AMERICAN ARACHNOLOGY

The Newsletter of the American Arachnological Society

NUMBER 54 January 1997

What's Inside

Dates & Deadlines

- 997 A.A.S. Meeting, 20-23 July, Dickinson, ND USA
- A.A.S. Research Fund 30 November & 30 May; (see past Newsletters for details)
- 1998 C.I.D.A. & A.A.S., 27 June - 3 July, Chicago IL USA
- 1998 Highlands Arachnology Course, late July or early August

AMERICAN ARACHNOLOGY

is the official newsletter of the American Arachnological Society and is distributed biannually to members of the Society. Items for the Newsletter should be sent to the Editor, Alan B. Cady, Dept. Zoology, Miami Univ.-Middletown, 4200 E. Univ. Blvd., Middletown, Ohio, 45042, USA, (513/727-3258, FAX: 513/727-3223; E-mail: CADYAB@MUOHIO.EDU). Deadline for receipt of material for the Spring issue (Vol. 55) is 15 April, 1997. All correspondence concerning changes of address and information on membership in the American Arachnological Society should be addressed to the Membership Secretary, Norman I. Platnick, American Museum of Natural History, Central Park West at 79th St., New York, N.Y., 10024 U.S.A, (FAX: 212/769-5277). Members of the Society also receive the JOURNAL OF ARACHNOLOGY, published triannually.

Report On The 1996 A.A.S. Meeting

The 1996 meeting of the AAS was hosted by Wayne Maddison and Leticia Avilés (and their minions) at the University of Arizona in Tucson, AZ. Those in attendance would agree they planned and ran a fine, well-organized meeting. Thanks to Wayne & Leticia and their hard-working crew (Greta Binford, Gita Bodner, Anne Danielson-Francois, Gina Gelsey, Peggy Gerba, Marshal Hedin, Susan Masta, Vince Roth, and Cora Varas-Vieria).

The 1996 AAS annual meeting took place at the University of Arizona in Tucson, AZ from 28- 31 July. The weather was typically hot and dry, but sporadic rain fell and moderated temperatures at times. Participants from across the United States, Canada, and Europe were treated to interesting field trips, informative paper and poster sessions (53 & 14 respectively), and an enjoyable banquet & auction.

The action started Sunday with a field trip up into the Santa Catalina Mountains. The trip started in the cool morning and wound it's way through the low desert and then up through the various vegetational types to a climate like New England (cool & moist). Those who had light jackets wore them, but this did not last for long. The return to lower elevations found the desert heat had returned. There was a mixer that evening where a taste of Mexico was available, and good conversation was evident. Those who were interested were treated to a variety of video presentations ranging from a vintage spider-and-the-fly cartoon to episodes of "Acorn the Nature Nut".

Paper sessions began Monday and continued through the day. That evening found most out in the desert again rummaging around for various arachnids. Many were treated to their first view of scorpions under blacklights, and some were industrious enough to root-out tartantulas from their burrows. Tuesday's paper sessions were as diverse as the previous day's, featuring a symposium on jumping spider behavior. That evening at the Banquet, all were treated to a good meal and a travel-research presentation by Stim Wilcox about his adventures

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Abstracts of spoken papers

Systematics

Phyxelididae and Udubidae: New Families in the Araneomorphae

Griswold, Charles E. Department of Entomology, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118 U.S.A.

A phylogenetic analysis of major araneomorph clades using cribellate exemplars clarifies the placement of two problematic groups. Phyxelidines (formerly Amaurobiidae) constitute a new family distant from Amaurobiidae with the synapomorphies palpal femoral thorns, modified male metatarsus I, and paracribellar bases that are long and narrow. *Raecius* and *Uduba* (formerly Miturgidae Uliodoninae) are the sister group of Lycosoidea, and represent the new family Udubidae with the synapomorphies male tibial crack, clumped cribellar spigots, a ventroapical process on the male palpal tibia, and an additional tegular process.

Are *Centruroides exilicauda* and *Centruroides vittatus* (Scorpiones: Buthidae) Morphologically Different?

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The morphology of two common scorpions of the southwestern United States and Northern Mexico, *Centruroides exilicauda* (Wood) and *C. vittatus* (Say) is examined and compared. The two species have unpigmented color forms that are indistinguishable without locality data taken into consideration. Both species have been known in the literature under several different names due to differences in pigmentation. *C. exilicauda*, a medically important species, is more commonly known by its junior synonyms *C. sculpturatus* Ewing and its striped form, *C. gertschi* Stahnke. *C. vittatus*, which is not medically important, is the accepted name that includes *C. chisosarius* Gertsch and *C. pantheriensis* Stahnke as junior synonyms. The latter "species" is the immaculate form of *C. vittatus* that is often confused with the similarly immaculate form of *C. exilicauda* in Arizona. Over 200 specimens of each species from various populations and color forms were examined closely in efforts to discover distinguishing characters. At least three characters were found to be good with 70% or greater reliability. One of the characters, patella setation patterns, is statistically compared with a table. Other characters are shown with illustrations.

Morphological and molecular analysis of a cryptic species group: the *Metepeira labyrinthea* clade (Araneae: Araneidae).

Piel, William H. and Nutt, Karen 26 Oxford Street, Harvard University, Cambridge MA 02138

Recent controversy divides taxonomists between those who believe that speciation occurs following fixation of diagnostic characters, and those who believe that speciation results from cladogenesis alone. *Metepeira* is an excellent group to examine these alternative species concepts. While many *Metepeira* species are clearly separated by numerous diagnostic characters, the *Metepeira labyrinthea* clade is almost completely cryptic — putative species lack morphological differences in their genitalia and show high levels of intraspecific variation that conceal interspecific differences. To resolve the difficult taxonomy of this cryptic species group, we collected morphological character data and molecular character data (a 210 bps region of 12S ribosomal mtDNA) for *Metepeira minima* (an outgroup) and 9 specimens in the *M. labyrinthea* clade. Comparison between molecular and morphological phylogenetic trees show that there are, in fact, three separate species, but that these do not correspond to the three names previously attributed to this clade. We conclude that the name *M. grinnelli* should be synonymized with the older name *M. spinipes*; that the name *M. labyrinthea* represents a valid species; and that populations in the mountains of Chiapas represent a new species, "Species A," which has yet to be described. This study illustrates how sampling populations and comparing trees from separate lines of evidence may be crucial in delimiting species and discovering useful characters. While a diagnostic approach to taxonomy fails to discover all three species in this cryptic clade, our historical approach succeeds remarkably well.

A taxonomic revision and cladistic analysis of the hahniids of austral South America (Araneae, Hahniidae).

Catley, Kefyn M. Department Of Entomology, Comstock Hall, Cornell University, Ithaca, NY 14853

Revising the hahniids of austral South America has resulted in the first test of the monophyly of Hahniidae. I critically examine Lehtinen's (1967) contention that Hahniidae comprise three subfamilies, Hahniinae, Cybaeolinae and Cryphoecinae. My analysis renders Hahniidae (sensu Lehtinen) polyphyletic. Cybaeolinae is also paraphyletic, while the evidence indicates that Cryphoecinae is monophyletic. However, the monophyly of the genus *Cybaeolus* is established and the taxon redefined as sister to the rest of Hahniidae. Evidence relating to the evolution of the tracheal system and transverse spinneret topology in hahniids is presented. I also discuss levels of endemicity and phylogenetic uniqueness among temperate South American hahniids as they pertain to the biodiversity crisis in Chile.

Taxonomic Revision and Cladistic Analysis of the Genus *Caloctenus* Keyserling (Araneae, Ctenidae)

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The genus *Caloctenus*, recorded in the literature from the tropics of Africa, America and Asia, is revised and the phylogenetic relationships of this genus with other ctenid taxa are proposed based on a parsimony analysis. The phylogenetic study used 62 morphological characters and included 20 species in eight genera of the Ctenidae and three genera of the Lycosoidea, *Senoculus*, *Phanotea* and, *Machadonia*. The results provide strong evidence for the polyphyly of Caloctenus as previously recognized; therefore the genus is redefined based on various synapomorphies. *Caloctenus*, as here recognized, is restricted to four species from the montane forests of northern South America: *C. aculeatus* Keys., *C. gracilitarsis* Simon, *C. carbonera* n. sp. and, *C. oxapampa* n. sp. The analysis indicates a sister group relationship between Caloctenus and *Gephyroctenus*, a genus known from the Neotropical lowlands. The taxonomic status of seven additional misplaced species and the implications of the proposed phylogenetic hypothesis for the taxonomy of Ctenidae are discussed.

Faunas

Study of spiders of the genus *Latrodectus* (Araneae: Theridiidae) in Middle Asia

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There are three species of the genus *Latrodectus* inhabiting the area from the Kaspian Sea and Lake Zaisan in Eastern Kazakhstan: *L. pallidus*, *L. dahli*, *and L.* sp. The most common and highly distributed species, *L.* sp., was incorrectly considered as *L. tredecimguttatus* before the beginning of our research. At the present time the taxonomical status of this species is being studied. The talk will contain data about distribution of species, phenology, reasons for depression of populations (decreasing density to the minimal level), problems of bites registration and results of various experimental investigations.

A Species Composition of Spiders (Arachnida: Araneae) Inhabiting the Desert Zone of Kazakhstan, With the Analysis of Their Occurrence.

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A species composition of spiders (Araneae) occurring in the arid landscapes of Kazakhstan is given based on the original data and known from publications. At present, the total list contains 501 species belonging to 167 genera from 41 families. The author's collections comprise 350 species (150 genera from 38 families). 79 species, 40 genera and 10 families turned out to be new for Kazakhstan fauna; 21 species of those, together with 10 genera, are found to be new in Kazakhstan-Middle Asian area. The analysis of the species' occurrence is given.

Ohio Spider Survey; progress to date.

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The Ohio spider survey began 21/2 years ago with an initial effort to revise the only existing check-list of species occurring in Ohio. William Barrows (1924) list included 306 species. This list has been expanded by surveying existing spider collections and published lists from Ohio localities as well as reviews of Genera and Families with species that occur in Ohio. In addition, a series of regular collections from sites representing specific habitats have begun. As of this time the list of species verified for Ohio stands at 507. There are doubtless additional species to be added to this list. There are a number of collections that have not been checked. It is likely that species heretofore unreported will be found in the current or future sampling efforts. Comparison of 10 sites where spiders have been relatively intensely surveyed reveals a suite of very common species found at most sites. Many other species have been located at only a few sites. There is not yet sufficient information to determine the limits of distribution for any particular species in Ohio.

Venoms

Behavioral Correlates of Venom Evolution in Hawaiian *Tetragnatha*

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The role of spider venoms in predation or defense strategies varies widely among spiders. Although there is evidence of variation in venoms at low phylogenetic levels, no studies have rigorously analyzed the evolutionary context within which spider venoms have evolved, or determined the rates at which they evolve. Here I identify phylogenetic levels at which variation in venoms exists, and behavioral correlates of that variation in Hawaiian *Tetragnatha*. On the Hawaiian archipelago *Tetragnatha*, a cosmopolitan orb-weaving genus, has undergone a radiation in which a monophyletic lineage, the "spiny leg clade", has abandoned web-building and become obligately wandering foragers. Comparisons of venoms of species representing the orb-weaving and spiny-leg clades of Hawaiian *Tetragnatha* indicate that, in association with a shift in foraging behavior from orb-weaving to wandering, there has been a reduction in the number of chemical components detectable by RP-HPLC. Both orb-weaving and wandering *Tetragnatha* capture flying prey, but wandering spiders also capture non-flying prey. All Hawaiian *Tetragnatha* macerate prey and chewing can begin shortly after prey are seized in the chelicerae. Maceration appears to be used in early stages of prey immobilization to a greater extent for smaller prey (adult Tipulidae) than for larger, more active prey (e.g. adult Lepidoptera). For both small (Drosophila) and large (Pyralid adult) prey, orb-weavers begin chewing sooner and immobilize prey faster than wanderers. A shift in the relative importance of chemical and mechanical factors in prey immobilization associated with the loss of web-building in wandering *Tetragnatha* may have influenced the reduction of components in the HPLC range in which components are detected in the orb-weaving clade.

Survey of Spider Venoms For Alkaloidal Constituents

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Certain spiders produce venoms which contain alkaloid-like small molecule toxins. These alkaloidal compounds are promising models for the design and synthesis of compounds which may be useful in the investigation of the glutamate-receptor and calcium-channel biochemistry. In an effort to identify the spider taxa which produce these alkaloidal compounds, spider venoms were examined by means of thin-layer chromatography. One-hundred eighty-six whole spider venoms representing over 80 genera distributed among 27 families were examined. Two scorpion venoms and one centipede venom were also examined for comparative purposes. Our survey results demonstrate that certain spider families are rich sources of alkaloidal venom components, while other families are devoid of venom alkaloids and produce venoms comprised mainly of peptidal toxins.

The Tarantella in the Medieval Ages: When the Spider Bites, Feet Just Gotta Dance

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In the 13th-17th centuries in southern Italy, a curious human-spider interaction proliferated. It was thought that the deleterious and occasionally deadly bite of the spider could only be ameliorated by sweating the venom out of the body. The physical activity of choice was frenetic dancing accompanied by fast-paced music. It was considered contagious and, in concert with mass hysteria, the dancing spread quickly through the afflicted populace. The dance was known as the tarantella and lives today in traditional Italian folk culture. The causative agents of the tarantella have their origin in the widely spread fields of sociology, psychology, theology as well as toxicology. Although a lycosid was erroneously blamed as the etiological culprit due to its conspicuousness, when a spider was involved at all, it was more likely *Latrodectus tredecimguttatus*, a congeneric of the black widow spider. Analysis of the 20th century toxicology suggests that physical activity may actually assuage the painful symptoms of latrodectism. For legitimate spider-envenomated tarantella participants, dancing may have been a valid palliative for their malady.

Ecology

El Niño Events and Changes in Gnaphosid (Araneae) Abundance: Patterns From the Sevilleta LTER Data 1989-1992

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The Sevilleta Long-term Research Program (LTER) in central New Mexico covers several habitat types, all of which are strongly affected by El Niño Southern Oscillation (ENSO) events (changes in non-summer precipitation amounts). The LTER monitors various plant and animal taxa (including surface-active arthropods) for responses to these changes. These arthropod assemblages probably are only weakly structured by biotic interactions and are good populations in which to look for changes due to abiotic factors, such as climate. I have analyzed data for the gnaphosids, a co-dominant family with the lycosids, across nine Sevilleta habitats for a La Niña, or dry, year (1989), two medial years (1990-1991) and an El Niño, or wet, year (1992). Twenty-four species of gnaphosids have been collected from pitfall traps. The species tended to be widely distributed with most species occurring in five or six habitats. Population numbers varied widely from year to year, although species rankings changed little (that is, dominant species remained dominant). Most gnaphosids declined in abundance from 1989 to 1992, but these abundances followed independent paths through 1990 and 1991. The decline in gnaphosids was part of an overall decrease in spider abundance, although in the other major predator group, carabid beetles, abundances changed little or increased. In this semi-arid system there is a large amount of functional redundancy among the arthropod species, which may ensure continuity in ecosystem function even if species composition changes.

Association of Cursorial Spider Populations With Ecological Succession in Western Michigan (Arachnida: Araneae)

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The composition of ground surface spider populations were studied in three western Michigan plant communities: an old field, representing an early stage in ecological succession, an oak forest, a middle stage, and a beech-maple forest, a late successional stage or climax community. Specimens were collected for eight weeks (8 June-27 July 1995) using pitfall traps. Six pitfall traps were aligned 10 meters apart in each of the habitats. Specimens were identified to species where possible and compared at the levels of species, family, and guild. In comparing the three communities using the Bray-Curtis Index of Similarity, it was shown that all three communities supported highly distinct populations of cursorial spiders. This can be explained by the fact that each community was characterized by a distinct type of vegetation. Earlier studies of similar habitats by Dawson et al. (1988) and Bosworth and Sangster (1989), had shown this dissimilarity and that the middle - successional stage habitat held the greatest biodiversity of cursorial spider species. After a six year interval, we were interested in finding: (1) whether or not the early, middle, and late successional stages still maintained distinct spider populations; (2) whether or not the middle successional stage (oak forest) still had the highest biodiversity, and (3) whether or not the most change had occurred in the early successional stage habitat, and the least amount in the climax community.

Distribution and Abundance of *Spelungula cavernicola* Forster (Araneae: Gradungulidae), A New Zealand Cave-dwelling Spider.

McLachlan, Andrew R.G. Dept. of Zoology, Univ. of Canterbury, Private Bag 4800, Christchurch, New Zealand

New Zealand's sole protected species of spider, *Spelungula cavernicola*, is known only from a few limestone caves in Northwest Nelson, South Island, N.Z. Populations of this large (13 cm leg span) spider were studied in several caves (500 m of passage in total) over 13 months. Spider numbers varied between 111 and 42 during the year, largely in response to spiderling emergence from egg sacs. Timing of laying and of emergence from eggsacs appeared to be a seasonal. *Spelungula* probably takes at least 3 to 5 years to reach mature size and reproduces only slowly. Spelungula do not live in a web, but, very infrequently, some do build an irregular grouping of silk lines that are not thought to be used in prey capture. The main prey is cave weta (Orthoptera: Rhaphidophoridae) that are found throughout the caves, but mostly near to entrances, as is *Spelungula*. It is not known whether *Spelungula* is an obligate cave-dweller or not. Multiple logistic regression of 84 randomly chosen sites showed that *Spelungula* presence was best predicted by presence of cave weta, a prey of *Spelungula*, but not by the presence of any other invertebrates, nor light level, presence of water, distance to nearest entrance, nor relative humidity.

The Influence of Habitat Structure on Spider Densities in No-till Soybean Fields

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The goal of this research was to investigate the relationship between habitat structure, resulting from varying densities of weeds, and spider densities in no-till soybean agricultural fields. Previous data suggest that spiders respond to vegetational structure, and fields which are not tilled tend to have greater vegetational structure due to high densities of weeds. Nine subplots of 1 m^2 were established within each of three 0.42 ha. soybean plots. Weed densities were maintained at High, Medium, and Low levels by differential weeding. Vegetation height and weed density measurements as well as visual spider censuses were taken every two weeks. Across the season more than 87% of the spiders observed were small orb and sheet weavers, mainly the small orb weaver *Glenognatha foxi* and the small sheet weaver *Meioneta micaria*. By the end of the season significantly more web spiders were found in treatments with higher weed densities. When considered separately, both web types had higher numbers in areas with higher weed densities. However if we look at the substrate to which the spiders attach their webs, orb weavers were more likely to attach their webs to weeds in medium density treatments and sheet weavers were more likely to attach their webs to weeds in high density treatments.

Agro-ecology of Spiders: Diversity, Density and Predation on Aphids in Canterbury, New Zealand.

McLachlan, Andrew R.G. Dept. of Entomology and Animal Ecology, P.O. Box 84, Lincoln University, Canterbury, New Zealand

The species diversity of spiders in New Zealand agricultural land is poorly known. In this study, spiders were vacuum-sampled from arable pasture land as well as from adjacent field boundaries, and field-cage experiments were used to investigate the effects of spider predation. Spider density and diversity was highest in field boundaries - 18 species from 11 families (up to 890 per m^2) vs 7 species from 3 families (up to 24 per m^2) in pasture. Introduced European spider species (mainly Linyphiidae) dominated the open-field fauna, while endemic species were more prevalent in the less disturbed field margins. The results from the replicated field-cage experiments investigating the effects of spider density on aphid populations are discussed, along with the prospects for enhancing the contribution of spiders to biological control in farmland.

Has fish predation selected for conspicuous colouration in water mites?

Garga, Neera and Proctor, Heather C. Earl Hall, Queen's University, Kingston, Ontario, Canada, K7L 3N6

In freshwater habitats, dull and inconspicuous colouration of invertebrates is commonplace. A striking exception is water mites, which are often bright red or orange. This conspicuousness is often paired with production of distasteful chemicals. The current explanation for brightness and distastefulness in water mites is that it was selected for by fish predation. If this is the case, water mite species assemblages should be more conspicuously coloured in fish-present bodies of water than in fish-absent bodies of water. The results of an extensive survey of water mite populations in southern Ontario opposes this theory. Fish-absent bodies of water have higher proportions of conspicuously coloured water mites than do fish-present bodies of water. Using a phylogenetic approach, we investigate the role of carotenoids as photoprotectants in the evolution of warning colouration in water mites.

Social Spiders

Sex in the Selfish Herd: Male Competition and Mating Success in Colonial *Metepeira incrassata*

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In the orb-weaving spider *Metepeira incrassata* large colonies show a "selfish herd effect" where central positions are safer from predators and reproductive females there have increased reproductive success. In order to examine patterns of competition among males relative to these spatial differences in female fitness, a study was undertaken using populations of marked individuals. All males in three colonies were captured, measured, and marked with non-toxic paint. Colonies were observed from dawn to dusk for 4 - 7 days each, and all occurrences of guarding, aggression, and mating were recorded. The results show that larger males are more likely to guard and compete for females in the core of the colony than on the periphery. Larger males win more of their interactions, are better able to establish and maintain residency, and are more likely to mate than smaller individuals. Males also spend more time competing per female for those closer to maturity and for females in the core. These results suggest that male *M. incrassata* can perceive both spatial and

temporal components of female resource value and adjust their effort in competition accordingly.

Colony size and individual fitness in the social spider *Anelosimus eximius*

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We investigated the effects of colony size on different components of fitness in the social spider *Anelosimus eximius* (Araneae: Theridiidae). By monitoring and periodically censusing natural and artificially-established colonies of this species at a tropical rain forest site in eastern Ecuador, we investigated the effect of colony size on colony survival, the proportion of egg-laying females, the number of eggs laid in a clutch size, and the incidence of egg sac parasitism. We found that the mean life span of the colonies and the number of eggs laid in a sac increased with colony size, while the proportion of egg-laying females decreased with colony size. The presence of egg sac parasites that decreased the number of eggs that could successfully eclose from a sac complicated somewhat fitness estimates. In colonies ranging in size from 1 to 165 females, we estimated directly the per capita growth rate by dividing the total number of offspring that reached maturity in each colony by the number of females in the parental generation. If survival and fertility effects are taken into account, the per capita growth rate, and, thus, the average individual fitness, was found to be highest at intermediate colony sizes. Selection, therefore, should favor group-living and intermediate colony sizes in this social spider.

Facultative group-living in pholcid spiders: how hunger and body size affect the decision to remain in a group

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Holocnemus pluchei is a species of pholcid that sometimes lives alone and sometimes in groups. In previous work I documented that small group-living spiders lose food to larger competitors; on the other hand, they do not have to invest energy in web construction. I tested whether a small spider's energy level influences its decision to stay in a group web or to build a solitary web. I predicted that well-fed small spiders should invest in building their own webs in order to escape competition, while starved small spiders should stay in a group. Instead, I found that the strategy depends not only on energy level, but also spider instar. Counter to prediction, second-instar starved spiders built their own. This pattern gradually reversed in later instars; by the fifth instar, starved spiders stayed in groups and fed spiders built their own webs. A series of possible explanations are under test.

Prey Size Affects Group Survival in the Social Spider, *Anelosimus eximius*

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Previous work with the social spider *Anelosimus eximius* (Araneae; Theridiidae) has shown that the consumption of large prey sets up an asymmetry in size and reproductive ability of adult females. As a continuation of that study, small colonies of ten females were maintained on one of two feeding levels (high prey or low prey) with each of two prey sizes (house flies and fruit flies). After four weeks, morphological data were taken on each group to provide a measure of condition, the spiders were provided with an abundance of food for 48 hours and remeasured. Groups in both high prey treatments were well-fed based on our condition index however the variance in hunger was higher for groups fed the larger houseflies. In the low prey treatment, more than 80% of the spiders fed fruit flies were very hungry as judged by our index and did not feed when provided with a mixture of prey. Spiders in these groups began to feed and became active colony members only after they were moved to larger groups which had some less hungry individuals. Over 40% of the spiders in the groups fed the larger house flies at the low prey level remained in good condition by our index. When provided with a mixture of prey for 48 hours, these groups were all able to recover and feed. These data support the concept that the capture of large prey by this species sets up an asymmetry in access to food which allows some groups to survive low prey circumstances where groups feeding on small prey would not. The difference in the ability of groups fed large vs. small prey to recover from four weeks at low prey levels is evidence that differential group survival is an important aspect in the life history of this species.

Attack Strategies of Predatory Wasps on Colonial Orb-Weaving Spiders

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Predatory wasps in two families (Pompilidae, Sphecidae) capture spiders that the wasps paralyze and provide as a living food source on which their offspring develop. Little is known about the dynamics of predatory interactions between the wasps and their spider prey. While studying colonial araneid spiders (*Metepeira incrassata*), I determined that pompilid and sphecid wasps differ significantly in their attack strategies. In response to wasp attacks, the antipredator defense of spiders is to drop from their webs attached to a dragline. This mode of escape is successful against many wasp species, but is exploited by one pompilid. The general attack strategy of the three pompilid wasp species observed is to hunt throughout the large 3-D spider colonies, to attack a large number of spiders per predatory bout, and to follow large spiders which drop from their webs to the ground. *P. mixtus* exploits this escape behavior and actively induces spiders to drop from their webs, as it effectively tracks the spiders as they drop and captures them on the ground. In contrast, the four sphecid wasp species observed hunt only on the periphery of colonies, attack relatively few spiders per predatory bout, and attempt to sting spiders before they drop from their webs as they never follow the spiders to the ground. Differences in the wasp's predatory behavior is due to constraints of multiple (sphecid) versus single spider (pompilid) provisioning of nests. These characteristic differences in the behavior of different wasp families point out the need for arachnologists evaluating effects of wasp predation to take into account what types of wasps they are observing.

Jumping Spider Behavior Symposium

Experimental Studies of Mimicry Systems Involving Jumping Spiders (Araneae: Salticidae)

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Mimicry studies have been a popular aspect of natural history investigations. Anecdotal accounts are common, but detailed observational studies are rare. Also, there have been few experimental investigations of mimicry systems involving jumping spiders, beyond preliminary work. In 1976 Vane-Wright provided a classification of mimicry systems and operational definitions of these systems. The experimental studies that have been done are reviewed in the lights of Vane-Wright's paper, with suggestions for future work.

Phidippus (Salticidae) Phylogeny: Analyzing the Contributions of Behavior and Behavior-Associated Morphology to Species-Group Relationships.

Edwards, G. B. Florida State Collection of Arthropods, FDACS, Division of Plant Industry, P.O.Box 147100, Gainesville, FL 32614-7100 USA

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Morphological characters associated with male visual courtship, as well as behavioral elements of individual species courtships, were identified and analyzed for their contributions to the overall phylogeny of the genus. Examined were morphological characters of the chelicerae, clypeus, eye region, palps, and legs I of the male. Courtship characters included movements of the palps and legs I. Subgroups of the *P. putnami* and *P. mystaceus* groups were best

defined by courtship-related morphological characters. Not surprisingly, these two subgroups also had the most distinctive courtships.

Tales of Deceitful Derring Do: VersatileHunting Strategies of the Aggressive Mimic Jumping Spider *Portia*

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Species of the aggressive mimic jumping spider genus *Portia* use a wide variety of ploys to prey upon virtually any other species of spider available in their respective ranges. These ploys include cursorial hunting and web invasion. Web invasion involves luring by signaling, including particular signal combinations associated with particular web types, signal choice by trial and error learning, and imitation of at least one heterospecific mating signal. *Portia* also uses detour behavior to capture prey. These versatile ploys likely evolved through selective pressures such as the dangers of invading webs of dangerous prey, and the problems of invading webs of some species of spiders leave their webs after recognizing the presence of *Portia* on the web by simply sensing *Portia* walking on the web.

The Courtship of a Kansas Population of *Habronattus borealis* (Araneae, Salticidae).

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The male jumping spiders of the coecatus group of the genus *Habronattus* are known for their often long and complicated courtship displays. In most species in the group there are modifications of the third pair of legs, with the femur and patella-tibia often involved. *Habronattus borealis* lacks the modifications on the third legs and so it was thought that they would not display them. To test this hypothesis the authors independently observed courtship in individuals collected on the campus of the University of Kansas. Surprisingly, the males not only did not display the third legs, but appeared to have mostly eliminated courtship completely. A comparison with filmed courtship (loaned by Gail Stratton) of the same species from Michigan, shows that in southern Michigan at least, the courtship is more "normal", with the male "displaying" the third pair of legs as if there was some ornamentation.

The Evolution of Alternate Male Strategies in the Dimorphic Jumping Spider, *Maevia inclemens*.

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The two male morphs of *M. inclemens* differ dramatically in appearances. The tufted morph has black body coloration, with white legs and three tufts of setae on the anterior cephalothorax. In contrast, the gray morph lacks the tufts, has a striped body coloration, with orange colored pedipalps. In addition to morphological differences, males normally court females from different distances (gray morph at 3 cm; tufted morph at 9 cm). For this study, female choice for males courting at various distances (4 - 24 cm) was tested. Computer-animation was used to standardize versions of courting males. No mating preferences for either morph were observed at any distance (Chi square tests; $P > 0.5$) and females preferred the first moving male at close (4 cm; $P < 0.01$) and far distances (16, 24 cm; $P < 0.01$). However, at 8 cm there was no preference for first male movement ($P > 0.2$). Predation risk on males by females and by an +undetected+ predator (*Phidippus audax*, a larger, sympatric jumping spider) was also tested. Female attacks only occurred at 4 cm and 75% were toward the tufted morphs. Using 3-dimensional computer-animated courting males, as viewed from 45 degrees above the males, *P. audax* detected the gray morph at significantly further distances than the tufted morph. These results suggest that male morphs court at different distances to: (1) reduce competition with the opposite morph; (2) increase their probability of choice by the female; and (3) reduce predation risk by females or other predators.

Evolution of courtship in the jumping spider genus *Habronattus*

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Jumping spider species of the genus *Habronattus* show a diverse array of complex male courtship behaviors and associated morphological modifications ('ornaments'). The large size of the clade (about 100 described species) and richness of behavioral diversity make the group a promising one in which to find phylogenetically repeated patterns of behavioral evolution. A survey across the genus has so far yielded courtship observations for about 50 species. Preliminary analysis of these data using Griswold's 1987 cladogram hints at several possible patterns: (1) Ornaments held peripherally by males (above the body or to the side) are consistently black-and-white, in contrast to the often-colorful central ornaments (face, palpi, base of first legs). This may reflect a constraint in the female sensory system, for instance color-insensitivity in peripheral vision (side eyes) or motion-detection pathways. (2) Motions of these peripheral ornaments appear to be associated with stridulatory motions of the abdomen. In other respects as well, groups of features (ornaments, poses and motions) appear to operate in concert as if for emphasis (e.g., some species emphasize "wideness" in form, pose and motions, while others emphasize "verticalness"). (3) In three independent cases there has been a more or less complete evolutionary loss of ornaments, but in each case the behavioral elements of their more complexly-ornamented ancestors are at least weakly maintained. There are no clear cases of the reverse (loss of all special behavioral elements with retention of morphology). More detailed analysis will depend on further refinement of our understanding of the phylogenetic relationships. Griswold's phylogenetic analysis was based on a good number of appropriately varying characters, but many are courtship-related, which could mean, for instance, that any errors in the cladogram could introduce systematic biases in how courtship evolution is interpreted.

Diversification and Evolution

Adaptive Radiation in Spiders as Demonstrated by A Null Markovian Model

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Adaptive radiation is commonly invoked to explain the disparate diversity among major animal lineages and the success of a large clade is often attributed to one or more key innovations unique to that lineage. However, these evolutionary paradigms are poorly tested even the best known groups, such as birds, anoline lizards, and orb-weaving spiders. We test the hypothesis that adaptive radiation has contributed to the diversity of the order Araneae by determining if the number of un balanced clades (those whose species numbers differ by 90% or more) exceeds the number predicted by a null Markovian model. The current phylogeny of spider families contains 74 bifurcating nodes, of which 32 were unbalanced. As this is significantly more than the 14.8 expected unbalanced nodes, some of the diversity within the Araneae can be attributed to some deterministic cause (e.g. adaptive radiation). One of the more highly unbalanced (97%) bifurcations divides the orb-weaving spiders into the Deinopoidea and Araneiodea. The Deinopoidea construct horizontal orb-webs that contain cribellar capture threads, whereas vertical orb-webs that contain viscous adhesive capture threads are synapomorphies for the more diverse Araneoidea. As this transition involves changes in spider morphology and behavior, as well as in silk features and web performance, it can be viewed as a shift in "adaptive zone" (sensu Simpson) and the features that characterize the Araneoidea can be considered "key innovations".

Population Genetics of Incipient Speciation in Two Species of Jumping Spiders (Salticidae:*Habronattus*)

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In southeast Arizona, populations of two closely related species of jumping spiders appear to share similar histories of isolation due

to habitat fragmentation. The climate here has changed dramatically in the past 10,000 years, resulting in distributional changes in plant communities. Woodlands formerly stretched across lowland areas that are now desert. Today, isolated mountain ranges, the so-called "sky islands, "support disjunct patches of oak woodland (above 1500 m) and pine-fir woodland (above 2100 m). The jumping spider *Habronattus pugillis*, found in oak woodland, shows striking variation among mountain ranges. Males from different ranges differ in coloration of the face, palp, and legs, and in their courtship displays. In contrast, populations of *Habronattus oregonensis*, found in pine-fir woodland, show very little divergence. These observations are puzzling. Given that populations of each species have been isolated from their widespread ancestral populations for similar amounts of time, why should one species display much greater morphological divergence? I am using gene genealogies to determine what population genetic factors may account for this odd situation. Factors that may have promoted divergence in *H. pugillis* include selection, population bottlenecks, or accelerated mutation rate. Alternatively, migration of *H. oregonensis* among ranges may have reduced its morphological differentiation. I am comparing the genealogies of both species using mtDNA sequences from individuals collected from various ranges. Sequencing a non recombining neutrally evolving gene and comparing topologies of the genealogies allows me to infer some of the population genetic forces that have shaped the history of these species. My data so far suggest that a shorter generation time in *H. pugillis* may account for its greater divergence. This scenario makes sense ecologically, as *H. pugillis* inhabits lower latitudes and elevations where the reproductive season should be longer.

Mating Signal Divergence between Populations of *Habronattus americanus* (Salticidae) and its Close Phylogenetic Relatives

Hedin, Marshal and Maddison, Wayne Dept. of Ecology and Evolutionary Biology, University of Arizona

The *Habronattus americanus* species group, including 10 species distributed primarily in the western United States, represents a potential gold mine for students of speciation. These jumping spiders show striking differences both within and between currently recognized species, particularly in characteristics of male morphology and courtship behavior. These traits likely comprise part of the mating system facilitating successful copulation between members of the same population (species). Hence, their divergence may be the first involved in the creation of prezygotic reproductive isolation, and by studying the evolutionary forces underlying this divergence, we may gain insight into the initial stages of the speciation process. In this talk we will present data on patterns of male morphology and courtship behavior variation across populations of *H. americanus* and its close Phylogenetic relatives (including *H. sansoni, H. bulbipes, H. waughi*, and other novel populations). In addition, we will present a phylogenetic hypothesis for these populations, derived from analysis of mtDNA sequences. Finally, patterns of mating signal variation, viewed in light of phylogenetic evidence, will be used to interpret rates and patterns of character divergence. The relationship between this character divergence and its potential role in population divergence and speciation will be discussed.

Reproduction and related behavior

The Costs of Reproduction in the Wolf Spider (*Schizocosa ocreata*)

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I examined the costs of reproduction in *Schizocosa ocreata* by measuring sprint speed during four reproductive stages: pre egg sac, carrying an egg sac, carrying offspring, and post dispersal of offspring. The spiders were raced down a 1m track and four 25 cm sprint speed times were recorded. The fastest 25 cm time per spider at each reproductive stage was taken as the maximum sprint speed. The data indicate that sprint speed decreases in all stages following the pre egg sac stage. The sprint speeds of females carrying offspring were found to be the slowest of all stages. Sprint speeds of females carrying an egg sac and in the post dispersal stage did not significantly differ from each other. The results indicate that there is a cost associated with reproduction and it varies among reproductive stages regardless of female investment made in reproduction.

Resource Defense Polygyny in *Leiobunum vittatum* Say 1821 (Opiliones, Leiobunidae).

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A population of *L. vittatum* was studied in Eastern Pennsylvania during three complete mating seasons (late September through early November, 1993-1995). Every year, most of the population was measured and tagged for individual recognition. Behavior and position of each individual were also recorded. Sex ratio was estimated to be approximately 1:1, although a male biased sex ratio was observed in the field most of the time. Males defended territories against other males, territories were rocks on the ground usually covered by moss. Males were faithful to their territories, often for several days. Females moved randomly among territories and were never observed fighting. When a female entered a territory, the resident usually tried to copulate, and typically succeeded. Females occasionally rejected males, even when intensively harassed. Mating consisted of repeated copulations over a period of up to one hour. Both males and females could mate with more than one individual within minutes. Mating disruption by intruding males was common. After mating, males guarded females during oviposition for as long as the female remained in the territory. Females laid eggs in the moss layer. A larger proportion of females were known to mate, when compared to males. *L. vittatum*'s main sensory mechanism seems to be tactile. It is suggested that males defend rock territories to increase their chances of being found by females, which look for the moss growing on rocks as oviposition substrate. In doing so, females find mates as well. If this is the case, large rocks should represent better mating stations than small ones, as they are more likely to be found by females. More male fights should be observed on large territories as well. Data on mating and fighting behavior supported these hypotheses. During fights, resident males usually defeated intruders, and female-guarding residents usually defeated non guarding residents and intruders. When fights were symmetrical in terms of residence or guarding status, size was a weak predictor of the outcome.

Females Cannibalize Only When Hungry Despite Male Sacrifice in Redback Spiders

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During copulation, the male redback spider (*Latrodectus hasselti*) 'somersaults' and places his abdomen directly over his mate's mouthparts. This facilitation of sexual cannibalism is adaptive for male redbacks, who can increase their paternity by being eaten. However, despite the vulnerable "somersault' posture, males are not always cannibalized. Females consumed males during 65% of copulations I observed in nature. Through a field experiment and observations, I evaluated three hypotheses to explain this variation in female cannibalistic behaviour. Observations indicated that cannibalism did not occur because females sometimes mistook males for prey (hypothesis 1, 'mistaken identity'), nor did females use cannibalism to reject less fit males (hypothesis 2, 'mate rejection'). However, when I supplemented the natural diet of a subset of females, I found that satiated females were less likely to eat their mates (hypothesis 3, 'feeding opportunism'). It appears that diminutive redback males are below the prey size that well-fed females usually accept. Nonetheless, cannibalism occurs frequently because females are typically hungry in the field: the average condition of a sample of field-collected virgin females was less than half their estimated satiation level. These results indicate that, although males facilitate sexual cannibalism, their fate depends on the female's physical condition.

Reproduction and Growth in the Scorpion *Vaejovis waueri*

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The scorpion *Vaejovis waueri* is a small, dark-colored species which occurs in extreme southern and western Texas and northern

Mexico. Previously, I have reported on reproductive investment for a west Texas population (from Chandler Independence Creek Preserve) during one reproductive season. Here, I consider reproductive investment over a five-year period (1992-1996) as well as growth rates of laboratory-reared individuals. The measured reproductive variables (post-dispersal female mass, average offspring mass, litter size, total litter mass, relative clutch mass) all show significant among-year variation; however, the patterns of interrelationships among these variables are more consistent on a year-to-year basis. Growth rates also vary substantially, both among and within litters, with a large amount of overlap between successive instars in the morphological traits measured (carapace length and metasoma segment V length). Individuals mature at either the sixth or seventh instar, with the juvenile stage lasting a minimum of 18 months. Females are generally larger at sexual maturity than males and may be the only sex to mature at the seventh instar.

Mating Preference and Habit of a Long-Jawed Spider, *Tetragnatha elongata* (Tetragnathidae).

Danielson-Francois, Anne and Smallwood, Peter Ecology and Evolutionary Biology, University of Arizona, Tucson

Mating preferences of both male and female *T. elongata* from Delaware County, Pennsylvania are examined. There is a wide range of body size and weight in both sexes of *T. elongata* which allows for useful comparisons of male preference versus female preference with regards to differences in overall weight.

Size and Aggressive Behavior in Male-male Contests Among Wolf Spiders

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In agonistic contests in various animal taxa - including spiders -larger individuals tend to have an advantage. A size difference of 10% often predicts an advantage in contests among web-building spiders, where vibratory signals are used to assess relative weight and presumed fighting ability. However, fighting behavior involving a variety of signals is also typical of male-male interactions among wolf spiders, where there is no web or fixed territory to defended. Thirty male-male pairings of *Schizocosa ocreata* and *S. rovneri* tested the effect of size differences on the outcome of agonistic encounters. For each species, 15 trials paired males differing in body mass by < 10%, and 15 trials by > 10%. Comparison of are treat index score for each member of the pair determined contest outcome. Relative mass was important in determining trial outcome in both species overall, but outcome (win, lose, draw) was independent of a 10% size asymmetry. Smaller spiders tended to have a disadvantage in encounters, but aggressive behavior may overcome a size disadvantage. Analysis of behaviors shows that winners perform significantly more aggressive and persistence behaviors than losers and stalemates. While size may have predictive value in wolf spider interactions, other aspects of aggressive behavior may also play important roles.

Foreleg ornamentation and the efficacy of visual courtship communication of male wolf spiders (Araneae: Lycosidae)

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Mate recognition is crucial for the survival and reproductive success of spiders. In wolf spiders (Araneae: Lycosidae) mate recognition signals may include visual, vibratory, chemical, and tactile cues. This study examines the visual signals of *Schizocosa* wolf spiders and the effect of male foreleg ornamentation on the efficacy of courtship communication. The relative importance of visual and vibratory cues used by males in communication during courtship of four species within the genus *Schizocosa* varied as predicted, based on the occurrence of ornamentation and/or leg waving displays. Using video imaging techniques, the foreleg morphology of courting males from each species was altered in three ways (1) males lacking pigmentation or leg decorations, (2) males with pigmentation only, and (3) males with pigmentation and decorative leg brushes. These video images were shown to conspecific females, and receptivity to each image was scored and analyzed to test the hypothesis that ornamentation is an amplifier of male leg waving displays. Results support the hypothesis in part, as receptivity of females varied with video stimuli in the majority of species. The varying role(s) of visual and vibratory cues in courtship among these species will be discussed.

Foraging Sensory Biases: Implications For the Evolution of Courtship Displays in Wolf Spiders (Lycosidae)

Persons, Matthew H. and Uetz, George W. Department of Biological Sciences, ML 0006 University of Cincinnati, Cincinnati, OH 45221

One hypothesis for the origin of species-specific courtship is that it arises from sensory modes presently adaptive in another context such as foraging. Krafft (1982) suggested that there is congruence between the sensory channels used in prey detection and those used in courtship signaling among spiders. Male wolf spiders use visual and vibratory signals to elicit female receptivity. Female lycosids of different species have distinct sensory biases for the visual and vibratory components of the male display. This study tests the hypothesis that the sensory biases occurring in the courtship of four congeneric wolf spiders (*Schizocosa ocreata, S. rovneri, S. duplex*, and *S.* spp.) also exist in foraging behavior. To test for sensory for aging bias, spider foraging patch residence time and predatory lunging behavior was measured in the presence of combinations of visual and vibratory stimuli. Results are not consistent with the hypothesis. All four species exhibited tendencies toward a visual foraging bias despite biases for the vibratory component of the male courtship display in three of the species. The lack of congruence between foraging and courtship biases may be explained by strong selective pressure on males to inhibit the predatory response of females during courtship.

Water Mite Courtship Behavior and the Sensory Trap Hypothesis: Effect of Adding New Taxa to the Tree

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The sensory trap hypothesis for the evolution of male courtship characters suggests that males capitalize on pre-existing tendencies of females to respond to certain stimuli. Female sensitivities may evolve in non-sexual contexts (e.g. foraging) and be exploited by males later in a clade's evolutionary history. Proctor (1991, 1992) tested the sensory trap hypothesis for the evolution of leg-trembling in male water mites of the family Unionicolidae using both behavioral and phylogenetic studies. Although there was strong behavioral evidence in support of the hypothesis, the phylogenetic test was ambiguous, possibly because the tree was restricted to North American taxa. I have since observed the behavior of several Australian genera and subgenera and have added their characters to the tree. Results are disappointingly obfuscatory.

Asymmetry in A Male Secondary Sexual Character Influences Female Receptivity in Wolf Spiders

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In *Schizocosa ocreata*, conspicuous foreleg tufts of the male are critical in signalling during courtship and agonistic interactions. Field studies reveal that asymmetry in these tufts may take two forms: a) regenerative asymmetry - when one foreleg is autotomized and regenerated, the new forelg lacks the characteristic tuft; and b) fluctuating asymmetry (FA) - random deviations from perfect left-right symmetry. Analyses of morphology of field-collected males

suggest that asymmetry is negatively correlated with body condition. Females show reduced receptivity to males with regenerative asymmetry, which causes gross asymmetry in this important signalling character. However, female receptivity in response to intermediate levels of variation in symmetry of live males has been difficult to analyze, as FA may covary with body size, condition and/or behavioral vigor. We used video imaging to manipulate tuft asymmetry on a continuous loop of a courting male spider. With the confounding effects of male size and vigor held constant, female spiders exhibited reduced receptivity responses to all asymmetric video images. Results suggest that asymmetry in this male secondary character is an important criterion in mate choice.

Functional and Behavioral Biology

Host Species Influences Foraging Behavior in *Argyrodes trigonum*

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Argyrodes trigonum utilizes a variety of host species for foraging. Since host web structure and defensive behavior differ for different species, *A. trigonum* would be expected to modify its behavior depending on the species of host with which it interacts. The purpose of this study was to examine the foraging behavior of *A. trigonum* in the webs of two of its host species, *Neriene radiata* and *Achaearanea tepidariorum*. Spiders were kept in ten gallon aquaria each containing a single juvenile host spider and a juvenile *A. trigonum* individual. Observations of positions and interactions between *A. trigonum* and the host spider were recorded every 24 hrs. for 7 to 8 days. *A. tepidariorum* webs were invaded by *A. trigonum* more frequently than *N. radiata* webs (67% of *A. tepidariorum* webs compared to 25% of *N. radiata* webs). Invasion of *N. radiata* webs mostly led to host emigration and >50% of these led to invasion and host emigration from a second web; however only 2 host spiders were preyed on out of 187 observations. Invasion of *A. tepidariorum* webs mostly led to web sharing and was considerably more frequent for this host (38.5%) compared to *N. radiata* (0.08%). Invasion of *A. tepidariorum* webs rarely led to host emigration or predation. These data suggest that juvenile *A. trigonum* are more likely to behave as kleptoparasites of *A. tepidariorum* and as web stealers or (inefficient) predators of *N. radiata*.

Sprint Speeds of Scorpions: Among Family Differences and Parent Offspring Correlations.

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Fleeing from scorpions is a critical part of the defensive repertoire of scorpions. We examined sprint speed of juvenile scorpions and its relationship to the speed of their mothers. Speeds of juvenile scorpions, *Centruroides vittatus*, and their mothers were examined by repeated trials using racetracks. Individual juvenile speed was consistent across trials within individuals and differed significantly among individuals and families (litters). Juvenile sprint speeds were also significantly correlated to the speeds of their mothers. We suggest that scorpion sprint speed may be subject to selection and that there maybe an underlying genetic basis to observed differences in sprint performance among scorpions.

The Physics of Locomotion at the Water Surface: Data from the Fisher Spider, *Dolomedes triton*

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Kinematic studies in our laboratory have shown that a fisher spider (Pisauridae) can achieve relatively high accelerations on the watersurface despite the hydrophobicity of its legs and the consequent lack of intimate contact between the legs and the water. In the present study, we sought to distinguish among three hypotheses that could explain the source of the resistance encountered by the rowing legs (pairs II and III) as they sweep backward, propelling the spider forward. The hypotheses are as follows: (1) resistance to the motion of a leg results from the generation of a bow wave, and the work required to move against this wave provides the'purchase' needed by the animal to skate across the water (Denny 1993, p.282); (2) resistance to the motion of a leg arises from drag produced when the leg-cum-dimple moves through the water; and (3) resistance to the motion of a leg comes from the distortion of the dimple and the dimple's tendency to return to its usual symmetrical shape. In two experiments, we measured the forces produced when a water solution flowed past a stationary leg segment: in the first experiment, we varied the concentration of EtOH in the solution from 0% to 10%, causing the surface tension of the solution to decrease and the kinematic viscosity of the solution to increase; in the second experiment, we varied the concentration of SDS (a detergent), causing the surface tension to decrease but leaving the solution's kinematic viscosity unchanged. The results of these experiments revealed that, at water (or leg) velocities < 0.2 m/s, it is the drag produced when the leg-cum-dimple moves through the water (hypothesis 2) that is responsible for the ability of fisher spiders to move across the surface of water.

Irritation From Ingestion of the Urticating Hairs of Tarantulas

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New World tarantulas of the family Theraphosidae have abdomens with areas that are covered with urticating hairs. There are four such hair types found on different species, with a fifth type found on the pedipalps. Their purpose is protection against predation and parasitism. Type I hairs, because of their small size, are for aerial dispersal to a predators nasal mucosa. Type II hairs are woven into egg sacs for protection of the eggs from larval parasitic flies. Type IV and V hairs are possibly involved in respiratory inflammation for protection from predators. Type III hairs are probably the most potent in defense due to their considerable length and sharp pointed ends. The hairs are kicked into the predator's face causing eye and nasal irritation. This study examined whether ingestion may cause irritation that could possibly lead to avoidance of tarantulas as prey. Three naive rats were each introduced to a tarantula of the species *Paraphysa manicata*, which has type III and IV hairs. Two of the rats immediately attacked and ate the tarantula, while the third received hairs in the face and refused to eat. The two that each ate a tarantula had become less responsive and shivered and were sacrificed 12 hours following ingestion. They had red welts on their tongues which appeared swollen. The tongues were examined microscopically after preparation and H & E staining and urticating hair fragments were found throughout the epidermis of the tongue, some in the lower connective tissue, and several in the muscular layers. Neutrophils and macrophages were observable around the hair fragments suggesting inflammation. This evidence supports the avoidance hypothesis: a predator that ingests a tarantula bearing type III hairs will incur irritation and be more likely to avoid tarantulas as prey, or the must use complex learned behaviors in order to eat tarantulas safely.

Responses of *Argiope trifasciata* to Sub-lethal Exposure of Malathion in the Field

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Increased use of biological control methods as part of Integrated Pest Management schemes require an understanding of how potential control agents are affected by applications of agricultural chemicals. Laboratory tests have shown a variety of spiders experience changes of prey capture, courtship, locomotor, and web building behaviors following exposure to malathion. To see if similar results occur in the field, groups of *Argiope trifasciata* established in six 5X5 m experimental enclosures in a soybean monoculture were either sprayed or individually dosed with 10 ppm malathion. Those spiders exposed to the pesticide had decreased long-distance movements, spun smaller, less viscid webs, and produced fewer egg sacs. Treated spiders delayed laying eggs, and some were killed by frost before oviposition. These changes of locomotor and web building behaviors and apparent retardation of egg maturation may be related to malathion's influence on the central nervous system and that system's close integration with endocrine function. Thus, the pesticide may have both nervous and hormonal effects.

Common threads, broken patterns: tracing the evolution of arthropod silks

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While the ability to produce silk has been lost and regained multiple times in the insects, both primitive and derived spiders spin silks throughout their lives. A phyletic comparison of silk producing systems across arthropod taxa suggests two pathways to their evolution: (1) via a surficial gland system, derived from epidermal cells, or (2) via a systemic gland system derived from the crural glands of an onychophoran-like ancestor. While spiders retain and produce silks in both types of silk glands concurrently, insects in different orders produce silks via one system only. For example, the Embiidina produce silks via a surficial gland system whose glands are derived from epidermal cells in insect foretarsi, while the Lepidoptera produce silks via a systemic system derived from larval labial glands. In contrast, spiders produce silks via the piriform gland systems likely to be surficialin origin as well as the ampullate and tubulliform systems whose origin is likely to be systemic. Spiders are further distinguished from insects by their muscular and innervated spinnerets and spigots that allow them control of the diameter of silk threads, its protein composition and the rate that it is spun. Because of their unique sensory feedback systems, spiders are able to directly affect the proteins' physical and mechanical properties through the evolution of diverse silk spinning behavior.

The Material Cost of Capture Thread Stickiness and the Evolution of Spider Orb-webs

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Over 95% of all orb-weaving spider species produce viscous adhesiveprey capture threads. Relative to the volume of material they contain, these threads are 13 times stickier than the dry cribellar capture threads produced by members of the orb-weaving family Uloboridae. Neither spider size nor spinning anatomy limit an orb-weaver's ability to produce stickier cribellar threads, as demonstrated by the greater stickiness of threads produced by small uloborids that construct much reduced webs. Instead, the greater material cost of achieving cribellar thread stickiness appears to have constrained the size of cribellate orb-weavers and the stickiness of their threads and to have favored the origin and success of adhesive orb-weaving spiders.

Functional Similarities of Spider Webs With Diverse Architectures

Opell, Brent D. Department of Biology, Virginia Tech

Measurements of the diameters and lengths of silk fibers that form the sticky cribellar prey capture threads and non-sticky support threads in webs produced by members of the family Uloboridae were used to determine the volume of silk these webs contain. A transformational analysis of the relationship between spider size and the silk volume and total stickiness of webs produced by four orb-weaving species and four species that spin simpler webs shows that, despite differences in web design, web monitoring behavior, and spider size, a web's total silk volume is directly related to spider weight. A web's prey capture potential, as determined by its total stickiness and total capture area, is also directly related to spider weight. The volume of silk fibrils responsible for a web's stickiness is related to spider weight, whereas the volume of its support elements is not, but appears instead to be influenced by web orientation and architecture. Thus, a spider's energetic requirements appear to set the bounds within which the material investment, stickiness, and architectural details of its web are free to differ.

Life history and growth

Growth Trajectories of Spiders: A Quantitative Genetics Perspective.

Klawinski, Paul Dept. of Biology, Box 19498, University of Texas at Arlington, Arlington, TX 76019-0498

In spiders, adult body size has been shown to be correlated with male mating success, fecundity and offspring size. The degree to which adult body size is influenced by heredity and earlier developmental stages is currently poorly understood for a variety of taxa, including spiders. If body size at each instar is treated as a discreet trait, the heritability of these body size traits and their genetic correlations with one another can be measured. Genetic correlations are especially important because selection acting at one instar may affect the phenotype of the individual at other instars if genetic correlations do exist. I examined the genetic basis of body size for a single generation of wolf spiders (*Schizocosa ocreata*). Each individual was measured at each instar and heritability for body size at each instar as well as genetic correlations among body sizes at different instars were calculated and tested for significance. Heritabilities were significantly different from zero for all instars except one and genetic correlations among body sizes at different instars were high and positive. Thus selection acting on body size at any instar will lead to similar changes in body size at any other instar.

The Effect of Sugar Feeding on Survival and Molting in Running Spiders

Taylor, Robin M. and Foster, Woodbridge A. Research Center, Ohio State University, 1314 Kinnear Rd., Columbus, OH 43212

Our field observations on nectar feeding in three genera of running spiders suggest that plant nectar may contribute substantially to their survival and reproduction. In addition to sugars, nectars often contain amino acids, lipids, vitamins, and minerals. But laboratory experiments with the extra floral nectar of Terminalia suggest that survival is most affected by the nectar's sugar component. One species of newly-hatched spiderlings lived equally long on diets of nectar or sucrose at the same concentrations, and more than half in each group molted at least once. Yet, their survival was significantly lower on a diet of less concentrated sugar, and only half as many molted, once only. Juveniles raised on a diet of insect prey lived nearly twice as long when also given access to sugar. For another species of newly-hatched spiderlings receiving an alternating diet of insect prey and sugar, survival and molting success were significantly affected by the timing of their access to each food item. In this same species, virtually all control spiderlings receiving prey alone died without molting.

The Phylogenetic Basis of Sexual Size Dimorphism in Orb Weaving Spiders

Hormiga, Gustavo and Coddington, Jonathan A. Department Of Biological Sciences, George Washington University, Washington, DC 20052

Following Darwin, most authors have assumed that sexual size dimorphism in spiders was male dwarfism: from monomorphic ancestors males evolve to a smaller size relative to females. The golden orb spider, *Nephila clavipes*, is the most famous example: adult males are up to eight times smaller than adult females. Here we provide comparative data that suggest that the most frequently studied cases in spiders, including *Nephila*, represent female gigantism, not male dwarfism, although male dwarfism does occur. When placed in a phylogenetic context the data show that females grew larger over evolutionary time, but males stayed the same or even increased in size. This improved understanding of evolutionary history makes it unnecessary to propose adaptive evolutionary decreases in male size. The many theories that focus on male dwarfism in spiders are thus of limited applicability.

Etcetera

Information about the Euroasian Arachnological Society

Tarabaev, Chingis K. Institute of Zoology, National Academy of Sciences of Kazakhstan, Academgorodok, Almaty 480032, Republic of Kazakhstan

The Euroasian Arachnological Society was created in 1992 in Almaty as a result of reorganization of the former Arachnological Society of the USSR. In its new status, the society has members from Finland, Germany, Holland, Belgium, Israel, Japan, the U.S.A., and

Canada. Because of economical problems in countries of the former USSR, meetings of the Association are occurring on a non-regular basis. The next meeting may take place in 1997.

Using the Tree of Life Project to disseminate information about biological diversity and phylogeny on the World Wide Web

Maddison, David and Maddison, Wayne Dept. of Entomology, University of Arizona, Tucson, AZ 85721

This presentation is an introduction to the Tree of Life Project, with a focus on how arachnologists can contribute. The Tree of Life project is a multi-authored collection of linked pages on the World Wide Web, each page concerning a group or species of organism. A page concerning a group of organisms (for instance, the Salticidae) contains a diagram of the phylogeny or classification of the group. The names of subgroups (terminal taxa in the tree or classification) are hypertext links that take you to pages concerning those subgroups. One can thus wander from the page concerning all life, down through pages concerning animals, arthropods, spiders, Salticidae, and eventually to the page on the genus *Habronattus*. Each page also includes pictures and information about the organisms. There are three main functions of the Tree of Life: to describe and document the world's organisms, to convey something about our phylogenetic understanding of various groups, and to provide links to taxon-specific information on the Internet. The target audience ranges from systematists who work on the group to high school students. Our long-term dream for the Tree of Life is to have it resolved to the species level in many groups, including thousands or millions of species, with potentially hundreds or thousands of authors taking care of various taxa, on servers distributed all over the Internet. It would be a reference work, an educational aid, and, we hope, a source of inspiration and promotion for biodiversity. Some arachnid sections of the Tree are developed (Salticidae, scorpions, with mites getting underway), but there are many opportunities for arachnologists to make the Tree grow in their groups. In this presentation we discuss how someone can contribute as author or coordinator of a group, and how the pages are actually built.

Poster Abstracts

Sympatry, Parapatry and Mode of Speciation in Two Colonising Species of *Tegenaria* (Araneae: Agelenidae).

Croucher, Peter J. P., Oxford, Geoff S., and Searle, Jeremy B. Department of Biology, University of York,, PO Box No 373, , YORK YO1 5YW, United Kingdom.

Reinforcement of reproductive isolation as a result of selection against hybrid forms at species boundaries remains a controversial aspect of speciation theory. We present an intriguing model system in which the possibility of reinforcement is being explored. The closely related members of the '*Tegenaria atrica*' group, T. *atrica*, *T. saeva* and *T. gigantea*, have surprisingly discrete ranges in the British Isles and Ireland. In southern England T. *saeva* occupies the west and *T. gigantea* the east and these two species meet parapatrically with apparently little hybridisation. Both species have expanded their ranges northwards during the last century and are found in sympatry in the York area, where a high degree of intermediacy has previously been described. Here we discuss the UK distributions of these species and present a number of morphometrical analyses in both sexes of *T. gigantea*, *T. saeva* and their putative hybrids. These data are placed in the context of the species' European distributions, and behavioural and genetical information. The presence of recent sympatric, and long-standing parapatric and allopatric populations of these species provide an unparalleled opportunity to explore the possibility of reinforcement as part of the speciation process.

Kin recognition in the pisaurid *Dolomedes triton*

Kissane, Kelly C. Central Michigan University

The presence of the nursery web, limited maternal care and the widely varied diet seen in pisaurids suggest that social behavior could have evolved in this family. Observations of the pisaurid *Dolomedes triton* revealed that juveniles sometimes build small nursery webs after dispersal from the maternal nursery web, share prey, and rarely cannibalize siblings up to the 4th instar. Aggressive behavior was observed to occur in 77% of non-kin *D. triton* interactions, but only 33% of sibling interactions resulted in aggressive behavior. This suggests that juvenile *D. triton* are capable of recognizing kin, and treat them preferentially over non-kin.

Comparison of Daily Activity Patterns in Two Groups of *Schizocosa* Wolf Spiders from Northern Mississippi (Araneae; Lycosidae).

Latimore, Jo A., Stratton, Gail E., and Miller, Gary L. University of Notre Dame, Department of Biological Sciences, 107 Galvin Life Science, Notre Dame, Indiana 46556

In order to assess the effect of time of day on activity patterns and potential for courtship in wolf spiders, we compared populations of two species, *Schizocosa avida* and *S.* near *crassipes*, from northern Mississippi. The behaviors of both groups were observed in several different laboratory treatments and compared. Five-minute and 30-minute around-the-clock observations were made of focal males in three different density treatments: natural density for the male's population, twice natural density, and alone. Males of both species demonstrated a potential for activity at anytime as well as peak activity levels either just before or just after nightfall in all density treatments. Activity level, measured as frequency of behaviors, was directly proportional to density. In one treatment, interference behavior by a male *S. avida* directed toward a copulating pair was observed. In another experiment, both the potential for courtship and the latency to courtship was evaluated every 6 hours for a 24-hour period for one population of *S.* nr. *crassipes*. The shortest average response time for both chemoexploration and courtship was recorded at 0400, while the largest proportion of males showed courtship at 2200.

The effects of visual and vibratory stimuli on prey capture success in deciduous leaf litter habitat versus floodplain habitat for wolf spiders *Schizocosa ocreata* and *Schizocosa rovneri*

Nadeau, Hillary A. and Hodge, Margaret A. College of Wooster, Wooster, OH 44691-2363

Schizocosa ocreata and *S. rovneri* are almost identical sibling species of wolf spiders, reproductively isolated by their differences in visual and vibratory courtship behavior. *S. ocreata* lives in a deciduous forest leaf litter habitat and *S. rovneri* lives in a floodplain habitat. Different habitats transmit some signals better than others, and therefore it is possible that the two different microhabitats these spiders are found in had an important role in the evolution of their courtship behaviors, and in the same sense, the sensory modalities used to detect prey. I studied the ability of males and females of these two species to detect prey in the two different habitats, and their ability to detect prey using isolated visual and vibratory sensory modalities. Individuals of both species hunted for crickets for two hours in chambers containing an artificial paper habitat replicating the complexity or simplicity of the natural habitats. Each spider was scored for the number of crickets eaten. To isolate the use of vibratory stimuli for prey detection, the spiders' eyes were painted before they were allowed to hunt. To isolate the use of visual stimuli in prey detection, the spiders were scored for their response to a video cricket. *S. rovneri* caught more crickets than *S. ocreata* in both habitats, female spiders of both species caught more crickets than males, and both species caught more crickets in the simple floodplain habitat. When able to hunt using only vibratory stimuli, *S. rovneri* caught more crickets than *S. ocreata*, and the number of crickets caught be females greatly decreased, but there was no impact on cricket consumption by males. In testing prey detection with vision alone, an equal number of both species detected the video cricket, but *S. rovneri* responded with a higher frequency of attacks. Habitat does seem to have an effect on prey capture success. *S. rovneri* appears to be a more aggressive forager than S. *ocreata*, possibly

because of the lower prey density in its habitat. Females may not only eat more crickets than males for additional energy needs, but females may also be more sensitive to visual and vibratory stimuli than males because females are on the receiving end of the courtship signal and act as the discriminators of courtship cues.

Food aversion learning in the jumping spider *Phidippus audax* (Araneae: Salticidae)

Okuyama, Toshinori Department of Zoology, Miami University, Oxford, OH 45056, USA

Animal foraging is constrained by the way in which the forager's environment and inner condition are combined at the point when a foraging decision must be made. The importance of learning behavior and the specific cues an animal uses to learn are not well understood for spiders. Various aspects of the process by which the jumping spider, *Phidippus audax* (Araneae: Salticidae), learned to avoid unpalatable milkweed bugs, *Oncopeltus fasciatus* (Hemiptera), were tested in a laboratory setting. With few exceptions, all the spiders were able to learn and avoid milkweed bugs after several attacks. The spiders could avoid the bugs sooner when they were younger and when they were well-fed. The spiders also learned more quickly when they encountered bugs more frequently. The efficiency of learning became worse after a short period time interval, which indicated the spiders were notable to remember the previous experience. Data suggests that color is not important in the learning process because spiders, trained to avoid green-painted milkweed bugs, did not discriminate between green- and silver-painted crickets. Evidence suggests that this learning is important in the field situation for this animal. Spiders collected from fields where milkweed plants were common were much more likely to avoid milkweed bugs at the first encounter in comparison to spider collected from fields were milkweed was not present.

The Benefits of Silk Recycling and the Production of Less Costly Capture Threads For the Economy of Spider Orb-web Use

Opell, Brent D. Department of Biology, Virginia Tech, Blacksburg, Virginia 24061 USA

The combined material and behavioral cost of constructing an orb-web that contains cribellar prey capture thread is equivalent to 85% of a spider's weight. This cost is reduced by 32% if a spider recycles its silk and by another 34% if it produces less costly adhesive capture threads with the same stickiness as cribellar threads. Consequently, to recover the cost of constructing a cribellate orb-web, a spider that practices silk recycling must capture an insect whose weight is three times its own, whereas a spider that recycles its silk and produces adhesive thread of the same stickiness must capture an insect weighing only twice as much as it does. This increased economy may have favored the transition from cribellate to adhesive capture threads and the success of orb-weavers that produce adhesive capture threads.

Discordant patterns of geographic variation between allozymes and mtDNA sequences among Mexican *Metepeira* (Araneae: Araneidae).

Piel, William H. and Nutt, Karen Harvard University, 26 Oxford Street, Cambridge MA 02138

Paradoxically, an allozyme study of *Metepeira "spinipes"* (sen. lat.) demonstrated extensive gene flow among four populations whose members are nevertheless morphologically and behaviorally distinct. Initially, the authors tentatively concluded that the populations exhibited panmixis, and suggested that local environmental effects accounted for the apparent morphological and behavioral differences. However, later they concluded that such differences were too great to be accounted for by the environment alone, and that the four populations actually represented three different species. To confirm that the allozyme results were, in fact, artifactual, we reexamined the relationships among these populations by sequencing a portion of the 12SmtDNA ribosomal subunit. In contrast to the allozyme result, our results demonstrate good agreement between patterns of genetic and morphological/behavioral variation. We suggest (1) that the allozyme allele frequencies are homogenized by balancing selection, not gene flow as was initially concluded, and (2) that this study therefore provides another instance where inferences about population structures from allozyme data are misleading.

Evidence For Possible Competitive Interaction Between Two Spider Species

Popson, Mary Ann Dept. of Biological Sciences, Bowling Green State Univ., Bowling Green, OH. 43403

Competition may occur between spider species when webs of one species prevent prey from entering the webs of another. I studied interactions in the field between *Holocnemus pluchei* (Pholcidae) and *Agelenopsis* sp. (Agelenidae) to determine whether the presence of a nearby *Holocnemus* had a negative impact on agelenids. I looked for evidence of food deprivation caused by nearby webs by comparing agelenids that had *Holocnemus* webs directly above them with those that had nothing above. Agelenids with a *Holocnemus* web directly above had a lower condition index, a measure of relative feeding success, than agelenids with nothing above. I also found that agelenids were associated with any *Holocnemus* spider size, but were more likely to be associated with medium *Holocnemus* webs. Distance between the webs was not related to the size of either the spiders or their webs. My data suggests that there may be a competitive interaction between these spiders.

Neurochemical Changes and the Ontogeny of Behavior in the Solgupid, *Eremobates palpisetulosus* Fichter (Solpugida: Eremobatidae)

Punzo, Fred Box 5 F, Dept. of Biology, University of Tampa, 401 W. Kennedy Blvd., Tampa, FL 33606 U.S.A.

Data indicated that changes in brain amine concentrations are associated with ontogeny of behavior in *E. palpisetulosus*. Serotonin (5 - HT) and dopamine (DA) levels increased during early postembryonic development whereas N - acetyldopamine (NADA) levels were found to decrease. 5 - HT levels increased significantly between the first and second nymphal instars; DA increased significantly after the second instar stage. Octopamine levels did not change during the development in this species. This suggests that neurochemical changes may play a role in the regulation of shifts in behavior (gregariousness, aggression, dispersal, feeding) associated with specific developmental stages.

Larval orientation in scorpions: phylogenetic patterns and ecological speculations.

Savary, Warren E. 813 Haight Avenue, Alameda, CA 94501

Female scorpions carry their larvae on their dorsa in one of three patterns of orientation: random, longitudinal, or transverse. Random orientation, in which the larvae are stacked in two or more layers on the dorsum of the mother and show no group consistency in alignment, occurs in most taxa for which larval orientation data are available. Transverse orientation, in which the larvae are again in Two or more layers, yet face the midline of the mother's dorsum, has been reported only for *Diplocentrus whitei* (Diplocentridae). Longitudinal orientation, which differs significantly from the other orientation patterns in that the larvae are arrayed in a single layer, occurs in several genera in the family Vaejovidae. In the longitudinal orientation pattern, the larvae are aligned parallel to the midline of the mother and face anteriorly. Outgroup comparisons, based on the most recently available published and unpublished hypotheses of scorpion phylogeny, establish the transverse and longitudinal orientation patterns as derivations. In addition to other previously hypothesized adaptive advantages, I propose that the longitudinal pattern of orientation may facilitate the cuticular transfer of water to the transported larvae, thus affording an advantage in arid environments.

Behavioral and Field Studies of the jumping spider *Habronattus oregonensis*

Scheidemantel, Debora Dept. of Ecology and Evolution-

ary Biology, University of Arizona, Tucson, AZ 85721

This study was conducted to determine behavior patterns of the jumping spider *Habronattus oregonensis*. Agonistic encounters occur in the field when spiders wander into areas already occupied by another spider. Which spider keeps control of the area is determined differently for males than for females. In male-male spider agonistic interactions, the size of the spider as measured by weight seems to be the most important factor in winning a skirmish regardless of familiarity with an area (residency). And males choose not to fight 44-47% of the time. For female-female spider agonistic interactions, however, residency does affect the outcome. The resident female spider does hold the advantage. Weight is a less important factor. So far females always engage. Male-female interactions are covered in courtship and mating behaviors.

The Scorpion Fauna of New Mexico, U. S. A.

Sissom, W. David Department of Life, Earth, and Environmental Sciences, West Texas A & M University, WTAMU Box 808,Canyon, TX, 79016

The scorpion fauna of New Mexico was studied, based on available museum materials and field work conducted over a seven-year period. The following taxa were documented for the state: *Centruroides vittatus* (Say), *C. exilicauda* (Wood), *Diplocentrus peloncillensis* Francke, *Superstitionia donensis* Stahnke, "*Uroctonus "apacheanus* Gertsch & Soleglad, *Serradigitus agilis* Sissom & Stockwell, *S. wupatkiensis* (Stahnke), *Paruroctonus boreus* (Girard), *P. utahensis* (Williams), *P. pecos* Sissom & Francke, *P. gracilior* (Hoffmann), *Vaejovis coahuilae* Williams, *V. crassimanus* Pocock, *V. russelli* Williams, *V. spinigerus* (Wood), and five new montane species of *Vaejovis* related to *V. vorhiesi* of Arizona. The status of *V. flavus* Banks known from "Albuquerque" is briefly discussed. Several additional species might occur in the northwestern and southwestern corners of the state, including *Vaejovis jonesi* Stahnke, *V. "confusus*" Stahnke, and *Hadrurus spadix* Stahnke. Species richness is highest in the southwestern part of the state, where elements of the Sonoran and Chihuahuan Deserts overlap in distribution.

Relationships Between Body Size, Clutch Size and Offspring Size in Two Species of Lycosids

Walker, Sean E. , Balfour, Robert A., Marshall, Samuel D., and Rypstra, Ann L. Department of Zoology, Miami University , Oxford OH 45056

In general, clutch size and clutch mass increase with female size for ectothermic taxa. However, among spiders there is no clear relationship between offspring size and clutch size or offspring size and female size. In some cases, spider egg size increases with increasing body size and in other cases egg size is relatively fixed in a population. We sought to investigate these relationships in two species of wolf spider that differ in body size and foraging behavior. Clutch size is positively correlated with female body size in *Hogna helluo*, however, there is no correlation between clutch size and body size in *Pardosa milvina*. Offspring size is significantly different between both species, but there is no correlation between female size and offspring size in either species. There is a weak negative correlation between offspring size and clutch size in *Hogna*, suggesting that in this species there is a trade off between size and number of offspring. However, the opposite is true in *Pardosa*; there is a weak positive correlation between offspring size and clutch size.

From Jim Berry, Editor, Journal of Arachnology

Jim has the pleasure of reminding everyone that page charges for JOA have been eliminated! This is for electronic submissions only, and there is a $3 per line charge for changes in proof.

Authors are requested not to send the original illustrations when they submit a manuscript. With the four copies of the manuscript, they should submit only **photocopies** of the figures. Photocopies should be reduced to fit the exact size the author intends for final publication. Original figures should be submitted only when the manuscript is accepted for publication. For more information, contact Jim Berry (e-mail: BERRY@BUTLER.EDU).

1997 A.A.S. MEETING
DICKINSON, NORTH DAKOTA

The 1997 meetings of the American Arachnological Society will be held in Dickinson, North Dakota on **20-23 July, 1997**. It will be hosted by Dan Mott (Dickinson State University). There will probably be a social event the 19th (Saturday), and Dan has some small excursions planned to unique places for both social and collecting activities. More information on registration and the schedule will be in the Spring Newsletter. In the meantime you may contact Dan at: Dept. of Natural Science, Dickinson State Univ., Dickinson, ND 58601; Tel. (701) 227-2111, Fax-225-0526; e-mail DANIEL_MOTT@DSU1.DSU.NODAK.EDU

Considering the Great Plains location of our 1997 meeting, I thought it appropriate to attempt to organize a symposium on grassland arachnid biology. This is to be interpreted broadly as including: evolutionary biology, ecology, behavior, distribution, faunistics, and natural history of grassland arachnids. If you are interested in participating in this symposium, please drop me a note preferably by email, otherwise US mail (often I am not easy to reach by phone).

Bruce Cutler, Entomology, University of Kansas, Lawrence KS 66045-2106; BCUTLER@ALIVE.BIO.UKANS.EDU.

The host for the 1998 CIDA/AAS meeting, Petra Sierwald, notes that preliminary registrations have been slow to come in. She urges everyone interested to provide a notice of intention so you may receive the second circular with deadlines and other details. - Ed.

XIV C.I.D.A. Congress and A.A.S. Meeting

The American Arachnological Society is pleased to invite you to the XIV International Congress of Arachnology and the 22nd Annual Meeting of the American Arachnological Society, co-sponsored by the THE FIELD MUSEUM in Chicago (USA), from Saturday 27 June to Friday 3 July, 1998. The FIELD MUSEUM is located at the shore of the ocean-like Lake Michigan in Chicago's Grant Park, close to downtown Chicago with its world-famous architecture, the largest indoor aquarium in the world, (the Shedd Aquarium), and the oldest U.S. planetarium (Adler Planetarium). During the Meeting, the "Taste of Chicago" Festival and Independence Day festivities will offer great dining and entertainment opportunities directly in front of the FIELD MUSEUM. Housing will be available in downtown hotels within walking distance from the Museum (between $90 and $120 (US) per night) and in the dormitories of the nearby Illinois Institute of Technology (currently $25 for a single, $20 per person for a double room, air-conditioned). The dormitories are open to everyone. Low cost transportation between the dormitories and the FIELD MUSEUM will be available. We hope you intend to participate and return the information below to THE FIELD MUSEUM. You will then receive the second circular in the spring of 1997.

HOST: Petra Sierwald, Insects, FIELD MUSEUM Roosevelt Rd. at Lake Shore Dr., Chicago, IL USA 60605; Phone: (312) 922-9410, ext. 841; Fax: (312) 663-5397 E-mail: SIERWALD@FMPPR.FMNH.ORG

Please send the following information to the address above to begin your registration process:: Name, Address, Today's Date, Your Signature

From Bruce Halliday:

The 10th International Congress of Acarology will be held in Canberra, Australia, July 6-10, 1998. The host institution is the CSIRO Division of Entomology. Scientific sessions and accommodation will be in the Australian National University. For further information contact - Dr. R. B. Halliday, Principal Research Scientist (Acarology), CSIRO Division of Entomology, GPO Box 1700, Canberra ACT 2601 Australia; International Fax 61-6-2464000; Local Fax (06) 2464000; Tel. (06) 2464085; Internet BRUCEH@ENTO.CSIRO.AU

TREASURER'S REPORT

The American Arachnological Society
Third Quarter Financial Report
Oct. 6, 1996

Balance in checking, 2nd quarter, 1996 Chemical Bank South, Albion MI Acct. #075-964-7		39,865.38
Deposits		
Page charges		220.00
Interest		175.54
Donations, meeting auction		2,072.69
Membership		1,250.00
Sales, Spider Genera		464.00
Sales, back issues		45.00
Wire transfer from Th. Bilke for Dr. Song		543.53
Return of filing fee (overpayment)		10.00
	Subtotal	4780.76
Expenses		
Allen Press JOA 24(1)		5,257.53
Co-collected dues, British Arachnological Society		3,870.00
Co-collected dues, CJEA		3,249.00
Co-collected dues, ASJ		1,240.00
Co-collected dues, Revue Arachnologique		1,110.00
Co-collected dues, Arthropoda Selecta (via NY Ent Soc)		720.00
Co-collected dues, Acta Arachnologica Sinica		630.00
Dr. Song, for books paid for by Th. Bilke		543.53
Bank Fees, printing checks, deposit slips, return item		65.26
Petra Sierwald, mailing expenses, Associate Editor		517.30
Jon Reiskind, mailing expenses, Spider Genera		68.45
William Piel, 1st place, student paper award		100.00
Maydianne Andrade, 2nd place, student paper award		50.00
Greta Binford, honorable mention, student paper award		50.00
State of CA, filing fee		10.00
	Subtotal	17,485.09
	Amt in Checking	27,161.03
	Amt in CDs	63,000.00
	and money market	17,164.06
	Smith Barney Acct. # 221-11904-14-14	
	Total Assets	107,325.09

The American Arachnological Society
Fourth quarter financial report
Dec 31, 1996

Balance in checking, 3nd quarter, 1996 Chemical Bank South, Albion MI. Acct. #075-964-7	$	27,161.03
Deposits		
Interest		124.87
Membership		2,920.00
Sales, Spider Genera		65.00
Sales, reprints		6.00
Subtotal		3,115.87
Expenses		
Allen Press, reprints, return of loan		271.37
Allen Press JOA 24(2)		6,273.54
Subtotal		6,544.91
Amt in Checking		23,731.99
Amt in CDs	$	51,000.00
and money market	$	31,579.00
Smith Barney Acct. # 221-11904-14-14		
Total Assets	$	106,310.99

The American Arachnological Society
Final Report, 1996
Dec 31, 1996

Balance in checking, end 1995 Chemical Bank South, Albion MI. Acct. #075-964-7	$	27,449.57
Activity in Checking account.		
Deposits		
Membership		21,771.00
Page charges		2,910.00
Sales, Spider Genera		1,279.50
Sales, back issues		221.00
Interest, checking account		641.76
Dondations from meeting		2,072.69
Misc (payment for books		543.53
Refund of filing fee		10.00
Subtotal	$	29,368.88
Expenses		
Allen Press JOA 23(3)		5,257.53
Allen Press JOA 24(2)		6,273.54
Co-collected dues		10,825.00
Newsletter printing		1,700.00
Postage		822.24
Honoraria		1,500.00
Student awards		3,700.00
Misc. books		543.53
		800.00
		271.37
Filing fees, bank charges, printing checks		120.25
Meeting expenses (T-shirts)		1,273.00
Subtotal	$	33,086.46
Amt in Checking	$	23,731.99
Activity in Smith Barney Account # 221-11904-14-14		
Amount in CD's	$	51,000.00
Amount in Money Market	$	31,579.00
Interest earned in 1996: $4,914		
Total Assests:	$	106,310.99

Respectfully submitted,

Gail E. Stratton, Treasurer
American Arachnological Society
P.O. Box 2198, Oxford, MS 38655

Fina AAS report 1996

ARACHNOLOGICAL NOTES

From Elizabeth Hathway:

LITERATURE AND PERSONNEL EXCHANGES WITH CUBAN COLLEAGUES

Are you interested in developing exchanges with Cuban arachnologists? Scientists in Havana are eager to strengthen interaction with their North American counterparts. Also, there is a great need for biosystematic literature for research institutions in Cuba. If you would like to donate literature and/or would like to interact with Cuban colleagues, please contact: Elizabeth Hathway, North America-Cuba Biodiversity Information Exchange, Association of Systematics Collections (ASC), 1725 K Street, NW, Suite 601, Washington, D.C. 20006, (202) 835-9050, fax: (202) 835-7334, email: HATHWAYE@ASCOLL.ORG

COCUYO - A NEWSLETTER OF THE INVERTEBRATES OF CUBA

Cocuyo is a newsletter about the activities of scientists who study the invertebrates of Cuba. It is produced by editors Julio A. Genaro and Jorge L. Fontenla of the Museo Nacional de Historia Natural (MNHN) in Havana and published and mailed with support from the RARE Center for Tropical Conservation in Philadelphia. The editors are interested in article contributions and exchanges. Contact: Julio A. Genaro, Museo Nacional de Historia Natural, Obispo #61, Esquina a Oficios, Habana Vieja 10100 CUBA, fax: 537 62-0353 OR E. Hathway, ASC, 1725 K Street, NW, Suite 601, Washington, D.C. 20006, fax: 202 835-7334, email: HATHWAYE@ASCOLL.ORG

From Rick Vetter:

Arachnologists, I am currently undertaking a revision/review of the spider genus *Neoanagraphis* which is, at the moment, considered a member of the family Clubionidae. I am aware of them from the southern California deserts north to the Sierra mountains, throughout the Great Basin and east to New Mexico. Possibly they go further east into Texas and/or south into Mexico.

From the specimens I have seen, *Neoanagraphis* is about 8mm long, uniformly tan in color. uniquely, they have a very long tarsal claw on Leg IV which at first glance appears without teeth (although a few teeth are buried at the base in some hairs). I would appreciate getting any and all specimens for examination. Rick Vetter, Dept. Entomology, Univ. Calif. Riverside, Riverside, CA 92521; e-mail VETTER@CITRUS.UCR.EDU Tel. (909) 787-3550; Fax (909) 787-3086

From Prof. Dr. Adriano B. Kury

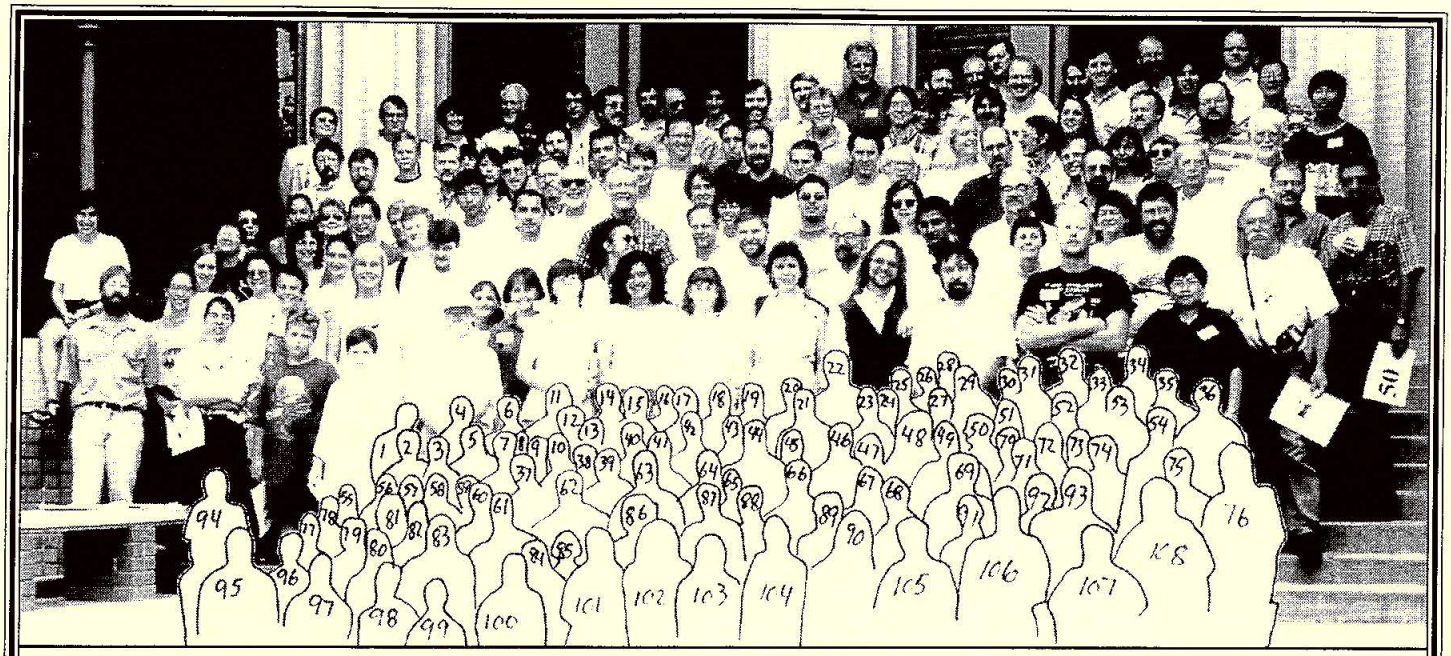
Dear Colleagues: I am pleased to inform you that I am the new curator of the Arachnological section of the Museu Nacional of Rio de Janeiro, and that I am presently involved in the reconstruction of the laboratory, including an electronic database and active communication with arachnologists. The section has been recently deprived of the arachnological reprints, so I would like to ask you to send available reprints of your own papers. Dr. Adriano B. Kury, Departamento de Invertebrados, Museu Nacional/UFRJ, Quinta da Boa Vista, So Cristvo. 20940-040, Rio de Janeiro - RJ - Brazile-mail ADRIK@AX.APC.ORG Tel. (021)= 537-4376

A Review by **Herbert W. Levi**

Beitrage zur Araneologie 4 (1994): 1-778. Jorg Wunderlich Verlag, Straubenhardt, Germany. Edited by J. Wunderlich.

The 778 pages include 62 papers, 21 by various authors, 41 by J. Wunderlich. Most papers are descriptions of new species; there are also short behavior observations, a checklist of Chinese Linyphiidiae, and numerous new genera, many based on only one included species. Most genitalia illustrations are adequate for recognition. A second similar volume 5 is to appear shortly. The user of this volume will be frustrated by a lack of an index and no publication date.

The XIV International Congress of Arachnology in 1988 is in Chicago, IL; held jointly with the A.A.S. annual meeting.This is an unusual opportunity for anyone interested in arachnology since the Congress rarely comes to the western hemisphere. To make it a full arachnological summer, plan to take the Biology of Spiders course at Highlands, NC, later in July or in early August (dates not yet set)! For more information, contact: William A. Shear, Dept. of Biology, Hampden-Sydney College, Hampden-Sydney, VA 23943 USA Tel. (804) 223-6172 FAX (804) 223-6374; e-mail-BILLS@TIGER.HSC.EDU



Identification of Persons in Group Picture at AAS Meeting, Tucson, AZ, July 1996

1. Petra Sierwald 2. Kefyn Catley 3. Robert Suter 4. Jason Bond 5. Jerry Rovner 6. Pegy Gerba 7. Dennis Rodinbaugh 8. Beddie Scheidemantel 9. Thomma Bibigoul 10. Andrew McLachlan 11. Bill Bennet 12. Dianne Andrade 13. Charles Griswold 14. Chuck Kristensen 15. Lenny Vincent 16. Chingis Tarabaev 17. Steve Johnson 18. Andrey Feodorov 19. Rich Bradley 20. Brent Opell 21. George Uetz 22. Craig Hieber 23.Alan Cady 24. Beth Jacob 25. Woodbridge Foster 26. Jim Carico 27. Dave Kroeger 28. Bryan Renolds 29. G.B. Edwards 30. Scott Johnson 31. Doug Gaffin 32. Brian Carrol 33. David Sissom 34. Wendel Icenogle 35. Joe Bigelow 36. Tsunemi Yamashita 37. Toshimori Okuyama 38. Michael Plagens 39. Dave Richman 40. Gustavo Hormiga 41. Pete Croucher 42. Will McClintock 43. Matt Persons 44. Dave Clark 45. Todd Blackledge 46. Kevin Delaney 47. Joe Beatty 48. Jo Latimore 49. Dan Mott 50. Vince Roth 51. Mary Ann Popson 52. Jow Warfel 53. chris Baptista 54. Jim Arnold 55. John Moore 56. Katherine Suter 57. Barbara Reger 58. Gary Miller 59. Ann Rypstra 60. Rob Balfour 61. Sean Walker 62. Rogelio Macias 63. Al Brody 64. Robin Richardson 65. Sandra Brantley 66. Chris Amaya 67. Julia Long 68. Tariq Farooqui 69. H. Don Cameron 70.William Piel 71. Matt Greenstone 72. Barbara Roth 73. Maryetta Hight 74. Jim Berry 75. Darrell Ubick 76. Jack Kaspar 77. Elizebeth Grey 78. Karen Cangialosi 79. Pat Miller 80. Catherine Craig 81. Linda Rayor 82. Eileen Hebets 83. Rosemarie Roeloffs 84. Maggie Hodge 85. Hillary Nadeau 86. Gita Bodner 87. Jon Reiskind 88. Marshal Hedin 89. Bruce Cutler 90. Kari McWest 91. Susan Masta 92. Robin Taylor 93. Mark Stowe 94. Greta Binford 95. Wayne Maddison 96. Gail Stratton 97. Leticia Aviles 98. Eddie Hieber 99. William Miller 100. Wesley Boatman 101. Frances Fee 102. Neera Garga 103. Heather Proctor 104. Cora Varas-Vieira 105. Warren Savary 106. Chad Lee 107. Diana Silva 108. Pat Craig

from page 1....

with Robert Jackson at various sites seeking to observe and measure the araneophage salticid *Portia*. The Annual Auction followed, presided over by it's organizer Vince Roth and the perennial fast-talkin', smooth-walkin' auctioneer, George Uetz. Vince had assembled a large amount of interesting and rare literature and other materials, including a collection of t-shirts from Meetings-past. Once again the Auction was a success, and generated more funds for the student research coffers.

Wednesday had paper sessions in the morning, with the Annual Business Meeting and a workshop on the Tree of Life Project that afternoon. This was a fine meeting, with many papers and posters from a rather wide array of arachnological subjects. The social activities and field trips were quite enjoyable, and the Meeting T-shirt is a killer! Wayne & Leticia were able to place the unique stamp of the Southwest on this gathering, making it one which will be remembered.

In The Next Issue ...

- Deatils & Forms for the 1997 AAS Meeting
- Minutes of 1996 AAS Business Meeting
- A report on Mus. Zoolog. Bogoriense, Indonesia
- Vince Roth -- Collecting in Madagascar

Join the A.A.S. !

Are you reading a borrowed copy of *American Arachnology*? Start enjoying the benefits of membership in the American Arachnological Society. Complete the following form and send with your dues, (calculated by table below), to the Membership Secretary (address below).

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American Museum of Natural History
Central Park West at 79th Street
New York, New York 10024 USA

Members receive the *Journal of Arachnology* triannually, and the newsletter *American Arachnology* biannually.

AMERICAN ARACHNOLOGY

The Newsletter of the American Arachnological Society

Number 54 **January 1997**

E-Mail Happenings

Those wishing a hard copy of the AAS E-Mail Directory should contact the Secretary (Alan B. Cady, Dept. Zoology, Miami Univ.- Middletown, 4200 E. Univ. Blvd., Middletown, OH 45042, U.S.A.). A new version (5.0) is now in production, and a Full version of this will be sent to all on the list upon completion. If you wish to have your e-mail address included in the A.A.S. E-Mail Directory, **or** if your address has changed, **or** if it's an incorrect entry, please contact Alan Cady (CADYAB@MUOHIO.EDU).

A.A.S. Membership Directory

A directory listing the names of all A.A.S. members in good standing was produced in May 1996. The Secretary reminds Members wishing to have more than just their name listed in the Directory, that you may include additional information (address, phone, FAX, e-mail) according to your desires. Anyone wishing a copy of version 1.0 of the Directory should contact the Secretary (hardcopy available now, digital later).

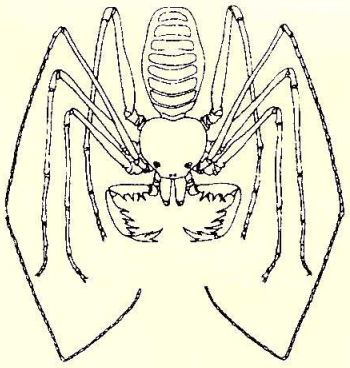
From Heather Proctor.... ARACHNIDS 1998: CALL FOR CALENDAR-QUALITY SLIDES

The study of arachnids appears to promote the development of superb photographers; or perhaps, the spectacular nature of arachnids attracts them. Regardless, the American Arachnological Society plans to put our expertise to good use by assembling thirteen of the most outstanding images into a calendar - Arachnids 1998.

Arachnids 1998 will be a high-quality, high-resolution, full-colour wall calendar. It will depict the year 1998 but will be available by Autumn 1997. This is a call for 35 mm slide images to be submitted as good copy slides (i.e. don't submit the originals) along with brief descriptions of the images. Photographs of any arachnid native to North, Central, or South America are eligible, and both portrait and landscape orientations will be accepted. Candidate slides will be held until winners are determined, and at that time originals of the winning slides will be requested. Winners will be chosen by a panel of arachnologists, entomologists, and non-arthropodologists on the bases of image quality and subject. We will try to choose a breadth of taxa and of photographers (maximum of two winning photos/photographer). The closing date on slide submission is February 28, 1997. The 13 lucky winners will be determined by mid-April.

To include non-photographers in the fun and excitement of calendar construction, we are also requesting submissions of "famous dates in arachnology" to augment the typical "Christmas", "Passover", "Victoria Day", "Ramadan" etc. typically found on calendars. We will also request important dates in Mexico, Central, and South America.

Please send your duplicate slides and important dates to: Heather Proctor, Department of Biology, Queen's University, Kingston, Ontario K7L 3N6, Canada; email: Tel. (613) 545-6000-5510 PROCTORH@BIOLOGY.QUEENSU.CA.



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