Newsletter of the American Arachnological Society

American Arachnology

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Future A.A.S. Annual Meeting Sites

2004— 23 —> 27 June, Norman, Oklahoma

2005— Hiram, Ohio

A.A.S. Election–2004

Please watch your mailbox... Your ballot for the 2004 A.A.S. election is arriving soon. We select a new Director, so be sure to mark your choice and send your ballot ASAP.

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 Cady, Dept. Zoology, Miami Univ.-Middletown, 4200 E. Univ. Blvd., Middletown, Ohio, 45042, USA, Voice:(513)727-3258, Fax:(513)727-3450; E-mail:CADYAB@MUOHIO.EDU. Deadline for receipt of material for the Fall issue (Vol. 70) is 1 October, 2004. All correspondence concerning changes of address and information on membership in the American Arachnological Society should be addressed to the Membership Secretary, Jeffery Shultz, American Arachnological Society, Dept. of Entomology, Univ. of Maryland, College Park, MD 20742; Voice:(301)405-7519, Fax:(301)314-9290, E-mail: JS314@UMAILSRV0.UWMD.EDU. Membership information may be found at the AAS website: http://WWW.AMERICANARACHNOLOGY.ORG. Members of the Society also receive the JOURNAL OF ARACHNOLOGY (published triannually) and have access to electronic resources (JOA OnLine).

Reports from the 27th Annual AAS Meeting, Denver Museum of Nature & Science, Denver, 24-28 July, 2003

The 2003 AAS meeting was meticulously planned and executed by our hard-working host **Paula Cushing** and her dedicated crew at the Denver Museum of Nature and Science in Denver, Colorado. All in attendance agreed that it was a fabulous meeting that provided many opportunities for arachnologists to confer, learn, and socialize. Paula and her group of volunteers deserve a hearty "**Thanks & Well Done!**". Some recollections of Alan Cady are presented here.

2003 AAS Meetings in Denver

The annual gathering of AAS members and other interested arachnophiles started with a lively social where old friends and associates were reunited and new friendships were initiated. The next morning we gathered in the Ricketson auditorium at the Denver Museum of Nature and Science, and were welcomed by our host Paula Cushing and Richard Stucky, Vice President of Programs at the Museum. Paper sessions started with the symposium on social spiders where we were brought up-to-date on advancements in this field ranging from influences of El Niño on social spiders to how molecular techniques may be

used to describe social spider population structure. That afternoon, posters were applied to the walls of a large hall in the Museum, an impressive venue for those viewing and discussing the displayed work. After the afternoon paper session on evolution we assembled on the grand steps in fornt of the Museum's glass wall for the group photo. We were treated to a magnificent view of the rose garden in the foreground and Denver in the distance, all framed by the massive mountains beyond. Most folks then made the short trek next door to the Denver Zoo for a private guided tour of their new Tropical Discovery Center. Refreshments were available while we were immersed in a steamy environment exhibiting exotic flora and fauna from tropical areas all over the globe.

Paper sessions the next day on systematics, behavior, and anatomy & physiology were interspersed by impromptu wanderings during lunch and other breaks through the various informative exhibits at the Museum. That evening was the Banquet, where we dined on a wide variety of regional foods in the same expansive atrium of the museum that housed the poster session. Good food and fellowship was enjoyed before the ArachnoAuction started. Once again auctioneer George Uetz guided us through bidding on a large number of assorted items, including some arachnologically-oriented craftwork produced by the local spider-study group. A rolling thunderstorm provided a backdrop for the festivities.

The following morning we again gathered outside Ricketson Auditorium, and after enjoying a light breakfast and wonderful view of the Rocky Mountains, paper sessions on ecology, systematics, and behavior took us through the day. That evening featured casual presentations and photo salons about a variety of arachnids, capped by two presentations sponsored by the AAAFF (Arachnological Association for the Absorption of Federal Funds).

Early the next morning field trips departed to see fossils and investigate alpine and great plains habitats. (Reports on those follow this account.) This time also initiated the scattering of meeting participants back to their natural habitats and continued endeavors studying arachnids. This meeting displayed a very diverse collection of work on many aspects surrounding arachnid biology. These included the research efforts of many students, once again demonstrating the strength, depth, and growth of the AAS and arachnology.

Chris Buddle reports on:

The Alpine Field Trip

'Im a lowlander, living at virtually sea-level in Montreal – thus, it made sense to grab the opportunity to jaunt around at 11,000 ft as a 'field trip' option during the 2003 AAS meetings in Denver. And our host, Paula Cushing, was correct - we did feel the elevation at this altitude (mainly shortness of breath, and thankfully no altitude sickness), and we were treated to spectacular vistas and a true taste of Rocky Mountain bliss (yes, this sounds like a beer commercial, but it's hard to get out of this frame of mind after visiting 'Coors Country', and driving past the brewery in Golden on the trip back to the hotel!).

The day started early, and after squeezing into our blessed vans and their cheery drivers, we headed up to Guanella Pass (at 11,669 ft in elevation {Hey Chris... what's that in metric?... eh? Ed.}). We were above tree-line here, and thanks to a sunny and relatively clear morning, the views to adjacent mountain ranges were incredible. The mountain air and snow (and snowballs, thanks to Karen Bost and Doug Gaffin) lifted spirits and helped clear our heads after several days of indoor meetings. The arachnid hunting was perhaps not the most amazing, but this did not dampen spirits as we soaked up the sights and sounds. Pierre Paquin and I tipped boulders (huffing and puffing all the way) seaching for *Cicurina*, and we were able to find *Cicurina pagosa*, *Walckenaeria communis*, *Scotinotylus majesticus*, an unknown *Walckanearia*, some *Micaria*, an immature *Pellenes*, and a few Opilionids. Jeff Shultz later identified these to be *Togwoteeus biceps* and some other specimens were possibly *Opilio parietinus*. Bruce Cutler reported various other finds included many *Pardosa*, *Tetragnatha,*immature *Phidippus*, immature gnaphosids (one was a male *Haplodrassus signifer*, and some dictynids.

As predicated, the clouds began rolling up the valley just after noon, so with full bellies and great sadness, we hopped back into the vans for the drive down the valley. The rest stop half-way down the pass was actually productive for both bladder relief and collecting! The afternoon trip took us to the lovely Golden Gate Canyon, where we were able to collect, or hike (or both) for a couple of hours. The site here was a south-facing slope, graced with Limber pine and Engelmann spruce. The rain cleared and the sun returned for this leg of the trip, and the arachnophiles were treated to some decent collecting, including reports of *Habronattus venatoris*, *Tibellus* sp, *Steatoda* sp., Misumenine thomisids, an *Ozyptila* female with egg sacs (photographed by Joe Werfel), *Phalangium opilio*, and (this may come as a shock), many *Pardosa*.

The alpine field trip was a great success. Thanks to our skilled driver's, we made it back safely, and quickly navigated Denver rush-hour. The rich, oxygenated air of the city centre returned, and we all headed home (sigh). Denver will always be near, however, as those Coors beer commercials will be a constant reminder of the AAS 2003 alpine field trip! I think I'll go and grab one now.

Chris Buddle Ste. Anne de Bellevue, QC, Canada

Rich Bradley reports on:

The Great Plains – Foothills Field Trip

The "foothills" field trip went to Roxborough State Park. This lovely park provided beautiful scenery, including the red sandstone spires of the Fountain Formation. Our small group (10) enjoyed fabulous weather and good company. James Kase provided an overview of the geology and habitats in the park. The latter included some grasslands, riparian strips, oak scrub and brushlands.

The group split up and we all explored or relaxed as our interests dictated. Hank Guarisco, G.B. Edwards and Neil McReynolds were busy sweeping and collecting in a variety of habitats. Rich Bradley, Allen Brady and Don Cameron took a more measured pace, walking the trails and searching for spiders as well as other sights. Our group (Rich, Allen and Don) found a number of interesting animals, including a beautiful subadult male *Hogna* (probably *carolinensis*) found by Allen.

Allen also located a burrow that he suspected would have a *Geolycosa* resident. He demonstrated the "grass blade" method to determine occupancy. Sure enough, the grass blade "twitched and twisted" indicating that a little excavation would be rewarded. I (Rich) dug a hole near the burrow then carefully removed soil to expose the burrow and occupant. There was a beautiful female *Geolycosa* (probably *missouriensis*) a striking yellow/gold color with jet black under the legs and on venter of body. Paula Cushing and Karen Cangialosi took advantage of the beautiful weather and actually relaxed! We met at lunch and decided to stay at this beautiful park a bit longer then "took the long way home" via Dr. Cushing's backyard where the elusive *Zodarion rubidum* was found under rocks in Paula's garden. It was a very successful field trip and a good

time was had by all.
Rich Bradley

Abstracts of Symposium, Poster and, Oral Presentations - 27th AAS Meeting, Denver CA 24-28 July, 2003

Sociality Symposium Abstracts

Social Theridiids - Phylogenetic Patterns, Processes, And Predictions

Ingi Agnarsson
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Theridiids are particularly interesting for studying spider sociality. The majority of social spider species are theridiids, and representatives of the family show the entire spectrum of web sharing, ranging from short term maternal care (e.g. *Theridion*), to periodic or permanent social behavior (most *Anelosimus*, some *Achaearanea* and *Theridion*), and kleptoparasitism (e.g. *Argyrodes*). Major questions surrounding spider sociality include: the origin of quasisocial behavior (e.g. via aggregations around abundant resources or temporal extension of maternal care), its phylogenetic distribution (e.g. single vs. multiple origins, origins clumped or randomly distributed), and how different forms of web sharing (e.g. sociality and kleptoparasitism) may be related. To investigate such questions I present a cladistic analysis of 61 theridiid taxa, based on 242 morphological and behavioral characters. The resulting phylogenetic hypothesis implies the following: 1) sociality in theridiid spiders evolved as a temporal extension of maternal care, 2) quasisociality (<10 species in total) originated independently no less than four times within Theridiidae; by contrast, web sharing evolved once in the diverse clade of kleptoparasites (>200 species), 3) social instances are non-randomly clustered among distal theridiids, suggesting a common cause, 4) kleptoparasitism and sociality may be related as alternative modifications of maternal care. My phylogenetic hypothesis, furthermore, predicts that maternal care may be much more widespread and common than currently entertained and that social behavior will be discovered in several taxa whose behavior is currently unknown. One such prediction was confirmed by the discovery of the first social *Anelosimus* in Africa.

Sociality Buffers Against Inbreeding Depression In A Subsocial Spider

Leticia Avilés
Dept. of Zoology, University of British Columbia, Vancouver, Canada,
Todd Bukowski
Center for Insect Science, University of Arizona, Tucson, USA.

Social spiders are unusual among social organisms in being highly inbred--males and females mature within their natal nest and mate with each other to produce successive generations. We hypothesize that such inbred social systems originated under conditions where benefits of group living were sufficiently strong to overcome inbreeding depression in the transition from an outbred ancestral state. As a window into such conditions, we have been exploring the fitness consequences of group living, inbreeding, and dispersal in inbred social and outbred subsocial species in the genus *Anelosimus*. In the subsocial spider *Anelosimus* cf. *jucundus* in southern Arizona we examined the consequences of artificially-imposed inbreeding on various components of fitness in spiders raised under natural conditions. We found that inbreeding depression was only evident during the solitary phases of the spider's life cycle. Prior to dispersing from the maternal nest, offspring from inbred and outbred clutches did not differ in size or survival probability. Instead, fitness during these stages was influenced primarily by ecological and demographic factors such as lifespan of the mother, number of siblings in the group, and distance to a creek. Following dispersal, however, inbred spiders developed more slowly and reached a smaller size. We suggest that a similar buffering effect of group living may have facilitated the origin of inbred social systems in the genus.

Description Of Populations Of The Colonial Orb-Weaver *Parawixia bistriata* In Different Habitats

Florencia Fernández Campón
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Parawixia bistriata (Araneidae) is a colonial orb-weaver that occurs from wet forests to semiarid habitats in subtropical and temperate regions of South America. In order to examine the effect of prey levels on colony size I studied colonies under different prey conditions in populations from the Dry and Wet Chaco in northern Argentina (referred as dry and wet sites, respectively). I further examine whether these differences in prey levels were translated into any difference in development of spiders that could affect fecundity. Censuses conducted during the spring-summer season 2002 showed that in colonies comprised by 6th instar individuals prey availability is not positively correlated to colony size, but shows the opposite trend. Colony size was larger in the dry sites, but within-habitat variation in colony size was similar between habitat types. Life cycle stages occurred two months later in the dry than in the wet sites. Results from transplanted colonies suggest that this delay in stages is due to differences in prey availability. In contrast, mean spider mass of 6th instar individuals did not differ between habitats. The number of eggs/sac produce by female showed the same pattern as spider mass. When reciprocal transplants of colonies were performed, the changes in local conditions (most probably prey) were reflected in a larger number of eggs/sac in colonies transplanted to wet sites, and fewer eggs/sac in colonies transplanted to dry sites. These results suggest that prey levels do not affect aggregation behavior in *P. bistriata* in the direction showed by other species (larger colonies under high prey conditions). However, even though lower prey levels might be delaying development in dry populations, native individuals from dry sites seem to be adapted to local prey conditions and, in terms of reproduction, are as successful as populations under higher prey conditions.

A one-dimensional developmental system may preclude the evolution of higher eusociality in spiders

Catherine L. Craig
Harvard University and Tufts University, MA

Sociality—cooperative nest building and sharing of tasks---has evolved in all higher orders of insects (Hölldobler and Wilson 1990). Furthermore, all eusocial species are marked by reproductive and worker castes that are behaviorally and physiologically distinct from each other (Wheeler 1991). This makes a flexible developmental pathway and the physiological ability to reprogram this pathway in response to the environment the most important preconditions for the evolution of eusociality (West-Eberhard 1989). In other arthropods, developmental flexibility is mediated by a two dimensional regulatory system consisting of ecdysone, which causes morphogenic change, and juvenile hormone, which modifies the effects of ecdysone to allow extended growth. In spiders and their ancestors, however, only one developmental hormone has been found. In this talk I will compared the primary developmental patterns and physiology of insects and spiders to determine whether a life-long commitment to silk production has, in some way, limited developmental flexibility in spiders.

Dynamics of group formation in pholcids:lessons from a long-term study

Elizabeth M. Jakob
Dept. of Psychology, University of Massachusetts Amherst, MA

I will integrate results from my long-term study of facultative group living in *Holocnemus pluchei* (Family Pholcidae).I was especially interested in how individual variation impacts group dynamics, a problem that is more tractable in *H. pluchei* than in many other taxa.In a series of laboratory and field experiments, I documented that individual variation in size, sex, and recent feeding success all influence spider behavior, sometimes in surprising ways.I will discuss briefly current popular methods of modeling the role of individual variation in social groups and why some are less appropriate for spiders, and describe the value of a spatially explicit, object-oriented approach.

Social dynamics in an atypical social spider, *Delena cancerides* (Sparassidae)

Linda S. Rayor, Anne Pfeffer, Rachel Walsh
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David Rowell
School of Botany & Zoology, Australian National University

The endemic Australian huntsman spider, *Delena cancerides* (Sparassidae), is the most atypical of known social spiders due to its complex social dynamics that do not fit into any cur-rent model of spider sociality (Aviles 1997). *Delena* are large non-web building spiders that live coopera-tively under bark of dead trees in dense colonies of 30 – 300 individuals. Colonies typically consist of 1 to 8 adults and multiple cohorts of off-spring. *Delena* share behavioral traits with many of the coop-erative spider species, but differ behaviorally in significant ways from all of the other social spiders (Rowell & Aviles 1995, Aviles 1997). My talk will highlight features of social dynam-ics in *Delena* colonies that are similar to other cooperative spi-ders, as well as features are that significantly different. *Delena* do not produce silk webs that facilitate cooperative prey capture and communication. My research indicates that *Delena* compensate for the lack of webs with frequent interac-tions and diverse communicative behavior that is quite com-plex compared to many other social species. Unlike other social spiders that are typically in-different to individuals from other colonies, *Delena* are often highly aggressive to non-colony members. Experiments suggest that *Delena* respond aggres-sively to large unfamiliar individuals, but readily accept smaller unfamiliar animals into the colony. Even among indi-viduals within a colony the degree of conflict and competition is strikingly high for a social spider. Patterns of prey sharing among mothers, non-mother adults, and immature spiders il-lustrate some of these conflicts.

Investigation of a Brood Fostering Hypothesis that Explains Variation in Levels of Sociality

Susan E. Riechert & Thomas C. Jones
Dept. of Ecology & Evolutionary Biology, University of TN, Knoxville TN

The exhibition of altruistic and cooperative behavior in a world, which favors individualism and selfishness is a problem that has been approached largely through the study of bee, wasp and ant social systems. The social insects, however, pos-sess a unique mechanism of inheritance (haplodiploidy) that makes self-sacrifice easier to achieve than in other systems. Spiders make a better model for investigation of the determi-nants of social behavior as they have the typical diploid pat-tern of inheritance. We have been analyzing the factors under-lying cooperative brood care in the spider, *Anelosimus studiso-sus* that exhibits a higher incidence of multiple female colonies caring for a common brood at higher latitudes and in colder local environments at a particular latitude. A mathematical model indicates that females will cooperatively care for a brood in those environments in which a single female has a high probability of dying before her offspring are able to care for themselves. The results of initial field measures and experi-ments completed on spiders from populations along a latitu-dinal gradient between south Florida and Tennessee support the Brood Fostering Model of sociality.

Population structure in the cooperative spider *Stegodyphus dumicola* (Eresidae): A DNA fingerprinting study

Deborah Smith
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Joh Henschel
Desert Research Institute, Windhoek, Namibia

We used TE-AFLPs, or three enzyme amplified fragment length polymorphisms, to investigate population structure in a Namibian social spider. Spiders were collected from 33 loca-tions in 3 regions in Namibia. We screened 1 adult female per colony (N=45; some colonies did not contain adults) to look for genetic differentiation among regions. We screened groups of 4-8 colony mates from 13 colonies to examine variation within and among colonies. Bands on TE-AFLP gels were scored as polymorphic or fixed, and pairwise distances among individu-als were calculated based on simple band sharing. AMOVA (analysis of molecular variance) was used to investigate parti-tioning of genetic variation among regions, among collection sites and among colonies. We found that the cooperative *S. dumicola* had a slightly lower proportion of polymorphic loci (bands) than the solitary *S. lineatus* (62% vs. 73%). AMOVA analysis of 1 female per colony showed little genetic differen-tiation among the three regions North, Highlands, and Low-lands, but because samples were not balanced among regions this result should be accepted with caution. AMOVA analysis of genetic variation among collection sites and among colonies within sites, showed 57.5% of genetic variation in these sam-ples was among collection sites, 17.7% among colonies within collection sites, and 24% within colonies. Thus, partitioning into highland, lowland, north regions apparently did not ac-count for significant amounts of genetic variation. Most varia-tion is among collection sites (groups of colonies), and at a single collection site, there is more variation within than among colo-nies.

El Niño influences and colonial orb-weaving spiders: Evidence for multi-level selection and origins of sociality?

George W. Uetz & J. Andrew Roberts
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Aggregations of the colonial web-building spider *Metepeira spinipes* on the Monterey Peninsula in California, linked to the 1997-98 El Niño phenomenon, present a unique opportunity to examine mechanisms responsible for group-living in spiders. In previous (drought) years, populations were predominately soli-tary, but following the recent El Niño event, large colonies were observed. We have now collected data on colonies of *M. spinipes* from multiple sites on the California coast, and have observed colony size distributions and population trends over several suc-cessive years of the climate cycle. Patterns of colonial behavior vary between coastal sites: populations in low elevation (moist) habitats in Monterey and Half Moon Bay show a higher propor-tion of colonial individuals and stable or increasing mean colony size; higher elevation (exposed, variable) habitats at Point Lobos and Año Nuevo show declining proportions of colonial individu-als and decreasing or increasing colony size (respectively). Our intensive field studies in Monterey confirm earlier observations: increases in prey insect abundance during El Niño years result in higher density of spider populations, creating conditions fa-vorable to aggregation and social behaviour. Spiders aggregate in sites with high prey availability, and nearest neighbor dis-tance decreases with increased colony size. Observations of prey availability and individual prey capture rates support the pre-dictions of risk-sensitivity theory: spiders living in groups have increased prey capture and reduced variance. Individual spi-ders in groups produce more egg sacs than solitaries, and year-to-year colony size and persistence data suggest a potential role for multi-level selection in this colonial web-building spider.

Poster Presentation Abstracts

The effect of predator hunger on chemically-mediated antipredator responses and survival in the wolf spider *Pardosa milvina* (Araneae: Lycosidae)

Ryan D. Bell
Susquehanna University, Selinsgrove, PA
Ann L. Rypstra
Miami University, Hamilton, OH
Matthew H. Persons
Susquehanna University, Selinsgrove, PA

The wolf spider, *Pardosa milvina*, exhibits antipredator be-havior when detecting silk and excreta from a larger co-occurring wolf spider, *Hogna helluo*. Since the quantity and quality of silk and excreta may vary with the hunger state of the predator, we tested if cues from hungry vs. satiated *Hogna* would influence *Pardosa* activity level and survival. *Pardosa* activity was measured on substrata containing chemical cues from 1) a satiated *Hogna*, 2) a *Hogna* withheld food for 2 weeks, or 3) a control consisting of a blank test container (N = 20/treatment). *Pardosa* response was recorded on each substra-tum over a 30-min period using video-tracking equipment (Videomex I). We then measured *Pardosa* survival in the pres-ence of live hungry and satiated *Hogna* on each respective sub-strate treatment or a blank control substrate in a fully factorial design. Results indicate *Hogna* cues significantly reduced *Par-dosa* activity level and that *Pardosa* show significantly less activity in the presence of cues from a hungry *Hogna* than a satiated one. Predator hunger state and substratum type sig-nificantly affected *Pardosa* survival in the presence of live *Hogna*. However, cues from hungry vs. satiated *Hogna* re-sulted in no difference in *Pardosa* survival nor was there a sig-nificant interaction between *Hogna* hunger state and substra-tum type on *Pardosa* survival. In summary *Pardosa* can dis-criminate between hungry versus satiated predators based on silk and excreta cues alone, but differences in behavior as a re-sult of this discrimination did not translate into increased sur-vival in the presence of a live predator.

Taxonomic Survey of the Tarantulas (Araneae, Mygalomorphae, Theraphosidae) of Colorado

Nick Betzen & Paula E. Cushing

Denver Museum of Nature & Science

As part of the Colorado Spider Survey we are trying to determine the identity and range of all the species of tarantulas (Araneae, Mygalomorphae, Theraphosidae) found in Colorado. A search of the literature shows two recorded species of tarantulas fromColorado:*Aphonopelma coloradanum* (Chamberlin 1940) and *A. echinum* (Chamberlin 1940), both found in southeastern Colorado. We suspect that these two recorded species from Colorado actually represent a single species and that both should be synonomyzed with *A. hentzi* (Girard 1852). In order to determine this, we have conducted collecting trips based on the reports of tarantula sightings made by Colorado Spider Survey participants. Through these collecting trips we have determined that there are at least two valid species of tarantula in Colorado, one from the southwestern plateau area and one from the southeastern plains area. In order to identify these species and document their ranges we plan to conduct further collecting trips and laboratory studies.

A banding technique for studying spiders in pecan canopies

Alejandro Calixto, Allen Dean, Bill Ree, Lisa Brook,s and Marvin Harris,

Department of Entomology, Texas A&M University, College Station, TX

Corrugated cardboard band refuges were used to determine phenology and density of spiders throughout the year on pecan foliage. Two hundred bands (10 per tree on 20 trees, with each band 2.5"x5", folded over a twig and held by a clothespin) were attached to the limbs at heights between 1.6- 2 m. They were left for 7 days, collected, placed into ziplock bags and replaced; the bags were numbered by tree and returned to the lab where they were frozen for later analysis. In the lab, each band was inspected and all spiders and other arthropods were counted. A total of 20,358 spiders including 63 species within 17 families were collected using this banding technique. *Hibana sp.* (27%), *Trachelas mexicanus* (10%), *Philodromus sp.* (8%), *Eris sp.* (5%) and *Hentzia sp.* (5%) were the most common species encountered. Spiders are present year round. Phenology consisted of an increase in number across the year and a reduction, but not disappearance, during the winter. Increases in numbers were observed in September and December suggesting an increase in "ballooning" behavior as a response to the oncoming winter. This method provides an efficient and inexpensive technique to study spiders in pecan tree canopies.

Spider Genera of North America Revision Project Update

Paula E. Cushing

Denver Museum of Nature & Science, Denver, CO

Pierre Paquin

San Diego State University, San Diego, CA

Nadine Dupérré, Québec, Canada

In September 2001, a team of taxonomists and interested arachnologists proposed to the American Arachnological Society Executive Committee that the *Spider Genera of North America* guide by Vince Roth be revised. The Spider Genera of North America Revision Project is scheduled for completion by the end of 2004. Eighteen chapters are either completed or are being illustrated. The fourth edition of the *Spider Genera of North America* guide is expected to be available for purchase no later than early 2005. Stop by this poster for a sneak preview of the fourth edition.

Spiders in Texas Pecans

Allen Dean, Alejandro Calixto & Marvin Harris

Texas A&M University, Dept. of Entomology, College Station, TX

Spider fauna in pecan orchards has been sampled using different collection techniques to determine relative abundance and distribution through time. Spiders were sampled using pitfall traps, corrugated cardboard band refuges and other methods like hand collection. Information presented is intensive sampling at two locations (Comanche Co. is arid and Robertson Co. is more humid) in Texas. The most common spider species occurring in the pecan agroecosystem, and where they were found (trunk, leaves, nuts, ground, etc) is presented. These predators are a significant component of the pecan agroecosystem. Their conservation will contribute to better biocontrol in agricultural systems and to preserving biodiversity in the environment.

Metasoma of *Orthochirus* (Scorpiones: Buthidae): Are Scorpions Evolving a New Sensory Organ?

Elizabeth V. Fet, David Neff, Matthew R. Graham, Victor Fet

Marshall University, Huntington, WV

A peculiar array of cuticular pits, with a single socketed seta emanating from each, is observed ventrally and laterally on the posterior segments of metasoma in a few Buthidae (Scorpiones), including all species of the widespread Old World desert genus *Orthochirus* Karsch. SEM investigation shows those pits adorned with variable size setae, which exhibit microanatomical features characteristic for chemoreceptors (curved shape, end pore). *Orthochirus* metasoma at SEM magnifications from 15x to 7,500x is illustrated. Observations in nature (Central Asia) show an unusual rest/defense posture in *Orthochirus*, with metasoma positioned flat on the dorsal side of mesosoma, its small telson folded in a groove, and ventral surface of the metasomal segment V forming a "face shield". The observed side-to-side metasomal motion during prey search also seems to agree with a possible special functional role. We suggest that the up-and-forward facing (in rest posture) ventral/lateral surfaces of posterior metasoma in *Orthochirus* and related buthid genera could be used as a chemosensory array, analogous to insect antennae. Or, quoting Brownell (2001) on arachnid chemoreception, "God has a plan after all!".

The influence of chemical vs. visual cues from females on male courtship behavior in a wolf spider (Araneae: Lycosidae)

Jeremy Gibson

University of Cincinnati

Mate choice by females is usually based on some aspect of male signaling, but male courtship behavior may not be independent of the presence of the female. Males of the wolf spider *Schizocosa ocreata* use multimodal communication (visual and vibratory signals) and typically begin courtship behavior when they encounter the silk of adult females. While silk alone may be sufficient to elicit a response, it is unknown whether males use other stimuli from females to initiate courtship. Moreover, does having more than one stimulus (e.g., visual contact with the female) increase male courtship vigor? To test this, males were separated into three female stimulus treatment groups: visual cues only (female isolated on separate substrate), chemical (silk) cues only, and chemical (silk) plus visual cues. Several aspects of male courtship behavior (chemo-exploratory behavior, jerky-tapping) varied significantly between treatment groups. Males that were exposed to female silk performed chemo-exploratory and jerky-tapping behaviors more often than males given only visual stimuli. Furthermore, males in the visual treatment group spent more time stationary than those males in either of the other treatment groups. These results suggest that male wolf spiders rely more on chemical stimuli than visual stimuli from females to initiate courtship behavior.

Reassessing the scorpiofauna of Saudi Arabia

Brent E. Hendrixson

East Carolina University, Greenville, NC

W. David Sissom

West Texas A&M University, Canyon, TX

This poster briefly discusses the systematics, taxonomy and species composition of the scorpion fauna of Saudi Arabia. Examination of several hundred specimens (from the American Museum of Natural History, British Museum of Natural History, Field Museum of Natural History, Hebrew University, Museum of Comparative Zoology, Museum National d'Histoire Naturelle, Naturhistorisches Museum Basel, and the personal collections of Matt E. Braunwalder and W. David Sissom) revealed a total of 13 genera and more than 20 species. Six putatively undescribed species are identified in the following genera: *Buthacus*, *Butheolus*, *Compsobuthus* and *Hemiscorpius*. One new synonymy is proposed: *Vachoniolus minipectinatus* is considered a junior synonym of *Vachoniolus globimanus*. Three species are reported from Saudi Arabia for the first time: *Butheolus anthracinus*, *Compsobuthus longipalpis* and *Leiurus jordanensis*. Each genus is diagnosed, and most are accompanied with illustrations and color digital images; maps

have been provided to determine species distributions. The status of *Leiurus quinquestriatus hebraeus* is revisited. Several genera remain problematic and are in need of major revision because most characters have been found to be as variable intraspecifically as interspecifically. Finally, the biogeography of the scorpions of Saudi Arabia is briefly discussed.

The Role Of The Web In Prey Capture By Three Species Of Web-Building Wolf Spiders (Araneae: Lycosidae)

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Sosippus is the only genus of wolf spiders (Lycosidae) in North America that construct prey-capture webs; other genera are cursorial hunters. The function of a spider web is to enhance the ability of the spider to capture and subdue prey, so we hypothesized that *Sosippus* would capture prey more quickly with a web than without a web. *Sosippus californicus*, *S. floridanus*, and *S. placidus* were presented with live crickets in two conditions: with or without a web. The time (latency) to subdue the prey was recorded for each condition. We found that S. placidus and *S. californicus* captured prey quicker with webs than without webs (Paired, 1-tailed t-tests, *S. placidus*: d.f. = 50, t = -2.032, p <0.05; *S. californicus*: d.f. = 13, t = 3.408, p < 0.05). There was no difference in latency to prey capture with or without a web by *S. floridanus* (d.f. = 40, t = 0.848, p = 0.2008). We speculate that since *S. placidus* and *S. californicus* live in xeric habitats, they may have come to rely on the web to a greater extent than does *S. floridanus*, which lives in more mesic habitats. This may explain why these two species don't capture prey without webs as quickly as do *S. floridanus* (mean (+ s.e.) time (minutes, seconds) to capture without webs: *S. placidus*: 4.34 + 1.38; *S. californicus*: 8.25 + 1.26; *S. floridanus*: 0.47 + 0.31).

A Comparison Of The Diversity Of Ground-Dwelling Spiders In An Old-Growth Beech-Maple And A Second-Growth Forest

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Beech-maple forests were once widespread throughout Ohio and Indiana, but uncut, old growth stands are now restricted to a few small remnant sites. Ground-dwelling spiders are an important trophic link between the decomposition food web and the other forest fauna. Their diversity is linked to the complexity of the leaf litter and prey abundance, both of which may be greater in later stages of succession (Uetz 1990). Our ongoing study is designed to measure and compare the diversity and turnover of leaf litter spiders in a pristine 200-acre beech-maple forest (100+ years old) and an adjacent, contiguous second growth forest (<50 years old) in northeast Ohio. Eight pairs of pitfall traps were sampled in each habitat at weekly intervals from July-September, 2001 & 2002. We compared the familial and generic diversity in the two habitats, and changes in diversity and abundance from year-to-year. The most abundant genera in both habitats were *Wadotes* (Amaurobiidae) and *Neoantistea* (Hahniidae). *Wadotes* was over twice as abundant in second-growth traps in 2001,however this difference vanished in 2002. *Neoantistea* is similarly abundant in both habitats, but increased dramatically (almost 7 fold) in 2002. In both years *Agroeca* (Liocranidae) was more abundant in the second-growth, whereas *Phrurotimpus* (Liocranidae) and Pirata (Lycosidae) where more abundant in the old-growth. Contrary to expectation, there were no differences in diversity between the habitats. The number of genera captured in each habitat was greater on most dates in the second-growth sites but this difference was not significant.

Two New Species of *Sabacon* Harvestmen, with Descriptions of the Females of *Sabacon astoriensis* Shear and *Sabacon sheari* Cokendolpher, from Western North America (Arachnida, Opiliones, Sabaconidae)

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Two new species of Sabaconidae (Ischyropsalidoidea) are described: *Sabacon* # 1 from central Alberta and British Columbia and *Sabacon* # 2 from Oregon. Descriptions of the females of *Sabacon astoriensis* Shear 1975, from Oregon, and *Sabacon sheari* Cokendolpher 1984, from Oregon and Idaho, are also described.

Immunoreactivity of Glutamic Acid Decarboxylase (GAD) Isoforms in the Central Nervous System of the Barn Spider, *Araneus cavaticus*

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The Gama-aminobutyric acid (GABA) has long been considered an inhibitory neurotransmitter in the central nervous system (CNS) of both vertebrates and arthropods. The glutamic acid decarboxylase (GAD) catalyzes the conversion of L-glutamate to GABA. As the GAD has a restricted tissue distribution, it is highly expressed in the cytoplasm of GABAergic neurons in the CNS. However it is also present in other non-neuronal tissues such as testis, oviduct and ovary. Recently, there were reports that a GABA-like immunocytochemical reactivity and a ninhydrin-positive GABA derivative, GABamide, exists in the visual ganglia and in the water-soluble fraction of the spider web respectively. So, this experiment initiated to identify exact distribution of the GAD isoform immunoreactivity in the CNS of the spider to reveal the ecophysiological significance of GABA for spider's behavior.

Territory Size And Spacing Patterns In The Wolf Spider, *Pardosa milvina* (Araneae; Lycosidae)

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In active spider species, the number of encounters they have with conspecifics can have important consequences to both reproduction and survival. In a simple laboratory experiment, we explored the factors that influence spacing and aggression levels between females of the active wolf spider, *Pardosa milvina* (Araneae; Lycosidae). In each trial, two females were placed in arena and the distance between them and any interactions were monitored for 15 minutes. In different treatments we explored whether their behavior was affected by body size differences, and/or habitat quality (moisture, presence of prey or predator information). Spiders that were similar in size moved closer together than those that were asymmetrical in size. Presumably they could tolerate one another better because the threat of cannibalism was lower. Spiders in a moist environment were found closer together and attacked one another more than those on a dry substrate. Spiders held in the presence of cues left by crickets (the prey items they had been maintained on most recently) moved closer together and came in contact with one another more than spiders held on conspecific cues or on cues from a common predator, *Hogna helluo* (Araneae; Lycosidae). Thus spiders in high quality environments (moisture and/or prey present) tended to interact more than those in a hostile environment (dry and/or risk of predation). We presume these increased interaction levels are due to a higher activity level under good conditions.

Los Angeles Spider Survey completes its first year

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Natural History Museum of Los Angeles County

For the past year, the Natural History Museum of Los Angeles County has conducted an urban spider survey of the greater Los Angeles area. The public was invited to participate by collecting spiders in their houses and gardens, recording collection data, and bringing them to the museum. Approximately 2500 spiders have been collected by the public and by museum arachnologists. Most of the spiders were collected from houses and gardens in urban areas of Los Angeles County. Approximately 35% of the spiders collected were in the family Theridiidae. *Steatoda grossa* (Theridiidae) was the most common spider at 20% of all specimens received, and was found both inside and outside. The most commonly found spiders indoors included: *Cheiracanthium mildei* (Miturgidae), 7%; *Scotophaeus blackwalli* (Gnaphosidae), 8%; *Oecobius navus* (Oecobiidae), 6%; and Pholcidae, 19%. The most common spiders found outside were: Agelenidae (predominantly *Hololena curta*), 16%; various Araneidae, 9%; *Latrodectus hesperus* (Theridiidae), 8%; and *Achaearanea tepidariorum* (Theridiidae), 7%.). The majority of the most common species found in the LA area were typical cosmopolitan species; *Cheira-*

canthium mildei, Latrodectus hesperus, and most of Agelenidae and Araneidae can be considered as a true native species adapted to an urbanized environment. Three species collected appear to be new records for the area: *Latrodectus geometricus* (Theridiidae); and *Tylogonus minutus* and *Plexippus paykulli* (Salticidae. The Los Angeles Spider Survey will continue with an emphasis on collecting in natural areas within the Los Angeles area.

The Phylogeny of the Oarcinae (Araneae, Mimetidae)

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The Mimetidae are a spider family of worldwide distribution and problematic taxonomic placement. The Oarcinae are a subfamily of mimetid spiders endemic to temperate Chile and adjacent Argentina. Their evolutionary history is of particular interest because of the Chilean biogeographic province's unique role in planetary diversity. Moreover, their close resemblance to orbicularians is relevant to certain controversies regarding the inter-familial placement of the Mimetidae. There are seven oarcine species, placed in the monotypic genus *Oarces* Simon and the slightly larger genus *Gnolus* Simon. All seven are recently revised and well delimited. The taxa are scored for morphological characters and a phylogeny is inferred under parsimony. The analysis strongly supports the monophyly of the Oarcinae with respect to other mimetid spiders, but does not support monophyly for either oarcine genus. Photographic evidence of araneophagy in oarcines, and a literature review of mimetid taxonomy are also presented.

Congruence between phylogenies created using morphological traits and mtDNA sequence data for the wolf spider genus Geolycosa

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Members of the wolf spider genus *Geolycosa* are obligate burrowing spiders. Earlier attempts of using morphological traits gleaned from Wallace's 1942 revision to create a phylogeny of the group were inconclusive. We have therefore focused on creating a new morphological data set that includes palpal, epigynal as well as somatic characters. The current data set includes 15 taxa of *Geolycosa*. Outgroups are the facultative burrowers, *Hogna georgicola* and *H. carolinensis* as well as non-burrowing *Pardosa milvina, Rabidosa punctulata* and *Rabidosa rabida*. For these taxa we have scored 45 binary, unordered characters, including 22 palpal characters, 3 epigynal characters and 20 somatic characters. Of the somatic characters, 13 are morphometric. Preliminary analysis of the morphological data set using Paup* suggests that some of the currently recognized species may not be monophyletic. Comparison of multiple populations will be necessary to clarify species relationships within this genus.

Foraging and habitat selection by the scorpion, *Centruroides vittatus*

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How does habitat selection effect the foraging success of the scorpion, *Centruroides vittatus* (Scorpiones: Buthidae)?The frequency of prey capture by *C. vittatus* was observed on the campus of Texas A&M International University in the Tamaulipan Biotic Province.The frequency of prey capture was significantly different for microhabitat classes.Prey capture frequency was higher for scorpions on blackbrush, *Acacia rigidula*, than other microhabitats and low when on the ground or cacti.Prey capture frequency was significantly higher with increased height on foliage.Prey capture frequency was significantly higher during March through May and September through October but not significantly different among temperature or humidity classes.Caterpillars of Lepidoptera were an important prey item (15 caterpillars of 45 prey items), and most of the captured caterpillars were observed on blackbrush (9 of 15).Why was foraging success of a *C. vittatus* higher in blackbrush?Further research will investigate prey availability on different plant species and at different seasons to compare with foraging success of scorpions.Why were scorpions located in microhabitats with low foraging success? Further research on the home range of *C. vittatus* will investigate uses of microhabitats (i. e., foraging or as refuges).

A Comparison of the Femoral Gland of *Zodarion rubidum* (Araneae, Zodariidae) with that of other species of Zodariidae

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Catherine Tuell, Colorado School of Mines
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Many of the members of the family Zodariidae possess femoral glands. The function of these glands is unknown. Our objective was to use Scanning Electron Microscopy (SEM) to determine the structure of the femoral gland of *Zodarion rubidium*, one of two species of *Zodarion* found in the United States. This species was originally documented from Pennsylvania by Bea Vogel in the 1960's and was discovered in Colorado by Colorado Spider Survey participants, Nina Shilodon and Steven Bonham in 1999. The femoral glands of *Z. rubidium* are compared with the glands found in other species in the family Zodariidae.

Fine Structural Analysis of the Central Nervous System in the Spider, *Achaearanea tepidariorum* (Theridiidae: Araneae)

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The central nervous system (CNS) of spiders has a lot of area must to be explore. The central nervous system (CNS) of spiders has a lot of area in need of desciption.The CNS of *Achaearanea tepidariorum*, consists of a dorsal brain or supraesophageal ganglion and circumesophageal connectives joining it to the subesophageal masses. We classify the brain as a protocerebral and tritocerebral ganglion depending on its body segmentation and other segmentation features. The subesophageal nerve mass underneath the brain is the foremost part of the ventral nerve cord. All of this nerve mass is totally fused together, and forming subesophageal ganglia in this spider. While the nerve cells are packed in the frontal, dorsal and lateral areas of the brain, the nerve cells of the subesophageal and abdominal ganglia are only restricted to the ventral and ventolateral regions. It has been revealed that the organization of the CNS of this spider, *Achaearanea tepidariorum* is more similar in feature to the family Araneidae rather than other web-building spiders.

Functional Organization of the Silk Spinning Apparatus in funnel-web spider, *Agelena limbata* (Araneae: Agelenidae)

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Silk apparatus of the funnel-web spider, *Agelena limbata* was located at the ventral end of the abdominal part, and was composed of internal silk glands and external spinnerets. Among the three pairs of spinnerets, the posterior pairs were highly elongated along the body axis. By the light and electron microscopic inspections, it was found that four types of silk glands were connected through the typical spinning tubes of each spinneret. Anterior spinnerets comprise 2 pairs of the ampullate and 125 to 150 pairs (female) or 110 to 114 (male) of pyriform glands. Another 2 pairs of ampullate glands in both sexes, 5 to 8 pairs of tubuliform glands in females, and 20 to 26 pairs (female) or 15 to 17 pairs (male) of aciniform glands were connected on the median spinnerets. Additional 8 to 10 pairs of tubuliforms in female and 41 to 53 pairs (female) or 27 to 32 pairs (male) of aciniform glands were on the posterior spinnerets, respectively. While the ampullate and tubuliform glands were connected with the spigot-type spinning tubes, the pyriform and aciniform glands with that of spool-type tubes. It has been also revealed that the tubuliform glands were only observed in female spiders, however the flagelliform and aggregate glands which had the function of adhesive thread production in orb-web spiders were not observed at both sexes of this spiders.

Ontogenetic Changes in the Foraging Behavior of *Argyrodes trigonum*

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Argyrodes trigonum is a species of spider that utilizes a range of foraging strategies: kleptoparasitism, host predation, web stealing and web sharing, as well as constructing its own web. Previous work has shown that foraging strategy is influenced by a variety of factors including developmental stage of *A. trigonum*. However, differences in foraging for different instars of spiders may be merely the result of differences in size of the host spider relative to *A. trigonum*. The objective of this study was to elucidate ontogenetic changes in foraging behavior that result from factors other than relative host size. The foraging behavior of all instars (1-6) of *A. trigonum* in the webs of the host spider, *Achaearanea tepidariorum* was observed. Host size was varied for each instar of *A. trigonum*. Spiders were kept in ten-gallon aquaria, containing one host spider and one *A. trigonum*. Observations of positions and interactions between host and *A. trigonum* were recorded several times daily for three days. Earlier (1st-3rd) instar *A. trigonum* exhibited more aggressive foraging tactics as well as more active behavior in general regardless of host size compared to 4th instar *A. trigonum*. Adult female *A. trigonum* also exhibited aggressive behavior. The more passive behavior of mid-sized individuals could be due to their need to redirect energy from active foraging into the final molt to sexual maturation.

Composição das comunidades de aranhas e suas associações com espécies de *Myrcia* em manchas de cerrado amplamente separadas no estado de São Paulo, Brasil

(Spider community compositions and their associations with Myrcia species in widely-separated patches of cerrado in São Paulo State, Brazil)

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Brazilian cerrado is a biologically-rich, poorly understood, yet rapidly disappearing habitat. Composition of the spider communities from patches of cerrado located in three separate sites in the State of São Paulo, Brazil were sampled by beating the canopies and adjacent shrubs of three *Myrcia* (Myrtaceae; "myrtle") tree species. These produced a total of 859 spiders belonging to 21 families and 75 species. The most undisturbed and densest cerrado patch had the largest number of spider species, predominated by stalkers and foliage runners. Cluster analysis (UPGMA) based on 12 sampled points defined as different microhabitats within each patch segregated the three sites mainly by the *Myrcia* species present and geographical location of the patches. The two most similar clusters were the areas where *Myrcia venulosa* was present. The growth form of this species is more ramified than the others, and may explain the observed spider distributions. The presence of thomisids (*Tmarus* and *Synema*) and the absence of the theridiid, *Crysso pulcherrima*, on this plant contributed most to the similarities between these two distant cerrado patches. Studies presenting data such as these are important to cerrado conservation efforts.

The response of male *Pardosa milvina* to the presence of females and their cues

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Males that incur substantial costs in locating, courting, and mating with a female should want to find a female as quickly and easily as possible. In order to do this, a male should use all available cues in the environment, such as visual and chemical, to assist in mate search and mate selection. *Pardosa milvina* (Araneae: Lycosidae) is a diurnal species with good vision and has the ability to use chemical cues in their environment. We attempted to uncouple the use of visual and chemical information in finding a female. In a laboratory experiment, we measured the degree to which males were attracted to chemical cues from a virgin female, visual cues from a virgin female and both visual and chemical cues from a virgin female. On average, males spent the most time in proximity to females when both type of cues were present followed by when only visual cues were present and the least amount of time when no cues were present. This experiment can assist in separating the importance of a male *Pardosa*'s ability to use visual and chemical cues in mate search.

Molecular Phylogenetics and Spinneret Evolution of RTA-clade Spiders

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The RTA clade is an extremely diverse group (~18,000 species, representing about half of the described biodiversity) of spiders, with much variation in ecology and morphology. The loss of the cribellum, which produces hackled silk providing stickiness for some spider webs, has been studied in orb-weaving spiders, but not explicitly in the RTA-clade. Using molecular data from slow-evolving genes (1,600 basepairs 18S, 800 bp 28S), we are working to resolve relationships of some of the more difficult-to-place three-clawed lineages in this group, focusing on Agelenidae, Amaurobiidae, and Dyctinidae, where taxonomy and previous cladistic analyses suggest multiple losses, or possibly loss and secondary gain, of the cribellum have taken place. Results of direct-optimization analysis show a well-resolved and robust Agelenid clade that includes the Agelenines, Tegenariines, and Coelotines, but excludes the sole cribellate New Zealand genus represented (*Neoramia*). The sister group of the Agelenid clade is a clade including exemplars of several families, including Amaurobiidae, Dictynidae, Cybaeidae, and Desidae, but this group is less well-resolved and less robust to changes in tree-search parameters. The results suggest that there have been fewer shifts from the primitive cribellate to the ecribellate state than implied by previous taxonomic and phylogenetic hypotheses, but further taxon sampling will be needed to fully address this question.

Scytodes vs. *Schizocosa*: Predatory techniques and their morphological correlates

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Wolf spiders (Lycosidae) typically subdue prey using their legs for capture and their fangs for the injection of venom. Spitting spiders (Scytodidae), in contrast, subdue prey by entangling them, at a distance, in a spitted mixture of silk, glue, and venom that immobilizes and may also kill them. We selected individuals of *Schizocosa duplex* (Lycosidae) and *Scytodes* sp. (Scytodidae) of approximately the same mass and carapace width to provide a quantitative assessment of their relative allocations of biomass to morphological features that might be expected to vary with prey-capture technique. As expected, the wolf spiders allocated significantly more to legs, chelicerae, and fangs, and significantly less to the venom glands, than did the spitting spiders. Further comparisons of the legs and chelicerae of the two species provided surprises. First, the legs of *Scytodes* were 42% longer than those of *Schizocosa* despite *Scytodes*'s smaller overall allocation to the legs. And second, although the relative size of the chelicerae differ greatly, the shapes of the chelicerae of *Schizocosa* and *Scytodes* were not significantly different despite the radically different tasks those structures must fulfill.

Evolution of water surface locomotion by spiders: a comparative approach

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Spiders vary enormously in their behavior when placed on the surface of fresh water. In some families (e.g., Theridiidae), the spider typically becomes wet and sinks or is incapacitated by adhesion to the water. In other families (e.g., Agelenidae), the spider remains dry and moves across the water by walking or running with the members of each leg pair moving in alternation with each other. In at least one family, the Pisauridae, the spider remains dry and moves across the water using a rowing or galloping gait in which the members of each propulsive pair of legs move in synchrony with each other. We tested representatives of 249 species from 41 families of spiders to determine

their ability to move on the surface of water. While some degree of hydrophobicity is widespread among spiders, the ability to move on water by rowing occurs rarely in some families but is common only among families in the Lycosoidea. Our mapping of water surface locomotion behavior onto cladograms of the Araneae suggests that the ability to row evolved at the base of the clade that includes Trechaleidae, Pisauridae and Lycosidae and evolved independently in some members of the family Ctenidae. Rowing behavior was seen in all tested individuals of Pisauridae, including *Pisaurina* spp. and *Dolomedes albineus*, species not normally closely associated with water. It is evident from our data that, in most spiders, phylogeny trumps recent selection (based on habitat preference) in determining the spiders' locomotor behavior on the water surface.

Male – Male Competition In The Wolf Spider, *Pardosa milvina* (Araneae; Lycosidae)

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Male-male competition in nature is widely observed because those males who are successful are more likely to get their genes in the next generation. *Pardosa milvina (*Araneae; Lycosidae) is a small, active wolf spider found in riparian zones and agroecosystems throughout the Midwest. Males prefer virgins to mated females and they can discriminate from chemical cues from females. We conducted a laboratory experiment to test the hypothesis that males will interact more aggressively with each other in the presence of cues from virgin females than on cues from mated females or when no female information is present. We monitored interactions between two males under three conditions: (1) control with no *P. milvina* cues; (2) cues from a virgin female; and (3) cues from a mated female. The males were introduced into the testing arena, allowed to acclimate for five min. under independent glass vials, and released. The were videotaped for a period of 15 min and the number of aggressive acts (i.e. touches and attacks) and the distance they maintained between them were recorded. We found that there was a higher rate of attacks and aggressive behavior between males on cues from a virgin female when compared with other conditions. This result suggests that male-male competition may have been heightened due to the spiders' preference for virgin female *P. milvina.*

Cryptic costs of mating under predation risk in the wolf spider *Pardosa milvina* (Araneae: Lycosidae)

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The wolf spider, *Pardosa milvina*, shows effective antipredator behavior in the presence of chemical cues (silk and excreta) from a larger predatory wolf spider, *Hogna helluo*. We examined the influence of substratum-borne predator chemical cues on male *Pardosa* courtship and copulatory behavior. Forty-one pairs of adult virgin male and female *Pardosa* experienced one of two substrates: 1) a sheet of filter paper previously occupied by an adult female *Pardosa* for 24 h followed by an adult female *Hogna* for 24 h or 2) a control sheet of paper occupied by only an adult female *Pardosa* for 24 h. Using behavioral observation software (Observer 4.1), we recorded courtship latency, duration, and intensity (as measured by leg raise and body shake rates). We also measured the number of successful matings, the duration of each mating, and the number and rate of successful and failed palpal insertions during copulation. We found no significant difference in mating success, courtship intensity, or copulation duration between treatments. However, males under predation risk had significantly reduced rates of palpal insertions and also had significantly more missed insertions than males not under predation risk. Results suggest predation risk may compromise sperm transfer efficiency or copulatory courtship even when courtship and mating success appear unaffected by the presence of predators.

First Data on the DNA Phylogeny of Some Cuban Buthidae (Scorpiones)

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First data on mitochondrial DNA (16S rRNA gene) were obtained from six species of Cuban buthids belonging to the genera *Alayotityus*, *Rhopalurus*, and *Centruroides*, and compared to the known buthid DNA sequences from the USA, Mexico, and Dominican Republic. Rooting with *Lychas* (Asia) clearly shows a separate position of *Alayotityus*, presumed to be an ancient Caribbean endemic. The single Maximum Parsimony tree (303 steps) for nine *Centruroides* species (rooted with *Rhopalurus*) recovered a well-supported (bootstrap 82 %) "Caribbean" clade as opposed to the "North American" clade (bootstrap 77 %). Cuban fauna of *Centruroides* is confirmed as consisting of two elements: an endemic core, and a North American element (*C. gracilis*), possibly introduced. Three endemic Cuban species of *Centruroides* and the Hispaniolan endemic *C. bani* form a topology (*C. bani* (*C. robertoi* (*C. anchorellus, C. baracoae*))), consistent with the morphology-based phylogeny suggested by Teruel (2001), and the intensive endemic speciation on Cuba. *C. anchorellus* and *C. baracoae* are confirmed as separate species, with genetic distance over 16%.

The effect of varying light conditioning on body state of the wolf spider *Hogna helluo*

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The wolf spider, *Hogna helluo*, is a known nocturnal spider. This would suggest that they would have increased foraging, indicated by better body condition, in a dark environment. In order to test this hypothesis, 123 *Hogna* spiderlings, aged 30-60 days, were conditioned in three different light environments: complete dark, complete light, and a 13L:11D cycle. Following this two-week conditioning, weight, carapace, and abdomen measures were taken. These revealed that spiders reared in the dark or in the light dark cycle were in better condition than those in constant light. The spiders were then fed four vestigial-winged fruit flies (*Drosophila melanogaster*) and given 90 minutes to consume the prey. After this feeding treatment, the previous differences in spider condition, indicated by weight and abdomen width, disappeared. This indicates that the spiders in the light treatment ate more than the spiders in the other treatments. This is a surprising result for *Hogna helluo*, a nocturnal spider. We speculate that this was found because the spiders raised in the light were hungrier than those in the other treatments, and thus, they ate more quickly when provided with an abundance of prey.

The Role of the Whip in Social, Predatory, and Investigative Behavior in an Amblypygid (*Damon diadema*: Phrynichidae)

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A distinctive characteristic of amblypygids is their long antenniform first pair of legs or 'whips.'Whips are used extensively to gather information about the surrounding environment. While whips clearly play an important sensory role, there is presently little data quantifying how amblypygid whip and palp activity changes in different contexts.To quantify aspects of amblypygid behavior we developed a detailed behavioral ethogram for *Damon diadema*, a Tanzanian species.We contrast the behavioral interactions of captive young and subadult amblypygids in social, exploratory, and potentially antipredator contexts. Whip contact is frequent between conspecifics in amicable and agonistic contexts, and is apparently important for both communication and localization.Young siblings are more amicable with each other than are subadult siblings or among unfamiliar individuals. Whip activity is significantly more frequent when an individual is in a group than when it is solitary.Even within an individual, if another animal is on one side, the two whips will move at different rates.Whip and palp movements differ when the animals are exploring potential predators or prey, and in social contexts. Our results document patterns and rates of behavioral interactions in amblypygids.

Common Missouri Tall Grass Prairie Spiders and their Responses to Fire and Weather

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I conducted a four year study of a tall grass prairie spider community to see how different species responded to controlled burns and weather. In March 1984, eight 30 x 30 meter plots were established in a section of Tucker Prairie (Missouri) that had been burned in March 1983. Four of the plots were burned again in 1984 and all eight were sampled in August of that year. In March 1985, another four plots were added to the study and burned and all12 plots were sampled in August. In 1986 and 1987, two plots burned in 1983, two burned in 1984, and two burned in 1985 were sampled in August. Sampling was done by collecting all spiders on the vegetation and the ground inside a 0.5 square meter quadrat. The ten most common species over the sampling period were *Wufila saltabunda* (10.3 per sample), *Schizocosa bilineata* (6.6), *Tibellus oblongus* (4.9), *Clubiona kastoni* (4.2), *Tmarus angulatus* (3.8), *Stemonyphantes blauvelte* (3.5), *Araneus pratensis* (3.4), *Thanatus vulgaris* (2.8), *Zora pumila* (2.1) and *Castianeira gertschii* (2.1). The distributions of these spiders were regressed against years since fire, and against degree days and rainfall (adjusted to reflect deviation from 30 year means). All three independent variables were highly correlated, so determining the relative influence of fire and weather on individual species was problematic. However, *Wulfila saltabunda* and *Tmarus angulatus* were more common immediately follwing fire and declined over time. *Schizacosa bilineata* was uncommon after fire but increased in each subsequent year. *Thanatus vulgaris* increased but then decreased after fire. *Zora pumila* was virtually absent until the third year after fire, but never reached very high levels. *Tibellus oblongus* and *Araneus pratensis* were more influenced by weather than by fire, both had higher numbers when weather was cooler and wetter than average. For the remaining three species, neither fire nor weather was a good predictor of their numbers.

Behavioral Responses of a Native Wolf Spider (Araneae: Lycosidae) to Cues of an Introduced Predator (Mantodea: Mantidae)

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Exotic predators are sometimes introduced into agricultural ecosystems for the purpose of controlling crop pests. However, studies are rarely conducted to determine if exotic predators have negative impacts on native predators. We recorded the behavioral responses of native wolf spiders (*Pardosa milvina*) to the excreta of an exotic species of praying mantis (*Tenodera sinensis*) that has been introduced for biological control. In paired treatment arenas, *P. milvina* spent significantly more time located on substrates with *T. sinensis* excreta than blank controls. In addition, *P. milvina* spent a significantly greater amount of time immobile and moved at a significantly slower mean speed while on cues relative to controls, which would reduce the probability of being detected by a predator. The behavioral responses to mantis excreta suggest that *P. milvina* may perceive *T. sinensis* as a predator. Reduced activity and longer residence times of *P. milvina* on cues of a larger syntopic wolf spider (*Hogna helluo*) result in weight loss, lower prey capture, and lower egg production. If *T. sinensis* has a negative impact on *P. milvina*, then the benefit of introducing this exotic predator for biological control may be lower than expected. Further studies are needed on the response of other native predators to *T. sinensis* and the impact of introducing exotic predators on biological control relative to systems with only native predators.

Oral Presentation Abstracts

Progress in tetragnathid phylogenetics with emphasis on the "Metinae" problem (Araneae, Tetragnathidae)

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Simon originally defined the tetragnathid subfamily Metinae as comprising "all forms intermediate between *Tetragnatha* and *Nephila*". This definition has obscured the higher level systematics of Tetragnathidae for more than one century. The phylogenetic relationships of metines are crucial to understand the evolutionary history of tetragnathid spiders. The cladistic analysis of Hormiga et al. (1995), based on 22 taxa and 61 characters, found metines to be paraphyletic with respect to tetragnathines, and nephilines sister to a clade including all remaining tetragnathid taxa. This presentation reports recent progress towards a better understanding of the phylogenetic relationships of metines. The cladistic analysis of a matrix of 42 species of tetragnathids (plus nine outgroups) and 117 characters scored(morphological and behavioral) corroborated the monophyly of Tetragnathidae, Nephilinae and Tetragnathinae, as well as the paraphyly of "Metinae" (the latter represented by 16 species). Traditional metines comprise two lineages: 'Leucaugines' and 'Metines sensu stricto.' The relationships of these two clades and the synapomorphies that support these lineages will be discussed.

Running Speed In The Wolf Spider *Pirata sedentarius*: Between-Sex Variation And A Cost Of Leg Autotomy

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Leg autotomy in spiders is a relatively common occurrence resulting from agonistic interactions with predators or conspecifics. While autotomy has immediate benefits, due to enhanced survival probability, it also potentially decreases future fitness. One possible cost of losing a leg is a reduction in burst running speed, which may affect prey capture and predator avoidance behaviors in wandering spiders. We examined running speed in intact and autotomized *Pirata sedentarius*, a wolf spider commonly found in moist cobble zones, from two stream banks in New York. Autotomy was fairly common in the field, with 18.8% and 22.2% of spiders missing at least one leg at our two sites. Females were relatively heavier than males and ran significantly faster. Intact spiders, both males and females, ran significantly faster than spiders missing a leg. We found no difference in speed between spiders which had lost a leg in the field and spiders for which we removed a leg in the laboratory. Heavier females ran significantly faster than lighter females in pre-autotomy trials, but mass did not affect female speed following autotomy. Male running speed was unaffected by mass. Our results suggest that leg loss is potentially costly to both male and female *P. sedentarius*, and does not support the "spare leg" hypothesis of Guffey (1998. J. Arachnol. 26: 296-302).

Phylogeography of the Desert Spider, *Agelenopsis aperta*: Testing Predictions Based on the Fossil Record

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Over the past two decades phylogeographic data, or the geographic distribution of gene lineages, has been increasingly used to infer historical events such as population fragmentation or range expansion. Unfortunately, most phylogeographic studies develop post-hoc explanations for observed patterns rather than use the genetic data to test a priori hypotheses. These a priori hypotheses can be developed from paleoclimatic, geologic, ecological or comparative phylogeographic data. For instance, fossil arthropod and plant data from arid southwestern United States during the last glacial maximum indicate that many desert organisms were restricted to lower elevations and latitudes than their modern day distributions. The desert spider, *Agelenopsis aperta*, currently exhibits a wide range throughout the southwestern United States but is limited to areas below 6000 feet. Based on the fossil evidence and the modern day elevational limit of *A. aperta* we hypothesized that this desert spider has been restricted to lower elevations and latitudes during glacial maximums and has only recently expanded its range to the modern extent. We tested this hypothesis by comparing observed patterns of mitochondrial DNA sequence variation to predicted patterns under various historical scenarios. Preliminary analysis shows support for a recent range expansion event but the evolutionary history of *A. aperta* populations appears to be more complex than can be predicted from the fossil record alone.

Did bolas-hunting spiders evolve through gradual web reduction?

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Moth hunting bolas spiders construct some of the most specialized webs found within the Araneidae. These highly reduced webs are thought to have evolved through a gradual reduction of the orb web within the Cyrtarachninae, which accompanied an increased specialization upon male moths as prey. However, this classic evolutionary story has never been empirically tested. We used both

mitochondrial (16S and COI) and nuclear (H3 and 18S) DNA sequence data to construct a phylogeny of genera within the Cyrtarachninae and to test the monophyly of these moth specialists using several putative araneid genera as outgroups. We also compare our results with the current phylogenetic hypothesis of araneid relationships based upon morphology and behavior.

A newly introduced jumping spider (*Myrmarachne formicaria*) in North America

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The large genus *Myrmarachne* (Araneae: Salticidae) includes over 200 species, with representatives on each biogeographic region except the Nearctic. A population of *Myrmarachne formicaria* has been discovered in northeastern Ohio. There is reason to believe that this species, which is widespread in Europe, is a recent accidental introduction to this area. This species seems to be well established, having been found with increasing frequency over the past three years. A resident of Warren, Trumble County, Ohio first reported noticing this odd ant-mimic around her residence during the summer of 2000. The first specimen record was obtained from the same locality on 16 August 2001. Subsequently, specimens have been found in neighboring Portage County. The species appears to be common in a variety of situations, including occasionally inside buildings.

Wandering the range: ground-dwelling spiders of the Sevilleta NWR, New Mexico 1990-2000

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New Mexico's climate is strongly affected by ENSO (El Nino Southern Oscillation) events, usually resulting in increased (El Nino) or decreased (La Nina) average winter precipitation. Arthropods are among the fauna monitored at the Sevilleta National Wildlife Refuge for changes in species and abundance that may be due to ENSO. I examined data from 12 predaceous families (9 spiders, 1 scorpion, 1 solpugid and 1 centipede) from 1990-2000 for relationships between these groups with rainfall in general and ENSO in particular. I used a "water year," from Oct 15 of one year to Oct 15 of the next, which described local growing seasons better than a calendar year. During this time there were 5 El Nino years, 2 La Nina years and 4 medial years. Arthropod data came from species counts from pitfall traps operating continuously since 1989 and collected at 2-month intervals. The traps were placed in three habitat types: desert grassland, creosotebush shrubland and pinon-juniper woodland. I used detrended correspondence analysis (DCA) to assess how well these generalist predators differentiated among habitats (very well) and years (not well). I used correlation analysis to assess the relationship for each family with precipitation at each site. Here the independence of family responses became clearer: at all sites gnaphosids and thomisids showed no correlation with precipitation, but lycosids did. Responses for the corinnids and dictynids varied by site. These assemblages were robust over this period, suggesting that the ENSO events were not severe enough to greatly influence community structure or function.

Testing biodiversity theory with ground-dwelling spiders: effects of productivity and disturbance

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Understanding what determines species diversity is a central ecological question.We tested whether ground-dwelling spider diversity is governed by the interaction between productivity and disturbance, as depicted by Huston's Dynamic Equilibrium Model. We created circular straw mulch "habitat islands" (0.5 m radius) on top of 2 x 2 m areas along a disturbance gradient: old-growth forest floor (lowest disturbance), no-till soybean fields, soybean fields tilled once, and soybean fields tilled twice (highest disturbance).Productivity was manipulated by adding compost beneath the straw mulch, which directly increased in the primary prey of spiders (Collembola) but did not affect spider diversity.The disturbance gradient, however, significantly affected diversity, and the intermediate disturbance hypothesis was supported.The forest-floor had the lowest spider diversity, and may be a dominance-controlled community. Patterns in soybean fields suggest the colonization-competition trade-off may be partially responsible for patterns in spider diversity.

Sperm competition mechanisms may benefit female orb-weaving spiders, *Micrathena gracilis*

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Multiple mating by females and the ensuing sperm competition, often selects for mechanisms that either prevent other males from releasing sperm or that displace previous males' sperm. Because sperm competition occurs within the female's reproductive tract, it is thought that females should influence which mechanisms succeed. I show here that the socially polyandrous but typically genetically monandrous spider, *Micrathena gracilis*, accrue significant weight-gain benefits by mating with both reproductive tracts soon after molting to adulthood. In this species males seek out females approaching the final molt, and females mate soon after molting. The act of mating usually alters the female reproductive tract in ways that effectively limits sperm release by subsequent males. I released individually marked females of various mating histories into an experimental forest plot in which all males had been excluded. I then followed their movements through the forest and measured their weight gained over time. Virgin and one-side virgin females built their webs higher above the ground and moved more often than non-virgin females. Non-virgin females gained weight more than three times as fast as virgin and one-side virgin females, an effect likely mediated, in part, by reduced foraging efficiency in the latter groups. Among non-virgin females, those with a genetically monandrous reproductive strategy gained more weight than females with the more rare genetically polyandrous strategy. I suggest that the mechanism that limits sperm release by subsequent males may underlie the effects of mating on weight gain.

Corn Plants Near Discrete Habitat Refugia (Small Straw Piles) in Conventionally-Tilled Fields Show Increased Growth, and Reduced Insect Damage

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The generalist predatory arthropods (GPAs) occupying crop fields have great potential as agents of biological control. The endemic species comprising this predator community are finely adapted to their specific microclimates and communities. Unfortunately, conventional tillage and harvesting operations are cyclical and destructive events, forcing the native generalist predator community to re-colonize these fields each year. Supplying discrete habitat refugia (small straw piles; 1m X 0.5m) is a simple and inexpensive means of reducing the impact agricultural techniques exert on populations of predatory arthropods in agroecosystems by providing them places to live and reproduce in the fields before the crops grow and mature. Previous experiments with such refugia in soybeans showed these straw piles harbored greatly increased carabid beetle and spider populations. Considering the drier, more open growth structure of corn, it was hypothesized that the influence of refugia in corn probably would be greater than for soy. Experiments with straw refugia in six one-third hectare conventionally-tilled fields found higher corn yields and plant growth near refugia, and insect damage was less for plants near refugia than at control sites. When larger GPAs were excluded from refugia, plants near those sites had similar growth and insect damage as plants near unscreened regugia. Comparisons of soil nutrients in refugia vs. control sites showed no significant differences, eliminating the possibility of a "fertilizer effect" influencing corn growth and yield. Further larger-scale tests are required. This easy and cheap technique has potential to help farmers increase yields with little effort and expense.

Prey Selection By The Red Widow Spider (Araneae: Theridiidae)

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To ascertain the prey of the red widow spider, *Latrodectus bishopi*, hereafter called "RWS", we collected arthropods trapped in webs of 30 adult females located in native oak-palmetto scrub at the Archbold Biological Station after dawn and before dusk for 5 consecutive days in early spring (March,

1989) and in late spring (May, 2003). We found that RWS females in early spring fed predominantly on nocturnally captured coleopterans (80% of prey items), but in late spring day-active hymenopterans were added to the RWS diet. Analysis of arthropods collected in aerial-interception traps operated at different heights in Florida scrub in winter, summer, and fall suggested that the predilection of RWS for beetles was a true specialization: coleopterans comprised only between 5 and 18% of the catch. Moreover, unlike hymenopterans and other arthropod taxa, we found significantly more beetles in traps operated at 1.5 and 1 m elevation, where RWS webs were located, than in traps at 0.5 m. Finally, statistical analysis of patterns of prey captured by individual RWS females showed that the process was infrequent (£ 0.4 prey/spider/day) and random.

Gastrulation and Inversion in Spider Development

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No one model of gastrulation in spiders is clearly supported by data in the literature. In embryos of *Zygiella x-notata*, we observed formation of an extracellular-matrix protrusion not described in other species. This 'nipple' forms prior to cell involution and migrates posteriorly, presumably reflecting movements of superficial cells. Next, we identified a distinct site of involution, the cumulus, which is a swelling several cell layers thick that forms near the origin of the nipple. Superficial cells move via the cumulus into the interior as the cumulus migrates posteriorly during gastrulation. After gastrulation is complete, the internalized cells participate in the formation of the germ band, which is the primordium of the ventral aspect of the spider. AT this point the embryo undergoes a massive morphogenetic movement called inversion. The germ band splits along the ventral midline and the two halves migrate away from each other to rest on opposite sides at the equator. After the halves have reached their equatorial endpoints, cells emerge from the halves to close the embryo dorsally while a cell sheet migrates from the posterior end of the embryo to close it ventrally. Despite being a definitive characteristic of spider development and one of the longer cellular migrations known in axis formation, inversion has not been studied beyond its description. Our preliminary investigation of possible cytoskeletal mechanisms underlying inversion used confocal imaging of tubulin and actin, and microinjection of microtubule and microfilament inhibitors. We demonstrate that inversion does not continue when either system is poisoned.

Contrasting Patterns of Genetic Structuring in Homalonychus (Homalonychidae) from the Desert Southwest

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The genus *Homalonychus* includes two species (*H. selenopoides* & *H. theologus*), both distributed in desert habitats of southwest North America. Prior studies indicate that *H. selenopoides* consists of a single genetic lineage, but that *H. theologus* is separated into two deeply-divergent mitochondrial lineages (*H. theologus* "northern" and "southern"). We have compared the population history and genetic structuring of *H. selenopoides* and *H. theologus* "northern" using DNA sequence data. These two lineages are very closely related, show few apparent ecological differences, and in most places are separated only by the narrow strip of the Colorado River, although no apparent geographic barrier exists in the northern Mojave Desert (vic. Death Valley). Unless landscape or regional histories have been very different, we might expect these spider lineages to exhibit similar patterns of genetic structuring. This expectation is not corroborated by our data. Instead, sequence data indicate that *H. selenopoides* is highly genetically-structured across the eastern Sonoran desert. Most haplotypes are geographically confined, and divergent from haplotypes from other sampling sites, suggesting long-term population fragmentation. Conversely, the *H. theologus* "northern" lineage shows a mosaic population genetic structure. More southerly regions are genetically structured, much like *H. selenopoides*. However, northern populations of this lineage show a pattern of genetic structuring consistent with recent range expansion, with a few closely-related haplotypes spread broadly over space. This apparent N > S range expansion is most obvious in the Mojave Desert, where the "northern" *H. theologus* lineage may actually be displacing the *H. selenopoides* lineage.

Taxonomic Diversity of Jumping Spiders in Trinidad and Tobago

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Trinidad and Tobago consists of two islands on the continental shelf off the northeast coast of Venezuela. Last year we published a list of the salticid fauna of this country (Living World, p. 39-44, 2002), noting 117 species. The majority of specimens were collected in the lower montane rain forest of the Northern Range of Trinidad. More intensive collecting in other habitats should produce more taxa. The number of species in eight salticid subfamilies was determined. Two non-taxonomic catagories were also enumerated, antlike and introduced species. The resulting percentages were compared to other New World regions with a relatively well catalogued salticid fauna. Unfortunately no comparable species lists exist for Venezuela or the Guianas so it is not possible to make a comparison to the nearest continental areas. In Trinidad and Tobago the largest subfamily is the "Freyinae" (not formally defined) with 19% of the species, followed by the Dendryphantinae with 15% and the Euophryines with 12%. Freyines are a speciose Neotropical group reaching their greatest diversity in equatorial South America. Dendryphantines are worldwide with most species in the New World. Euophryines are another worldwide subfamily with greatest diversity in the tropics. In comparison on the Caribbean islands (Trinidad and Tobago) Euophryinae are the largest subfamily with 24% of the species. Freyines only constitute 3% of the species. The diversity of salticids of Trinidad & Tobago more closely resembles that of mainland South America than of the northern Caribbean.

Seismic communication in a courting male jumping spider (Araneae: Salticidae)

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Andrew Mason, University of Toronto
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While research on spiders has long shown the importance of vibrations in communication, jumping spiders (Family: Salticidae) differ from most spiders in that they are visual "specialists", with vision playing a prominent role in their communication behavior.We now show that one species of jumping spider, *Habronattus dossenus*, also exhibits a surprising complexity of signaling behavior in the vibratory (seismic) modality.We videotaped courtship behavior and recorded seismic signals of males using laser vibrometry and observed that each prominent visual signal is accompanied by a seismic component. Using synchronous high-speed video and laser vibrometry we observed that only one seismic signal component was produced concurrently with visual signals, with most signals occurring independently.In order to test the independence of visual and seismic signal components and identify possible sound production mechanisms, we performed several signal manipulation experiments where we attempted to mute males. These experiments suggest that three independent mechanisms are used to produce seismic signals, and that the precise temporal coordination of visual and seismic signals is not due to a common production mechanism.The extensive use of complex, multicomponent seismic signals orchestrated with intricate movements of ornamented appendages adds a new dimension to jumping spider communication.

Natural history, mating behavior and sperm release in the haplogyne *Glenognatha emertoni* (Araneae: Tetragnathidae)

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Glenognatha emertoni (Simon) is a small tetragnathine orbweaver whose habits are unknown and which has previously been collected under rocks near streams in southern Arizona and New Mexico. Field observations revealed that adults are commonly found in vegetation alongside streams, rarely under rocks, and do not emerge from their retreats until dusk. Adult individuals and penultimate instar spiders raised to adulthood were used to examine sperm release and mating behavior in the laboratory. Unlike most other orb-weaving spiders studied, the number of sperm released and overall duration of copulation are not influenced by female mating history in *Glenognatha emertoni*. Male *G. emertoni* release equivalent numbers of sperm

to virgin and non-virgin females, a pattern also found in a related haplogyne spider, *Tetragnatha versicolor*. Males have large ejaculates ranging from a half-million to one-and-a-half million sperm. Males transfer more than three-quarters of their ejaculate, on average, to females; these sperm potentially compete with other males' sperm in the fertilization of a clutch of approximately 15-30 eggs.

The Effects of Size, Sex, and Reproductive Condition on Thermal and Desiccation Stress in a Riparian Lycosid Spider (*Pirata sedentarius*)

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Within a species, physiological tolerances and thermoregulatory behaviors may vary among ontogenetic stages or between sexes. Such different tolerances can strongly affect the ecology and life history of a species. In a laboratory study, we tested the hypothesis that *Pirata sedentarius* Montgomery 1904 are differentially susceptible to thermal/desiccation stress by size and sex. As predicted, male adults were more susceptible to thermal/desiccation stress than females. Unexpectedly, however, juvenile spiders survived longer under thermal/desiccation stress than adults. Furthermore, female adults without egg sacs displayed a trend toward higher thermal/desiccation tolerance than females carrying egg sacs. These results suggest that for *P. sedentarius*, microhabitat preferences and/or thermoregulatory behaviors may change over the course of development, and may vary 1) between sexes and 2) between females with and without egg sacs.

A behavioral investigation of male-male interactions in *Phrynus marginemaculatus* (Arachnida, Amblypygi)

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Whip spiders (Order Amblypygi) comprise one of the smaller arachnid orders about which surprisingly little is known.While male-male contests are described as being prevalent among different amblypygid species (Weygoldt 2001), only basic descriptions exist and quantitative behavioral studies are lacking. This study aims to characterize male-male interactions and to evaluate determinants of contest outcomes in *Phrynus marginemaculatus*, a species found in the Florida Keys.Male contests of this species are characterized by several behaviors involving some variant of palpal opening (e.g. double palp opening and asymmetric palp opening), contact with the antenniform leg by one contestant on different body parts of his opponent (e.g. contact on the cephalothorax, the legs, the palps, and the posterior of the prosoma), and extremely rapid antenniform leg flicking, which is also directed at a particular location on the opponent's body (e.g. the abdomen and the palps).In order to evaluate determinants of contest outcomes, two pairing treatments were established: similarly sized males and differently sized males. Contests were recorded in the dark and preliminary analyses suggest that weight is a better predictor of who wins than size (as measured by cephalothorax length and width).The number of antenniform leg flicks by an individual during a contest also seems to be correlated with winning.

Dances With Wolves Down Under

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Australia is one of the 'megadiverse' countries of the world and features some of the most unusual animals and plants. Recent molecular and morphological studies into the systematics of wolf spiders (Lycosidae) have confirmed the uniqueness of the Australasian fauna with the re-establishment of genera that are apparently restricted to Australasia and the Indo-Pacific, such as *Allotrochosina*, *Venatrix* and *Artoria*. These studies also revealed challenging problems in fitting some of these genera into existing subfamilial categories. This presentation provides an overview of the history of Australian wolf spider systematics characterized by the desperate attempts of early European arachnologists to fit Australian Lycosidae into Northern Hemisphere genera, which were primarily established with non-genitalic characters. We give a brief overview of the currently recognized 144 (of an estimated 500) species currently placed mainly in *Lycosa* and *Trochosa*, and show where they really belong (who knows, e.g. *Dingosa*, *Tasmanicosa* and *Hoggicosa*?). Australian wolf spider genera show clear affinities with certain biogeographic regions, e.g. the dry interior (*Hoggicosa*, *Venator*), or the temperate south-eastern forests of the Dividing Range (*Artoria*, *Venatrix*) which may provide some clues into the evolutionary radiations of these taxa.

A new approach to chemostimulation of scorpion peg sensilla reveals high resolution response properties to near-range chemostimulants

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Scorpion pectines possess ordered two-dimensional arrays of thousands of microscopic pegs, each innervated by about 10 sensory neurons. Previous electrophysiological studies demonstrated chemosensitivity of peg neurons to volatile organic compounds blown across the peg fields. We report here a new, more natural approach for assaying peg chemosensory responses. Peg sensilla on pectines of *Paruroctonus utahensis* were recorded extracellularly with tungsten microelectrodes. We devised a new method for stimulant delivery, using pure organic stimulants delivered via glass pipettes with tip diameters of approximately 10 microns. We used a piezoelectric-driven micromanipulator to vary the distance between the pipette tip and the recorded peg sensillum. Stimulant diffusion results in stronger, more vigorous, and more reproducible responses than when chemicals are applied in a directed stream (or "puff"). Furthermore, the peg neurons become more responsive with prolonged stimulation, and spike frequency is inversely related to the vertical distance between the pipette and the peg. This acute sensitivity to stimulant distance suggests the ability to localize point stimuli at the scale of the peg field. We are currently investigating whether the change in neural activity of peg sensilla with prolonged stimulation is attributable to circuit dynamics or altered neural activity in individual neurons.

Aversion Learning In Wolf Spiders: The Persistence Of Memory And The Role Of Sensory Cues

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We studied the ability of wolf spiders (*Schizocosa ocreata*) to recognize and avoid toxic prey after experience. Milkweed bugs (*Oncopeltus fasciatus*), were used as prey in aversion learning experiments. Spiders were assigned to one of three feeding treatments: 1) toxic (milkweed-fed) milkweed bugs; 2) toxic cardenolide-free (sunflower-fed) milkweed bugs; and 3) crickets (*Acheta domestica*). Spiders were offered toxic prey until avoidance was exhibited, then offered alternative prey. Feeding behavior varied with prey type; spiders accepted crickets and sunflower-fed milkweed bugs, but rejected toxic milkweed bugs. Spiders acquired aversion in 1-4 trials and refused cardenolide-free milkweed bugs thereafter, but accepted crickets. Additional aversion learning experiments examined the duration of a spider's learned aversion to toxic prey and the specific sensory cues (chemical, visual, tactile) involved in recognition and subsequent avoidance of potentially toxic prey. Spiders were trained, then re-tested each day for 4 days and again at 10 days. The mean number of trials needed to re-acquire aversion decreased by day 3, and frequency of spiders avoiding milkweed bugs increased to 100%. This pattern reversed on days 4 and 10, apparently due to hunger. Studies with video playback and painted milkweed bugs eliminated visual cues as recognition criteria, but tactile and chemical cues from *O. fasciatus* were significant factors in recognition and avoidance learning. Results suggest spiders can learn to recognize and avoid distasteful prey, which may be adaptive for generalist predators.

The potential role of olfaction in navigation and mate finding in the amblypygid *Phrynus parvulus* from Costa Rica

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Previous work on the amblypygid *Phrynus parvulus* from the tropical forests of Costa Rica found that mate finding in this species likely consists of males traveling throughout the environment in search of females, who likely remain stationary once they find a good crevice. The distances traveled by individuals are relatively large and the movement patterns suggested that males may have home ranges that encompass multiple large buttressing trees. In this heterogeneous tropical environment, the question remains as to how individuals are navigating

throughout the environment and how they are ultimately locating members of the opposite sex. In a series of both laboratory and field experiments, I investigated the potential role of olfactory cues in both mate finding and navigation. I found that males seem to be attracted to females with recently dropped eggs as well as to conspecific males by odor alone and tend to be deterred by the odor of females carrying eggs. Navigation studies revealed that individuals are able to navigate their way home from relatively far distances and results suggest that odor may play an important role in their navigational abilities.

Molecular Phylogenetics of the Mygalomorph genus *Aliatypus* (Araneae: Antrodiaetidae)

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The trapdoor genus *Aliatypus* includes 11 described species, basically all endemic to California (a single species is distributed in Arizona). The genus was revised by Coyle (1974), with subsequent work by Coyle (1994) and Coyle & Icenogle (1994), on phylogeny and natural history, respectively. The genus shows interesting distributional patterns in California (some taxa are found of both sides of the Sacramento Valley), is species-rich over a relatively small geographic area, and occupies an impressive variety of habitats. Some broadly-distributed taxa display considerable morphological variation over their ranges. A full understanding this biogeographic, morphological, and ecological variation requires a solid phylogenetic foundation. The initial blocks of this foundation were provided by Coyle (1994), who forwarded a morphology-based phylogenetic hypothesis for *Aliatypus*. Here we use DNA sequences from two nuclear gene regions (18S and 28S) to test the species-level phylogenetic hypothesis of Coyle (1994), while simultaneously considering intraspecific phylogenetic divergence of widespread taxa (i.e., testing species hypotheses themselves). Many of the broad-scale phylogenetic patterns suggested by Coyle (1994) are corroborated, including a general "3 clade" structure for the genus (*A. gulosus*, *A. californicus* group, *A. erebus* group). Interestingly, the DNA-based phylogenetic placement of *A. thompsoni* is somewhat ambiguous, as also suggested by morphology. Species with restricted geographic distributions are, for the most part, monophyletic on gene trees. However, more widespread taxa are often not monophyletic on gene trees, perhaps revealing hidden species diversity. Phylogenetically unique samples from previously unsampled geographic regions (e.g., south Coastal Ranges) might represent additional novel species-level diversity.

Web Spider Diversity in the Riparian forests of SW Ohio

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Corridors of riparian forests are often the primary source of forest habitat in agricultural landscapes. Studies have shown riparian forest corridors support high terrestrial vertebrate diversity but few studies have explored their importance to terrestrial arthropod diversity. We assessed the web spider diversity in riparian forests in SW Ohio using fixed plot visual searches. Samples were taken at the stream edge, in the center, and at the agricultural edge of riparian forests in three width classes (thin: 15-30 m, medium: 45-60 m, & wide: >80m from streamside) and the center and agricultural edge of hedgerows comparable in width to the thin riparian forests. Species richness and diversity were compared among forest types using rarefaction and ANOVA. Split – plot ANOVA allowed comparisons among the edge and center quadrats. Detrended Correspondence Analysis was used to compare the species assemblages among sites. Web spiders were significantly more abundant and diverse in riparian forests than in hedgerows of similar width. Interestingly, thin riparian forests were more diverse than wide forests, which, in turn, were more diverse than medium corridors. Stream edges had the lowest diversity. The DCA revealed the stream edge community to be distinct from assemblages in other quadrats. These results suggest the stream habitat plays a key role in structuring the adjacent terrestrial spider community, and riparian forest corridors are important to regional spider diversity in agricultural landscapes.

A study of the Eocene spiders from Florissant, Colorado

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The 34.1 million year old Florissant formation in central Colorado holds some of the most beautifully preserved and unique fossils from the Tertiary. This well known deposit is rich with fossil plants, vertebrates, and arthropods, which have been studied for over one hundred years. The order Araneae, is among the most diverse groups on earth and is abundant within the Florissant formation. It is believed that this order originated in the Devonian, with a major radiation in the early Mesozoic. Many of the modern families have origins well into the Late Cretaceous. Generally, fossil deposits containing spiders are rare, however, the record from the Tertiary is robust based on amber deposits in Europe and the Dominican Republic and fossil shale deposits like Florissant. As a result, Florissant is internationally renowned for its rare and excellently preserved spider fossils. Two previous researchers, Samuel Scudder in the late nineteenth century and Alexander Petrunkevitch in the early twentieth century, had researched the Florissant spider assemblage. Both identified these specimens to the species level. When looking at modern spiders, many generic and all specific designations are based on genitalic characters. Although the fossils are exquisitely preserved, this important character is not clearly visible in any of the specimens. As a result, it is my intention to re-evaluate the placement of these fossils.

The Effect of Nutritional Limitation and Chemical Cues on the Foraging Behavior of the Wolf Spider *Pardosa milvina* (Araneae, Lycosidae)

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Theory suggests that foraging behavior is shaped by the trade-offs made by animals under selection pressure to maximize their fitness. A potential trade-off exists between balancing hunger and exhibiting anti-predator behaviors which may detract from foraging. Although anti-predator behaviors (e.g. avoidance and vigilance) are well documented in the small wolf spider *Pardosa milvina* (Araneae: Lycosidae), little is known about how energetically stressed organisms balance conflicting information regarding the presence of predators and prey. Since *P. milvina* is known to respond to chemical cues left by other organisms in its environment, we manipulated food-limited individuals using cues from predators, prey, or both. Under these various conditions, we monitored the overall activity level and foraging behavior of female *P. milvina*. Contrary to previous findings, well fed and food limited spiders differed significantly in their behavior. In general, food limited spiders were more active and had a greater propensity to forage than well fed spiders. Additionally, food restricted spiders demonstrated a stronger response to different environmental cues when compared to those that were well fed. The results of this study contribute to our understanding of the trade-offs made by *Pardosa* when managing the competing risks of starvation and predation.

The Effects of Mating and Sperm Storage on the Behavior of Female Fishing Spiders

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Male accessory gland secretions passed to females during copulation may reduce female receptivity in some insects. Manipulative effects of seminal products are not reported in spiders, but decreased or loss of sexual receptivity of females after a single mating occurs in several species. Female *Dolomedes triton* rarely re-mate, and previously-mated females often cannibalize courting males. We tested the hypothesis that this reduced receptivity and increased aggression is a induced through seminal fluid. Virgin female *D. triton* were mated with males that were unable to complete sperm induction; the male genital pore was sealed with paraffin shortly after molting. Control groups were either mated with normal males or had no prior mating experience. Behavioral comparisons were made between groups during trials with normal, intact males at two time points: 24 hours after initial mating and 14 days later. Previous mating experience, whether sperm was transferred or not, resulted in a loss of receptivity. However, sperm storage was associated with attacks of males by females. Males paired with females that were storing sperm produced fewer courtship behaviors. Reduced receptivity in females appears to be controlled by palpal insertion during mating, while increased aggression towards males and

the elicitation of courtship behavior from males appear to be controlled by the presence of sperm.

Salticid molecular phylogenetics

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We review progress to date in resolving salticid phylogeny using molecular data. Data from our sample of 81 genera sequenced for 5 genes corroborate some previously recognized groups (e.g., dendryphantines, plexippines) and strongly support some novel groupings (pellenines+plexippines; dendryphantines + marpissines; sitticines+amycines+others). Additional sampling of Old World groups is needed to resolve the placement of groups such as *Salticus*, *Neon* and *Myrmarachne*, whether aelurillines and freyines are closely related, and other puzzles. We hope that the clarification provided by molecular data will help us notice morphological synapomorphies (e.g., tegular ledge, leg structure?), which could provide the next round of resolution of the family's phylogeny.Our current phylogeny offers insight into chromsome evolution (amycoids and pellenines with unusually high rates of change) palp evolution (polyphyly of free-embolus salticids), and biogeography (deep division of Old and New World).Molecular data are also resolving relationships among closely related species, but not without difficulties. Our data from *Habronattus* have resolved various clades, but hybridization in some species groups may be obscuring, or even corrupting, a simple branching phylogeny.

Evaluating Species Richness Of Wandering Spiders In A Mangrove Forest Of Chiapas, Mexico

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Wandering spiders comprise a minor proportion of the spider fauna in the mangrove forest of "La Encrucijada", Chiapas. From collections carried out during the wet season 2002 and the dry season 2003, only 31 species were identified, while more than eighty were obtained from the web-spinning spider collection. This web spiders dominance is thought to be due to the characteristic vegetation structure of the mangrove. Four estimators were used to evaluate the expected species richness: ACE (Abundance Coverage Estimator), Chao1, the first order Jacknife and the Michaelis-Menten equation. Estimated species richness was very close to the observed values in the wet season, except the Michelis-Menten equation. In the dry season, however, the sample resulted less complete and estimated richness was higher than observed with every estimator. Some species which in the dry season appeared in considerable number, were represented by only one or two individuals in the dry season, thus elevating the number of singletons and doubletons and therefore, causing the estimate to be less compatible with what we observed. Some spiders were found to have their active adult period separated between seasons, others were more abundant, and others were exclusive of one season. The reasons for such distribution in time and some notes on their microhabitats as seen in the field are discussed.

The unbearable lightness of being monophyletic. Clade stability and the addition of data – a case study from erigonine spiders (Araneae: Linyphiidae, Erigoninae)

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We present a new hypothesis of relationships among erigonine spiders based mainly on morphological characters. We have added taxa and characters to a previous analysis of erigonine relationships. Nearly all of the taxa added for the current analysis represent Neotropical genera. Cladistic analysis of the expanded matrix results in a single most parsimonious tree. Our phylogeny differs markedly from the previous cladistic hypothesis of erigonine relationships. We investigate how the addition of characters and taxa (alone and together) has altered the original phylogeny of erigonine genera. We conclude that topological changes from the previous study to the current one are largely the result of adding and modifying characters, not adding taxa. Our phylogeny has implications for hypotheses of character evolution in erigonines.

Individual and Combined Effects of Birds and Ants on Spiders in Ponderosa Pine Canopies

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Predator exclusion experiments have shown that both birds and ants can be important predators of spiders in forest canopies. Other work has demonstrated that the effects of multiple predators are often not independent of each other. To test whether there is interaction between the effects of these predators I conducted a three-year factorial experiment of bird and ant exclusion (i.e. bird exclusion, ant exclusion, dual exclusion and control treatments) in the canopies of ponderosa pine (*Pinus ponderosa* var. *scopulorum*) at the U.S. Forest Service Manitou Experimental Forest, Colorado, USA. This experiment has allowed me to identify the individual and combined effects of canopy foraging birds (Chickadees *[Parus spp.*] and Nuthatches [*Sitta spp.*]) and the ant *Formica podolica* on the web spinning and cursorial spiders in this system. In total I observed 13 species of cursorial spiders in five families and 14 species of hunting spiders in five families. Web spinning spiders were negatively affected by ants (exclusion led to a 30% increase), but not by birds. Cursorial spiders were negatively affected by both ants and by birds, and there was a significant interaction between the two predator effects; Bird exclusion increased spider abundance by approximately 60% in the absence of ants, but only by 20% in their presence. These results suggest that when we characterize individual predators-prey interactions, the effects we measure may only be meaningful within the context of the larger predator community within which they are studied.

Mechanical Properties of Major Ampullate Silk from the Brown Widow *Latrodectus geometricus.*

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Major ampullate (dragline) silk is the main web component as well as the silk that spiders use as a lifeline when they fall. This silk has a breaking stress of 4.6 GPa, which is similar to that of Kevlar. The majority of the mechanical testing studies have involved the major ampullate silk from orb-weaving spiders. To date, there have been no reports on dragline silk mechanical properties from a brown widow, *Latrodectus geometricus*. *L. geometricus* dragline is composed of two proteins MaSp1 and MaSp2, both of which have highly conserved amino acid motifs, especially the GGX, GA and poly A for MaSp1 and GPGGX and poly A for MaSp2.These sequences are the same as those found in the orb-weaving spiders. To determine if web structure and protein sequences influence the material properties of the silk, mechanical testing was performed on single strands of silk fibers from anesthetized adult female *L. geometricus* spiders. The 3 cm long silk fibers were tested for breaking stress and strain with a MTS Synergie 100 mechanical testing system using a 5 g load cell with the cross-head speed set at 10 mm/min. The breaking stress and strain were measured for 20 replicate samples and averaged. The values of 0.94±0.19 GPa for stress and 0.14±0.06 for strain suggest that brown widow dragline is one of the weakest ever reported.

Digital imaging techniques in Arachnology

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The increase in availability of digital imaging devices over the past decade has resulted in many new and exciting applications in the field of arachnology. With the help of digital photomicroscopy, it is now possible to use quantitative methods to analyze palpal and epigynal morphology in ways which were previously impossible or extremely difficult. Inexpensive digital scanners allow the measurement of many morphological features that were previously only addressable by quantitative techniques. One of the most useful features of digital imagery is the ability to measure the 2-dimensional area of an object. It is also possible to quantify color patterns and shading using digital techniques. We used digital techniques to measure palpal variation among populations of a wolf spider. We were able to reliably measure structures on the palp with minimal error. We were also able to measure variation in color pattern on the ventral aspect of the body and legs. These techniques have broad applicability across many scientific disciplines, and are particularly useful in arachnology.

Population structure of the spider *Waitkera waitakerensis* (Uloboridae): Does it really comprise a monotypic genus?

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The genus *Waitkera* is the only New Zealand representative of the family Uloboridae and is known from a single species, *Waitkera waitakerensis* (Chamberlain, 1946). This species is common in forests of the North Island, where it constructs orb-webs on under story vegetation. Rock outcrops in the Northland region support populations of *W. waitakerensis* comprised of larger individuals than those found elsewhere on the island, including those in surrounding forests. However, analysis of DNA sequences of the mitochondrial NADH dehydrogenase subunit ND1 with parsimony and TCS estimation does not delineate these rock-dwelling populations as a monophyletic lineage that might be regarded as a distinct species. Instead, they appear to represent an ecotype. The low genetic variability of *W. waitakerensis* and its population structure suggest this species contracted to the Northland during the Pleistocene and then it colonized the North Island via the Coromandel Peninsula.

Blind *Cicurina* (Araneae: Dictynidae) from Texas caves: A molecular application for conservation

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Many troglobitic species have limited distributions and deserve conservation status. The genus *Cicurina* consists of 128 described species of which ≈50 are cave obligate spiders. These species have typical morphological adaptations of troglobitic organisms such as reduction/loss of pigmentation and eyes. Blind *Cicurina* are numerous in Texas and currently 4 species have been designated as federally protected. The rarity of these spiders, sampling difficulties, and conservation status limit the number of specimens available for reliable species identification. In addition, females exhibit high intraspecific variation with many species being similar, juveniles are impossible to identify to species, and males are very rare (known only for 7 species). The rarity of these spiders, coupled the with the identification difficulties, is problematic as species level identification is required to assign conservation priorities to caves. In this study, we used phylogenetic analyses of ≈1000 base pairs of the mtDNA gene CO1 to examine the utility of molecular data in species identification of troglobitic *Cicurina*. The estimation of genetic variability of adult voucher specimens provides a molecular tool to identify immatures, often the only material available. Previous studies and collections have suggested that there are typically two *Cicurina* species per cave: One eyeless species (subgenus *Cicurella*) and *Cicurina varians*, a fully-eyed species (subgenus *Cicurusta*). Our results support that only one blind species occurs per cave, and also show that no hybridization occurs between *C. varians* as the two lineages were always recovered. Our results have implications for conservation biology and also provide insights into the systematics of the genus and evolution of troglobitic species.

Ladies and tramps: alternative reproductive strategies in Salticidae

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Jackson (1978, 1980, 1981, 1986) has documented agonistic and cohabitation behaviors of *Phidippus johnsoni* males. Males engage in visual and physical contests, even with no female present. Female *Phidippus* reproductive anatomy and sterile male breeding experiments (Jackson 1980) support the precedence of first male sperm in *Phidippus*. From the female's perspective, the agonistic, cohabitating male reproductive strategy is an elegant solution to the balance between female reproductive security and female choice. This type of reproductive behavior has been observed in several *Phidippus* species and a number of other salticid genera. Jackson and Willey (1995) have suggested that the cohabitation of males with juvenile females may be a "universal" reproductive strategy in salticids. However, our field observations with *Maevia inclemens* have shown that there is a least one alternative reproductive strategy used by salticids. *M. inclemens* males have no cohabitation or inter-male agonistic behaviors. Instead the dimorphic males wander through "lek-like" areas at the interface of woodland/prairie habitats searching for females. Females have short-duration (typically less than ten seconds) matings with multiple males. In addition, the female genitalia of *Maevia* do not appear to support the first male precedence model. This alternative reproductive strategy may be a significant factor in the evolution of dimorphic males in *Maevia inclemens*.

Searching for competition: sympatry and interactions between two Agelenid spiders.

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Similar predatory species living in close proximity can be assumed to interact along one or more axes of their' niche space. Typical axes or resources of concern are physical space, substrate, time and prey. If species are to persist in sympatry, limiting resources should be partitioned to some degree. Inter-specific competition can be considered in cases of unstable overlap of resource use. Sympatric populations of two Agelenid spiders were studied for two years in a riparian setting with the aim of characterizing their resource space and identifying, if possible, regions of interaction or competition. *Agelenopsis kastoni* and *Barronopsis floridens* are similarly sized web building spiders present in relatively high concentrations and in close proximity. At the scale of the survey, *A. kastoni* were more abundant than *B. floridens*. Results of field surveys suggest patterns of vertical distribution related to size of individuals of both species. *Barronopsis* move vertically as they mature while *Agelenopsis* are more widely distributed on the vertical axis as they mature. *Barronopsis* also tend to be clumped and restricted to a specific set of substrates within the habitat whereas *Agelenopsis* are more uniformly distributed and more varied in substrate preferences. In order to examine the factors affecting vertical distribution, laboratory trials were conducted with first generation lab reared juveniles of both species. The effects of varying intra- and interspecific spider density on vertical distribution were examined.

Diving crab spiders in the hanging stomachs of Borneo

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Misumenops nepenthicola and *Thomiscus callidus* (Thomisidae) are similar sized crab spiders that live within the pitchers of pitcher plants in Asia. Anti-predator behavior in both species includes dropping into the pitcher plant fluid, although *T. callidus* will usually leave the pitcher rather than hide in the fluid. *M. nepenthicola* almost always hides in the fluid when disturbed, and can remain underwater for up to 40 minutes. In tests with a simulated pitcher and pitcher plant fluid, *M nepenthicola* remained submerged more than ten times longer than *T. callidus*. This difference may be explained by the ability of *M nepenthicola*, but not *T. callidus*, to take a bubble of air underwater. *M. nepenthicola* has a cuticular indentation or pit next to its book lungs and the pit traps a bubble of air that covers the book lungs while the spider is in the fluid. Because *M. nepenthicola* can 'breathe' underwater, it can remain in the pitcher plant fluid for extended periods of time compared to *T. callidus*.

The genus *Sassacus* (Araneae: Salticidae) north of Guatemala

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The genus *Sassacus* s.l. ranges from southern Canada into South America. As of present it appears to be contained in three species groups, which may or may not be eventually separated into their own genera. These are the *papenhoei* group, the *vitis* group and the *arcuatus* group. The *Sassacus papenhoei* group (*Sassacus* s.s.) contains beetle mimics such as *Sassacus papenhoei*, "*Agassa" cyanea*, and "*Metaphidippus" paiutus*, as well as two undescribed species from Mexico. The *Sassacus vitis* group apparently contains only one elongated species. The *Sassacus arcuatus* group is more highly developed in South America, but one undescribed species is known from southern Mexico. The *Sassacus arcuatus* group appears to contain some species with male palpal structures intermediate between the *papenhoei* and *vitis* groups.Courtship in *Sassacus vitis* and "*Metaphidippus" paiutus* is very similar.

Consequences of complex display: Predator detection of multi-modal signaling

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Signal detection theory predicts that males in complex environ-

ments must produce signals that improve transfer of information by being distinct from background noise. Multi-modal signaling enhances this quality by improving detectability, but courtship signals selected to be conspicuous to intended female receivers become public information intercepted by others within the signal active space, including predators. Courtship signaling in male *Schizocosa ocreata* wolf spiders occurs in multiple modes including active, sexually selected behaviors and morphological traits that occur in the visual and vibratory modalities concurrently. These spiders co-occur with potential predators that may intercept courtship signals including other wolf spiders (Lycosidae), and jumping spiders (Salticidae). In this study, we used video/audio playback with multiple exemplars to explore 1) whether uni-modal versus multi-modal signals affect detection by invertebrate predators, and 2) whether variation in a single secondary sexual characteristic, presented as uni-modal versus multi-modal signaling affects signal detection. Predators responded with predatory behavior to exemplars of male *S. ocreata* courtship, tuft size had a significant effect on reaction time, and the presence of multi-modal courtship significantly facilitated detection for at least one predatory species.

Introducing SPIDA-web: An automated identification system for biological species

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At present, the most severely limiting factor on our understanding of community structure, diversity, and how diversity relates to ecosystem functions and services, is the lack of experts capable of identifying biological specimens to species. For most groups of organisms, the number of trained systematists is low, and the success rate of non-specialists trying to achieve accurate identifications on their own, with currently available tools, is even lower. The situation is worst for relatively small and inconspicuous organisms (i.e., precisely those groups that comprise the bulk of our planet's biodiversity). One way to ameliorate this problem is to encapsulate the taxonomic expertise of a specialist in a computerized identification system. We are currently developing an Internet-accessible automated identification system that uses artificial neural networks to make identifications of spider species based on digital images of the genitalia. We call this system **SPIDA-web** (**SP**ecies **ID**entification, **A**utomated and **web** accessible). As our test case, we are developing the system from two perspectives: taxonomic and geographic. For the first, we are focusing on the recently revised Australasian family, Trochanteriidae. For the second, we will use an ecological collection of spiders from a site in Knox County, TN. We are still in the early stages of this research, but early results indicate that SPIDA will be able to classify images to genus with 95—100% accuracy. Classification to species has proven more problematic due to the paucity of replicate specimens, but when sufficient numbers are available, accuracy falls in the 90—99% range.

Sharing a web site: a study of microhabitat selection in *Latrodectus hesperus*

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When choosing a web site, a spider has to make a decision based on an evaluation of microhabitat quality. A direct assessment of this currency is often costly as it requires both time and energy expenditures. As an alternative, the presence of residents in a site may be used as an indicator of microhabitat suitability and thereby increase the probability that other individuals will settle there. This process will in turn lead to the formation of localized aggregations. In southern British Columbia, western black widow spiders, *Latrodectus hesperus*, are often found to share microhabitats with conspecifics and/or co-occuring European house spiders, *Tegenaria* spp. These associated spiders seem to tolerate each other's existence and often form clusters of webs. In this study, we test the hypothesis that *Latrodectus hesperus* spiders preferentially settle in web sites already occupied by conspecifics or heterospecifics rather than in empty sites, by conducting a choice experiment in the laboratory. The results indicated that these spiders were more likely to settle in sites containing conspecifics than in empty ones.

Kinematics of Locomotion in the harvestman

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The long legs, compact body and hanging posture of harvestmen, coupled with the ability to rapidly traverse rough terrain, suggest that unusual mechanics enable these arthropods to maintain high speeds and stability. Our analyses of harvestmen running at over 30 body lengths per second revealed near-sinusoidal patterns of large vertical and lateral displacements of the center of mass about the net axis of travel, with the wavelength of the lateral sinusoid being twice that of the vertical. A simple pendulum model of locomotion was not supported, but instead the kinematics agreed with a spring-loaded inverted-pendulum model. Forward velocity changed in phase with vertical displacement, and the magnitude of the vertical motion makes harvestmen an extreme example of an animal running in a manner predicted by the spring-loaded inverted-pendulum model. The body of harvestmen appears to "bounce" from one set of supporting legs to another. The hypothesis that long legs require relatively high mechanical energy during running was not supported. Inspired by these findings, we hypothesize that springs within the legs of harvestmen are loaded along both vertical and lateral axes by gravitational acceleration of the body and that long, multi-segmented tarsi may have evolved to enhance the storage of elastic energy.

Aspects of the behavioral ecology of juvenile tarantulas within the maternal burrow

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Despite their notoriety and popularity in the pet trade, little is known about tarantulas in their natural environment. We are involved in long term study of a large population of tarantulas (*Brachypelma vagans*) in Puebla, Mexico. In May 2003, we found juveniles along with females in six burrows. Activities of these juveniles and the females were observed at night. Females emerge from their burrows soon after sunset and assume a sit-and-wait position in or near the burrow entrance. Their burrows are lined with web and a narrow collar of web also extends approximately 1 cm out from the burrow entrance. Juveniles emerge from the burrow within 30 minutes of the female and are found on the web collar. Although the females will remain motionless for long periods of time, juveniles are very active and there is a constant movement in and out of the burrow. Around sunrise, females retreat deep into the burrow after spinning a thin web covering over the entrance. Juveniles were often found on the web collar after the females had retreated and moved easily through the web covering. We observed juveniles dispersing from one burrow. Rather than a random evacuation from the burrow, juveniles initially formed three columns and followed one behind each other away from the burrow entrance.

Molecular Phylogeny Of *Caddo* And The Timing Of Phylogenetic Events In Caddidae (Opiliones)

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The genus *Caddo* has two species, *C. agilis* and *C. pepperella*, occurring in eastern Asia and eastern North America, a disjunct distribution also known in several other arthropod and numerous plant groups. Two phylogenetic hypotheses have been proposed: 1) *C. agilis* and *C. pepperella* are each monophyletic and 2) Asian and American *C. agilis* each gave rise to *C. pepperella* independently. The latter hypothesis renders *C. agilis* paraphyletic and *C. pepperella* diphyletic. The hypotheses were tested using elongation factor-1a (EF-1a) and RNA polymerase II (Pol II) from one representative of each species-locality combination. The acropsopilionine caddids *Acropsopilio chilensis* and *Austropsopilio sudamericanus* served as outgroups. Results from analysis of third-codon positions (nt3) by parsimony and likelihood (GTR + G model) unequivocally supported the monophyly of *C. agilis* and *C. pepperella*. Terminal branch lengths within and between *Caddo* species were similar, suggesting that separation of Asian and American populations occurred at about the same time due to climatic fragmentation of a once continuous forest habitat. Molecular clocks based on rbcL genes from 11 vascular-plant genera with pairs of disjunctly distributed species (Xiang et al. 2000, Mol.Phyl.Evol. 15:462-472) suggest that habitat fragmentation and divergence within *Caddo* species occurred about 5.4 million years ago (mya). A log-likelihood-ratio test showed no significance difference between the GTR + G and

GTR + G + clock models, and the 5.4-mya date was used to calibrate an EF-1□ + Pol II nt3 clock. The clock indicated that *C. agilis* and *C. pepperella* diverged about 40 mya and that Caddinae and Acropsopilioninae diverged about 90 mya.

Running performance of the grass-spider *Hololena adnexa* on intermittent surfaces

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Funnel-web or grass-spiders (family Agelenidae) run on the upper surface of their flat, sheet-ike webs. Lacking the adhesive coatings such as cribellate silk or sticky droplets found in the webs of other spiders, agelenids appear to rely on speed to capture prey that stumble onto the web. Speed is likely important for predator avoidance, and ability to locomote off the web is important for mate searching. The objectives of this study were to measure running performance on various surfaces, and observe how the legs and feet of the animals interact with the surfaces. Running performance of 24 spiders from a local population of *Hololena adnexa* was assessed on three different surfaces—metal screen meshes with grid sizes of 7.8mm^2 and 2.0mm^2, and paper. Performance, measured as linear speed, was not significantly different between the three surfaces ($p > .05$ in paired T-tests). Mean and maximum linear speed (44.8 body lengths/second and 79 body lengths/second) for all runs was comparable to literature values for fast arthropod running, when corrected for body size. Further observation of leg-surface interactions showed that forward progress is not impeded by failure of the tarsus/tarsal claw to intersect with the surface, suggesting the effective "foot" of the spider consists of more than just the terminal leg-segments, but likely includes metatarsus and tibia and may rely on setae for stabilization. This phenomenon of a "distributed foot" may be broadly important for stable locomotion in fast-running arthropods.

Biogeographic History of California *Atypoides* (Araneae, Antrodiaetidae)

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The biogeography of California has many unique patterns, one of which can be seen in the mygalomorph spider genus *Atypoides*. *Atypoides* includes three species- *A. hadros* distributed in the southeastern Ozarks, *A. gertschi* distributed in the southern Cascades of northern California and southern Oregon, and *A. riversi* distributed in both the northern Coastal Range and northern Sierra Nevada of California. *Atypoides gertschi* and *A. riversi* are parapatric in the northern Sierra Nevada and are believed to be sister species. Our study attempts to answer two questions regarding the phylogenetic and biogeographic history of *Atypoides*: 1) Are California *Atypoides* monophyletic, as hypothesized by Miller and Coyle (1996)?, and 2) What is the history of population and biogeographic diversification within *A. riversi*? To address these phylogenetic questions, sequence data from ribosomal and mitochondrial genes are being generated for both populations and species of *Atypoides* and related genera. 18S and 28S ribosomal data collected to date indicate that *A. gertschi* and *A. riversi* are not sister taxa, and that members of the genus *Atypoides* form a paraphyletic grade with respect to the genus *Antrodiaetus* (Antrodiaetidae). Phylogenetic divergence within *A. riversi* suggests that the Central Valley has been a long-standing barrier to gene flow, and that populations on opposite sides of the Central Valley may indeed represent unique species. This corroborates an early "incipient speciation" hypothesis of Coyle (1968).

Scytodes: Spitting Performance Parameters and their Biomechanical Implications

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Spitting spiders (Scytodidae) subdue prey by entangling them, at a distance, in a spitted mixture of silk, glue, and venom. Using high-speed videography, differential interference contrast microscopy, and laser-assisted oscillometry, we have begun to measure the performance parameters that will ultimately need to be explained in biomechanical and fluid dynamic terms. (1) The ejection of "spit" from the venom duct (near the proximal end of the fang) is orderly. It results in a pattern that scans along a lateral-medial axis (due to fang oscillations) while traversing from ventral to dorsal (due to cheliceral elevation). Each lateral-to-medial sweep of a fang produces silk-borne beads of glue that are not present during each subsequent medial-to-lateral sweep. (2) The ejection of "spit" is very rapid. A full scan (5-16 fang cycles, one upsweep of a chelicera) typically occupies less than 30 ms and involves fang oscillations at 500 - 1000 Hz. We have measured ejection velocities as high as 6.3 m/s. (3) The "spit" is contractile. During the 0.2 s following ejection, silk shortens by 40-60% and the product of a full scan by both of the chelicerae can exert an aggregate contractile force of 0.1-0.3 mN. Based on these parameters, we offer hypotheses concerning the biomechanical and fluid dynamic processes that enable this kind of material ejection.

Phenology and habitat use by brown recluse spiders (*Loxosceles reclusa*)

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During Summer 2002 and Spring 2003, I studied a naturally-occurring population of brown recluse spiders (*Loxosceles reclusa*) living in the basement of my home in St. Louis, Missouri were conducted every other night from June 2002 through June 2003 and locations of spiders, as well as daily temperatures, were recorded. In 2003, distance to the nearest shelter also was recorded for a subset of spiders showed that spiders first appear in small numbers in the spring, increase rapidly and reach a peak during the summer, and decline in the fall; no spiders were visible during the winter months. Observations during daylight hours revealed that approximately twice as many spiders are visible and active during night hours as compared to daytime. My observations also demonstrated that spiders are predominantly found at floor level or at very low heights near the floor, and that they prefer sites that are near to shelter. Appears to be extreme site fidelity (lasting days to weeks), territorial behavior, and many sites that were used in 2002 were re-used in 2003, although not necessarily by the same spiders. , additional observations on the main, living floors of the house showed that, when spiders are removed, it is common for new spiders to appear at the exact same sites within a day to a week later.

Laniatorid harvestmen in Baltic amber (Opiliones: Laniatores)

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Harvestmen of the suborder Laniatores have not been well represented in Baltic amber. Until now, the only one species has been described, *Gonyleptes nemastomoides* Koch & Berendt (1854), and this based on one poorly preserved specimen. This enigmatic species was originally placed in Gonyleptidae, a family now occuring only in the neotropical region, then moved to the Palpatores by Menge (1854, 1856), and more recently transferred to *Scotolemon* in the laniatorid family Phalangodidae (Staręga 1976, 2002). A reexamination of the type specimen now indicates that *Gonyleptes nemastomoides*, although a laniatorid, belongs neither to Gonyleptidae nor Phalangodidae, but to Cladonychiidae and thus represents the first fossil record for the superfamily Travunioidea. Based on the morphology of the hind claw, the species differs from the extant genera and so probably represents a new genus.

Comparative neuroanatomy of specialized visual processing centers in two spider families (Lycosidae and Salticidae)

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Specialized visual systems have evolved multiple times in ecologically and phylogenetically distinct families of arachnids. Wolf spider (Lycosidae) and jumping spider (Salticidae) visual systems in particular have become highly developed under potentially very different light conditions, with lycosids being active both day and night while salticids are primarily diurnal. Consequently, jumping spiders have evolved highly acute vision while wolf spider vision maximizes light capture in low light conditions. Both visual systems have been studied in detail at the behavioral, physiological and morphological levels. Surprisingly, research on the neuroanatomy of visual processing centers (neuropils) for principle and secondary eyes in either of these families has been lacking. Using multiple histological techniques, several types of optic neuropils were found and described in both families. Each of these neuropils has a stereotyped shape, structure and placement that do not appear to vary across species within a family. These processing centers are composed of multiple types of neurons, as determined by

modified Golgi methods. From the characteristic neuronal structure of the optic neuropils, predictions were made as to their function, based on similar structures in other arthropod visual centers. Utilizing a comparative approach when analyzing the neuroanatomy of different spider families, may give insight into the functional morphology and evolution of visual specialization under various ecological conditions.

Morphological And Molecular Systematics Of New Zealand Wolf Spiders

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The relationship of New Zealand wolf spiders to Australian, Asian and Holarctic genera was investigated using sequence data from the mitochondrial 12S rRNA gene. Analysis revealed that Australasian species form clades distinct from Palearctic and Holarctic species providing further evidence against the placement of Australasian species in Northern Hemisphere genera. There is evidence that New Zealand wolf spiders are related to a subset of Australian genera whereas the other Australian lycosid genera are related to Asian/Holarctic faunas. The 27 species of Lycosidae found in New Zealand have been revised and will be briefly discussed. A phylogeny for the genus *Anoteropsis* was inferred using parsimony analysis of morphological characters and contained significant phylogenetic structure. The phylogeny of *Anoteropsis* was further investigated using molecular data to test for congruence with the morphological data and the monophyly of widespread species. Data sets from the mitochondrial gene regions NADH dehydrogenase subunit I (ND1) and cytochrome c oxidase I (COI) of the 20 species in the New Zealand genus *Anoteropsis* were generated. Analyses supported the existence of five main species groups within *Anoteropsis*. Phylogenies generated from the COI data set show inconsistencies with the ND1 and morphological trees. A radiation of *Anoteropsis* species within the last five million years is inferred from the ND1 likelihood phylogram, habitat and geological data.

Phylogeny Of The Burrowing Wolf Spider Genus *Geolycosa*: Evidence For Rapid Morphological Evolution

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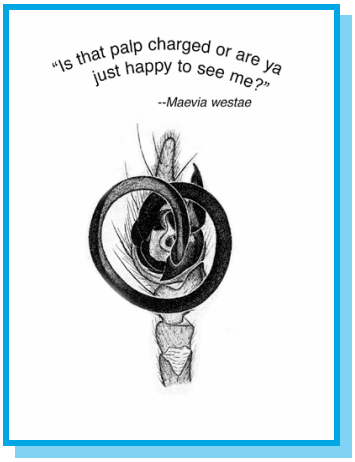
Samuel D. Marshall, Hiram College Hiram, OH
Walter R. Hoeh, Kent State University Kent, OH

Wolf spider genus *Geolycosa* is fossorial burrower in sandy area. There are total 20 species within this genus in North America. The current classification of *Geolycosa* rests mainly on Wallace's review published in 1942. However, relationships within the genus *Geolycosa* are poorly understood. Previous to this study, the interspecific relationships and evolutionary history of *Geolycosa* have not been evaluated within a phylogenetic framework. The goals of this study are to estimate the evolutionary relationships among *Geolycosa* species within North America and recover the underlying evolutionary processes. We used DNA sequences from mitochondrial genes and nuclear genes, and morphological traits in a cladistic analysis. Analyses from molecular data and morphological data will be compared and discussed. Results to date suggest that rapid morphological evolution has occurred in Florida *Geolycosa* clade and some *Geolycosa* morphospecies are not valid phylogenetic species. For taxonomic classification to be consistent with phylogenetic relationships, changes in the present taxonomy are necessary.



AAS Annual Meeting 2004 Norman, Oklahoma

Hosted by **Douglas Gaffin**

The 2004 annual meeting of the American Arachnological Society will be held at the University of Oklahoma in the city of Norman, 23– 27 June, and hosted by Dr. Douglas Gaffin.

Using the AAS website for registration and abstract submission is much preferred, and may be done by pointing your browser at:

http://www.americanarachnology.org/AAS_Meetings/AAS_2004.html

Alternately, you may use register for the meetings at:

http://www.peopleware.net/index.cfm?site-code=0214&eventDisp=5180609401&subeventDisp=PART&CFID=1274381&CFTOKEN=32640065

Another way to submit an abstract for a paper/poster presentation and the transmittal form, use:
http://www.americanarachnology.org/AAS_Meetings/AAS_2004_presentation.html

However, if you prefer using the US Poatal Service, all forms may be accessed via the website, printed, and mailed-in.

Also, the forms will be available in the upcoming issue #69 of *American Arachnology*, along with more detailed information about the 2004 Meeting.

The deadline for registration and abstract submission is

15 May, 2004

The meeting will include a scorpion symposium, research papers/posters, a collecting trip, a field trip to the Wichita Mountains, plenty of good food, and the traditional auction and banquet, this year at the Sam Noble Oklahoma Museum of Natural History (with special speaker **Dr. Kelvin Droegemeier**, director of OU's world-renowned meteorology program, speaking on an Oklahoma pastime -- storm chasing).

AND!!! Don't forget to submit your items to the annual **ArachnoAuction** !!

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American Arachnology

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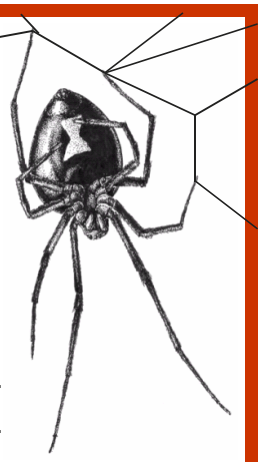

American Arachnolgical Society Website

http://americanarachnology.org

Ken Prestwich has developed our website where one may find membership information, **Annual Meeting Info & registration**, announcements & Bulletin Board, officers, meeting minutes, instructions to JOA authors, an electronic JOA index, graduate study opportunities, a photo gallery, links to other arachnological sites, and **JOA OnLine** (electronic versions of the Journal of Arachnology; available to A.A.S. Members). Many, many thanks and kudos to Ken for applying his time and skill to the Website!! Thanks too to Holy Cross for sponsoring the site.

Arachnology in Cyberspace

Here are some website addresses for arachnological information:

International Society of Arachnology—http://www.arachnology.org

Wolf Spiders of Australia (Lycosidae) - http://www.alphalink.com.au/~framenau/Lycosidae/index.html

Journal Of Arachnology Electronic Index

The electronic index for the Journal of Arachnology is available at: **http://vassun.vassar.edu/~celt/suter/spiderform.html**

Note that the main search keywords are:**Scorpion, Spider, Harvestman, Mite.** Any word or taxon that is in a title may be found with a search of the Index. Thanks to Bob Suter: **suter@vassar.edu** http://faculty.vassar.edu/~suter/Suter.html

AMERICAN ARACHNOLOGY

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