function as information gathering periods. Jamaican spiders, with proportionally longer appendages than the Peruvian morphs, tend to approach and capture prey faster than the Peruvian morphs do. When provided with a superabundance of prey, Ischnothele spiders exhibit an unlimited functional response (the overkill phenomenon).

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Geographic Variation Patterns in Jamaican Ischnothele (Araneae, Dipluridae) and Their Kleptoparasites

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Patterns of variation in anatomy, pigmentation, habitat, and Mysmenopsis kleptoparasites favor the hypothesis that the Ischnothele populations of Jamaica consist of two genetically distinct and reproductively isolated clusters. Since the two morphs of Ischnothele are each other's closest relatives and the two Mysmenopsis species are also each other's closest relatives, it appears that the host and kleptoparasite populations have coevolved. Moreover, since the kleptoparasite species are morphologically more distinct from each other than are the two Ischnothele morphs, we suggest that the former have evolved more rapidly than the latter.

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American Arachnology Newsletter No. 40 Nov. 1989

Eggsac Defense in the Spider Uloborus glomosus (Uloboridae)

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Female Uloborus glomosus deposit eggsacs in a chain along a radius of their horizontal orb-webs. When disturbed, these spiders remain in position next to their eggsacs, showing no active escape or avoidance behaviors unlike females without eggsacs. When a parasitoid wasp, Arachnopteromalus dasys was placed on an eggsac chain, females responded by jerking their webs. Some females subsequently turned and walked along the eggsac chains, sweeping the eggsacs with their long front legs. These behaviors are unique to females guarding eggsacs and could protect the eggs against parasitoids and predators. Females responded in a similar manner when U. glomosus spiderlings instead of wasps were placed on the eggsac chains. There was no significant difference between the percentage of females responding to wasps and to spiderlings, nor was there a significant difference in the initial response time of females with wasps on their eggsacs and those with spiderlings.

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A Comparison of Cursorial Spiders Along a Successional Gradient

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Ground surface spider populations were sampled using pitfall traps for 10 weeks (9 June - 11 August, 1988) in order to compare the composition and diversity of spider populations in three communities (Old Field, Oak Woodland, and Beech-Maple Forest). These communities, found in western Michigan, represent stages along a successional gradient. Specimens were identified to species where possible and compared at the levels of species, family, and guild. The cursorial spider guild was limited to those families which exhibited similar foraging strategies. Members of the families Theridiidae, Linyphiidae, Micryphantidae, Araneidae, and Tetragnathidae, which are considered aerial web-builders, were excluded from the data. Seventy species from 10 families were collected across the gradient and used in data analysis. This study and two previous studies (Benedict 1986, Sliwinski and Price, 1987) in the same communities as well as a similar study done by Bultman, Uetz, and Brady 1982) demonstrated that little species overlap exists between these three communities. These studies have established certain relationships that exist <u>between</u> the spider populations of the three communities sampled. They provide a useful means of comparison to other similar communities in different geographic areas. Continuing annual investigations to monitor fluctuations <u>within</u> these communities may provide data that serve as an important yardstick for measuring temporal changes in ecological communities. Supported by NSF-REU Grant #BBS-8804082.

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Funnels Versus Sorting by Hand

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My principal interest in using funnels came about because they represented potentially useful devices for estimating the total number of spiders in litter. It quickly became apparent that the results obtained from funnel samples were often very different from those obtained from sorting material by hand. These differences were initially attributed in good part to predation (by other spiders, centipedes, etc.) within the sample while in the funnel. I shifted to hand sorting as soon as possible after collecting the sample. It comes as no surprise that many factors are involved that influence the results. Chief among these are (1) the size of the sample relative to the size of the funnel, (2) the 'wetness' of the sample, (3) the season of the year as it affected the mobility of various species, (4) the integrity of the funnel itself, and (5) the inherently high variability of the numbers of spiders from point to point.

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Effects of Body Size on Male Agonistic Encounters in *Zygoballus rufipes* (Araneae, Salticidae)

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The effects of body size on male agonistic encounter outcome, duration and intensity were examined in the jumping spider *Zygoballus rufipes*, using body weight as an estimator of body size. Four hypotheses about body size effects on agonistic encounters were tested: the heavier individual is more likely to win; the probability of the heavier individual winning decreases as body size difference decreases; encounter duration increases as body size difference decreases. All of these hypotheses are supported by the data, but there are also some unexpected results: the probability of the heavier individual winning decreases abruptly at a critical level of body size difference; encounters between large males are more likely to terminate at the highest levels of intensity than encounters between small males. These results suggest: a limitation in the utility of body size difference as a predictor of agonistic outcome; the presence of body size related agonistic behavior strategies that are independent of the opponent's body size.

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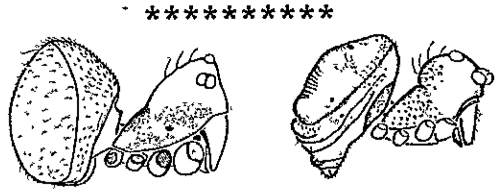

Arterial Development in Immature Apulmonate Arachnids, and the Implications of This With Regard to the Higher Systematics of the Class Arachnida

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Comparative developmental morphology suggests that the merostomates plus the apulmonate arachnids form a natural monophyletic assemblage, and, moreover, that neoteny in arterial development has been involved in the origin of the clade of pulmonate arachnids.

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Production and Response to Volatile Pheromones in the African Social Spider, *Agelena consociata*

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The role of volatile pheromones in the aggregation of the African social spider, *Agelena consociata*, was explored using spiders collected from the forest in Gabon, West Africa. Marked individuals released into the forest showed a high mortality rate. However, when multiple releases were performed over a period of days, individuals are found to locate each other, forming small colonies. Because the seasonal rains would wash away drag lines and any pheromone trail left by a spider, another mechanism, such as the use of volatile pheromones, is necessary to explain how individuals find each other. Bioassay techniques were used to investigate the production and response of individual spiders to a volatile aggregation pheromone. Spiders significantly oriented towards an air current passed through an unfamiliar nest and away from a control current unexposed to webbing or spiders. The spiders showed no significant orientation when presented with an air current that had been passed through their own nest.

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Trivial vs. Migratory Aerial Dispersal in Spiders: Evidence from a Comparison of Ground Level and Upper Air Samples

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We sampled ballooning spiders with tow nets within the surface boundary layer (SBL, 2.0-3.0m) and the planetary boundary layer (PBS, 100-300m). A striking feature of the data is the continued presence of spiders in the PBL throughout the night despite the absence of mechanisms to carry them there from the surface. We interpret this as the raining down of animals which were carried aloft during the day on thermal updrafts. Since winds in the troposphere can cover 50-100km during a day, this is evidence for "true" migration in the sense used by insect ecologists, i.e., a move which takes the animal from its original habitat to a new one. A notable exception to this pattern is the total absence of lycosids from nighttime samples, although they are reasonably plentiful during the day in both layers. This indicates that they may use behavioral means to avoid true migration, possibly limiting themselves to "trivial," i.e. within-habitat, dispersal, at least aerially. If correct this is ironic, since lycosids have been used more than any other group to place spider aerial dispersal in an evolutionary framework assuming selection for between-habitat migration. We discuss limitations of passive sampling devices for studying ballooning dynamics, and describe a system for active sampling in the PBL with a slow-flying airplane.

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Systematics and Biogeography of the Spider Subfamily Phyxelidini (Amaurobiidae, Phyxelidinae)

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The Phyxelidinae comprise a group of 53 species of African, Madagascan, and Southeast Asian amaurobiids. The new tribe Phyxelidini occurs from the Cape region of southern Africa to the eastern Mediterranean and in Madagascar. The tribe comprises 35 species in 7 genera. Synapomorphies for the tribe include an enlarged, weakly sclerotized conductor with a marginal groove in which the embolus lies, and a pars pendula which is developed as an elongate, flexible lamella. The majority of the species of Phyxelidini are narrowly endemic to cool-temperate "afromontane" forest habitats or to caves, and present an interesting pattern of disjunct distributions within Africa and between Africa and Madagascar. A phylogeny for the species is proposed and the historical implications of the distributions of sister groups are discussed.

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Foraging Decisions in the Spider *Achaearanea tepidariorum* (Theridiidae)

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Here I examine the role of previous experience with prey capture at the web site in influencing patch (web) leaving decisions by adult females of *Achaearanea tepidariorum*. Previous experience with either constant prey levels over differing amounts of time, or with differing prey levels over constant amounts of time appears to have no effect on giving up times. Giving up times for adult spiders were normally distributed, suggesting that *A. tepidariorum* does not use a random giving up rule either. The normal distribution and the early leaving times for underfed spiders suggests that a simple, physiologically based giving up rule is probably being used by this species. However, preliminary work with juveniles suggests that other rules may be used by younger spiders. These alternative rules will be discussed.

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Distribution and morphological variation in *Hypochilus sheari* and *Hypochilus coylei* (Araneae, Hypochilidae)

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On the basis of morphological differences in very small sample sizes, Platnick (1987) described two apparently allopatric species of Southern Appalachian *Hypochilus*. Thorough collecting in the areas between and around the original sites has yielded large enough sample sizes of both morphs to more effectively analyze their geographic distributions and patterns of morphological variation. Preliminary analysis of these data supports Platnick's hypothesis that these morphs are allopatric and that they represent genetically distinct yet closely related populations.

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Costs and Benefits of Group Living in a Pholcid Spider

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Holocnemus pluchei spiderlings are facultatively group-living, and costs and benefits of this behavior were examined. Food level should be important to spiderlings: laboratory experiments illustrate that juvenile food level influences development time

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and adult body size. However, group-living spiderlings capture less food than do solitary individuals: (1) in field surveys, spiderlings in group webs are seen feeding less often than those alone; (2) spiderlings in group webs have smaller abdomens than do solitary individuals; and (3) when prey are introduced into group webs, the largest spider that detects the prey wins it approximately 80% of the time. Spiderlings reduce the risk of prey loss by pausing frequently in their prey capture sequence in group webs; this apparently reduces web vibrations that may attract an adult. The main benefit of group living is likely to be a reduction in the cost of web construction, as evidenced by bomb calorimetry data.

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***Nephila*: Tetragnathidae or Araneidae?**

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The family Araneidae is diagnosed by specialized characters: the narrow canoe-shaped tapetum in the PME; the small chelicerae of males; and, in the male palpus, a twist that places the cymbium in a median position, the distinct median apophysis and radix, and the doughnut-shaped tegulum.

The family Tetragnathidae is harder to define. Many species, but not all, have lost the tapetum in the PME. In many species, the chelicerae of the male are enlarged. The male palpus has a large tarsal organ on the cymbium, the median apophysis and radix are lacking (both may be primitive characters), and the embolus is "wrapped" by the conductor. The specialized enclosed embolus is found also in *Nephila*.

In tracing sperm duct loops in the similar palpi of *Azilia*, *Leucauge*, *Nephila* and *Tetragnatha* (all considered tetragnathids), we found the configuration of loops was not similar. In SEM examinations the embolus of all seemed enclosed by the conductor.

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Habitat Selection by the Tarantula *Theraphosa leblondi* (Araneae, Theraphosidae)

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Retreat site selection by the theraphosid spider *Theraphosa leblondi* was studied in the field and laboratory. In the field active burrow sites were compared to non-burrow sites for macro- and micro-habitat variables. The burrows were found to be not significantly different for vegetation, leaf litter depth and slope of terrain. Prey traps set at a site of three active burrows and at a non-burrow site showed a highly significant difference, with the burrow site traps capturing far more possible prey items. Field enclosure experiments testing the effect of conspecifics on retreat site choice in immigrants showed no consistent trend. Laboratory tests of the effect of conspecific silk on retreat selection showed a highly significant preference for burrows with silk.

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Dispersal Strategy of the Obligate Burrowing Wolf Spider *Geolycosa turricola* Treat

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We studied the (1) timing of dispersal, (2) pattern of dispersion, (3) burrow site selection, and (4) survivorship in a large population of *Geolycosa turricola* in Mississippi between 1982 and 1985. Dispersal commenced in late May and was composed of at least two distinct dispersing groups. Early dispersers were significantly smaller and moved a shorter distance from the maternal burrow on average than late dispersers. Population-wide dispersion patterns were examined through the course of the dispersal season and the possibility of burrow site changes was

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studied. Survivorship was found to be different for the two dispersing groups. The possible relationship between dispersal strategy and subsociality is discussed.

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Zoogeography of the World Scorpion Fauna

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The distribution of all taxa of scorpions (Chelicerata, Scorpiones) was studied (ca. 1200 species, 120 genera, 9 families). Scorpion faunas of the New and Old World share a few common taxa (usually introduced). Species number is higher in the New World; genera number, in the Old World. In the Southern hemisphere, but not in the Northern, temperate/tropical scorpion faunas are more diverse than tropical ones. Seven major centers of diversity and endemism exist: Californian, Central Mexican, Antillean, Venezuelean, Central Chilian, South African and Saharo-Sindian. No pronounced endemism occurs in tropical fauna of the Old World. Seven general regions of distribution exist: Sonoran, Amazon-Antillean, Brazilian-Patagonian, Afrotropical, Saharo-Gobian, Indo-Malaysian and Australian.

(** deceased)

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The Relationship of Book Lung and Tracheal Systems in the Spider Family Uloboridae

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The book lung surface areas of adult female representatives of six uloborid genera that exhibit a wide range of tracheal development were measured. Relative to spider size, book lung area is inversely related to tracheal development. These species also show a phylogenetic trend toward increased book lung area. The number of leaves in a book lung is positively correlated with a spider's size and total lung area, although it is not significantly affected by tracheal development of phylogenetic position.

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The Pumpkiniform Spigot

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The external silk spinning apparatus of more than 30 representatives from 15 non-araneomorph families was examined using scanning electron microscopy. Three major spigot forms were recognized each with variations subcategorized. The pumpkiniform spigot is certainly the most distinctive of the three major groups. Its form is characterized by a remarkable likeness to a pumpkin. The spigot base is large and bulbous with an extremely thin diameter shaft emerging from a strong indentation. Corresponding histochemistry is likewise distinct. It is hypothesized that this silk producing structure is a derived one. Pumpkiniform spigots have been found on members within the Crassitarsae (i.e., the Nemesiidae, Barychelidae, Theraphosidae and Paratropididae) and on an undescribed species of <u>Aptostichus</u> (Cyrtaucheniidae), suggesting a new synapomorphy for this group.

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Crazy Characters for Crassitarsae (Mygalomorphae)

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Cladograms of mygalomorphs by Raven (1985) are examined and shown to be derived by agglomerative rather that divisive techniques. Initially, traditional family groupings had to be disbanded and an open minded approach to the significance of all characters used. Thus, characters previously used to separate the mygalomorphs primarily into two large groups are found useful only at family and sometimes at the species level. Whereas previously ignored characters were found very significant at higher taxonomic levels. Confusion in the use of keys concerning the apparent similarity of dense clusters of hair at the end off the tarsi and true claw tufts is addressed. Claw tufts are discrete pads of hair originating from paired sclerotised zones beside each claw and not originating from the cuticle of the tarsi itself. Hairs of claw tufts have highly fimbriated fine structures and are usually flattened. In contrast, extensions of the tarsal scopulae that surround the claws have slender cylindrical and less fimbriated tips. Characters used to define the Crassitarsae are simply those that describe monophyletic taxa most parsimoniously.

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Size-Specific Costs Affect the Size Structure of <u>Metepeira incrassata</u> Colonies

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The Mexican orb-weaving spider, <u>Metepeira incrassata</u>, lives in colonies of hundreds to thousands of individuals. Colonies have a characteristic size structure with larger spiders (including females guarding egg sacs) most common in the core, and smaller spiders toward the periphery. Size-specific costs and benefits in different regions of the colony explain the observed colony structure. On the periphery, both prey availability and wasp predation are greater. Large females are subject to preferential wasp predation, and trade reduced food for increased safety in the core. Smaller spiders experience little predation risk. In the core, smaller spiders have their webs aggressively taken over by larger spiders, more than in the periphery. In addition, because large spiders construct webs earlier in the day, smaller individuals may be displaced toward the periphery as their web-site space is encroached upon.

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Mating and Egg Production in <u>Pholcus phalangioides</u>

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Duration of copulation was recorded for 104 pairs of the cellar spider, <u>Pholcus phalangioides</u>. Pairs copulated for an average time of 72.3 minutes (sd = 43.3, range = 10-304). There appears to be no relationship between duration of copulation and whether or not offspring are produced. The relationship between duration of copulation and number of clutches and spiderlings produced by females will be discussed.

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Visual Mediation of Predatory Behavior in Wolf Spiders

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While it is well-documented that wolf spiders (Family Lycosidae) rely heavily on vibratory cues during predation and courtship, less is known about the role of visual stimuli in the predation process. In this study, responses of two species of diurnally active lycosids (<u>Schizocosa ocreata</u> and <u>S. rovneri</u>) to visual stimuli from prey were tested. These species differ in their use of visual cues during courtship. Prey items (live crickets) were presented to vibration-isolated spiders at varying distances in an arena. No significant differences were seen between

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species. A majority (>75%) of spiders oriented to prey within 30 cm, but far fewer (<15%) responded to prey 30 - 40 cm away. The mean number of orientation responses declined with distance, as the latency to first response increased. These data support the lycosid visual range estimates of Homann (1931), and suggest that wolf spiders are capable of detecting and orienting to prey using visual stimuli alone.

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Prey Perishability and the Evolution of Group Foraging in <u>Anelosimus eximius</u> (Araneae; Theridiidae)

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Group foraging should be advantageous if resource patches are ephemeral. The fraction of food harvested by individuals becomes less sensitive to a reduction of food availability caused by an increase in group size, if patches do not last long enough to be consumed. We tested this hypothesis using the cooperative spider, <u>A. eximius</u>. We compare total feeding times in natural colonies with estimates of the time solitary individuals take to completely consume prey (estimated from prey biomass and extraction rates). The perishability of insects as patches was determined by monitoring dead insects in artificial webs. Insects remained in artificial webs longer than it took natural colonies to consume them. Feeding times for solitary spiders are significantly longer than the natural feeding times and than residence times in artificial webs for prey larger than 16 mm. These results indicate that perishability, especially of large prey, may have been an influence on the cooperative foraging in <u>A. eximius</u>.

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Orb-web Weaving Spiders in the Early Cretaceous

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The use of webs in prey capture is the most outstanding achievement of spiders. Palaeozoic spider spinnerets are known, but presented here are fossils showing morphological adaptations for web weaving, from the Lower Cretaceous of Spain. Their tarsi bear three claws and serrated accessory claws for silk handling and locomotion on a web. Since only one Mesozoic spider, from the Jurassic of the USSR, has been formally described, the four specimens reported here are an important addition to the fossil record. They belong to three new genera placed in Dinopoidea and Araneoidea. Members of both of these superfamilies weave orb webs or orb web derivatives. The fossils provide evidence that the two groups of orb-web weavers were already well defined by the early Cretaceous. No tarsal claw details are preserved in the Jurassic araneoid, which may have been an orb-web weaver. If the orb web evolved only once, in the common ancestor of Araneoidea and Dinopoidea, its origin lies in the Jurassic or earlier.

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The Earliest Fossil Evidence of Spiders: a Devonian Spinneret

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Hydrofluoric acid macerations of Late Middle Devonian rocks (380-365mya) from near Gilboa, New York, have produced numerous fossils of arthropods. Among these a nearly complete spider spinneret was recently found. Details preserved include about 20 complete spigots, setae, and slit sense organs. While the spigots are similar to those found on mesothele median

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spinnerets, the fact that there are multiple spigots rules out the mesothele clade represented by living <u>Liphistius</u>. The structure of the spinneret itself suggests a rastelloid mygalomorph, but certain features of this group are lacking. The spinneret may be from a representative of an early spider group that has left no survivors.

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The First Paleozoic Pseudoscorpions

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Two specimens of fossil pseudoscorpions have been recovered from Middle Devonian rocks (380-365 mya) near Gilboa, New York. The larger specimen includes the entire animal except for the posterior part of the abdomen; the smaller is of a single pedipalp chela and a single chelicera. The specimens are evidently immature animals and a family assignment would be difficult even based on living material, let alone at this great age. However, it is possible that the two specimens represent different families. These specimens are the only known Paleozoic pseudoscorpions; the order next appears in the fossil record in Oligocene ambers (ca. 35 mya).

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Evolution of Locomotion in Arachnida

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The musculoskeletal anatomy of the prosoma and walking legs of key representatives from all living arachnid orders was surveyed to discover characters for phylogenetic analysis and to reveal evolutionary trends in the locomotor apparatus. The phylogenetic hypothesis suggested by computer-assisted analysis of 62 inter-ordinal characters suggests that the arachnid orders are monophyletic and have the following relationships: (((Palpigradi (Araneae (Amblypygi, Uropygi))) (Ricinulei, Acari)) (Opiliones (Scorpiones (Pseudoscorpiones, Solifugae))). The historical framework provided by the phylogenetic reconstruction reveals apparent patterns in the evolution of components within the locomotor apparatus. These patterns indicate that hydraulic leg extension is the primitive method of propulsion in Arachnida and that extensor muscles are derived. This analysis also suggests a new model for the generation of pressure in 'extensorless' arachnids, which is supported by preliminary electromyographic data from freely walking uropygids.

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The Spiral Embolus: An Archaic Feature?

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The term 'embolus' is used for that part of the genital bulb in spiders where the sperm duct opens. Comstock (1910:182, fig. 25) described three different "types" of emboli, based on their shape and supposed function: the spiral embolus [occurring in many spider families, including Pisauridae], the coniform embolus [e.g., in Araneidae] and a lamelliform embolus [e.g., in Linyphiidae]. The homology of "emboli" in different spider families has never been investigated. The spiral embolus consists of a gutter-like sclerite called truncus and a membranous pars pendula, forming a tube. A spiral embolus can be found in many groups of the Araneoclada. Furthermore, the morphologies of the emboli in <u>Liphistius</u> and <u>Heptathela</u> (Mesothelae) are strikingly similar.

(continued)