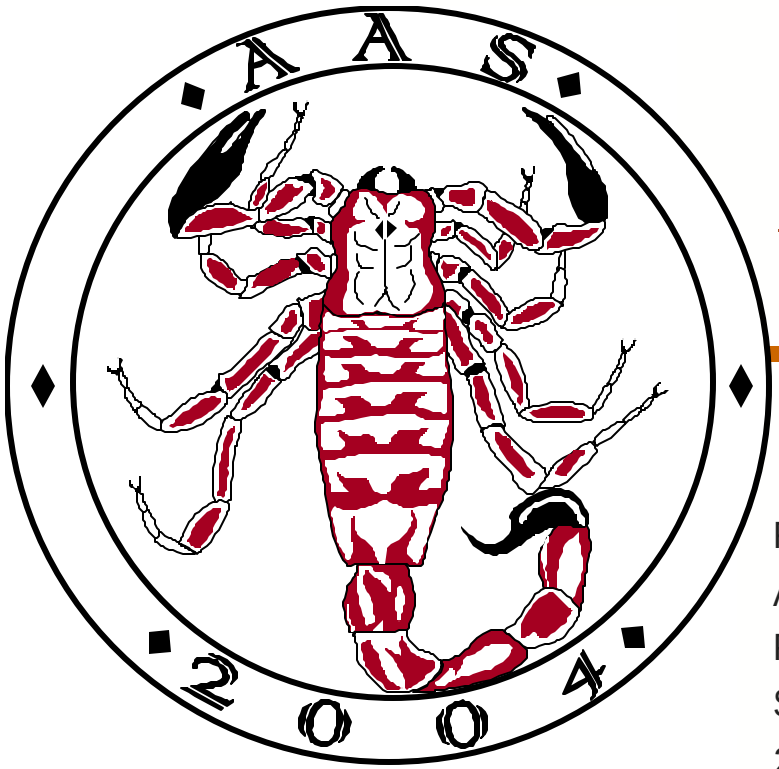
Newsletter of the American Arachnological Society



American Arachnology

Number 70 April 2005

In This Issue...

Future A.A.S. Annual Meeting Sites

2005– 26– 30 June; Akron, Ohio
2006– College of Notre Dame, Baltimore, Maryland

A.A.S. Election–2005

Please watch your mailbox... Your ballot for the 2005 A.A.S. election is arriving soon. We select a new President-Elect, so be sure to mark your choices and send your ballot.

Please NOTE—The deadline for registration and submission of materials for the AAS meeting in Akron is **20 May 2005** !!

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 Volume 71) is 1 October, 2005. 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: jshultz@umd.edu. Membership information may be found at the A A S w e b s i t e : h t t p : / / WWW.AMERICANARACHNOLOGY.ORG. Members of the Society also receive the JOURNAL OF ARACHNOLOGY (published triannually) and have access to electronic resources (JOA OnLine).

Report from the 28th Annual AAS Meeting
University of Oklahoma, Norman, 23-27 June 2004
Hosted by Dr. Douglas D. Gaffin

The 28th Annual AAS Meeting kicked off Wednesday afternoon and evening with registration and a reception at the Sooner Hotel. Former United States Senator and Oklahoma Governor and current OU President David Boren welcomed participants to the University the next morning and highlighted all the new buildings and initiatives occurring across campus.

The scientific part of the meeting began with a Scorpiology Symposium. Dr. Victor Fet proclaimed this symposium represented the third and the largest such symposium dedicated to scorpion biology. Dr. Gary Polis hosted the first one on June 25, 1985, in conjunction with the 9th AAS meeting at the Los Angeles County Museum of Natural History (12 talks by 12 authors). The second occurred on December 18, 1991 as part of the Annual Meeting of the American Society of Zoologists (now the Society of Integrative and Comparative Biology) in Atlanta, Georgia. Dr. Polis and Dr. Philip Brownell co-organized that meeting, which saw 14 talks by 15 authors. This symposium consisted of 19 talks and posters by 27 authors parsed into three sessions ranging from ecology to physiology to evolution. Symposium proceedings were included in the online journal,

Euscorpius, http://www.science.marshall.edu/fet/euscorpius/p2004_17.pdf

The scorpions finally gave way to the rest of the arachnids after the Thursday afternoon group photo. In all, the rest of the meeting consisted of six separate paper sessions and ran from Thursday afternoon to noon on Saturday. A lively poster session took place Thursday afternoon along with special guided tours of OU's renowned History of Science collection. Hundreds of live arachnids provided by our vendors ringed the poster room and added a special ambiance to the session.

The Thursday evening Informal Session continued the model of the Denver meeting with the public invited to listen, learn, and interact with the AAS experts. The venue was the plush auditorium at the Sam Noble Oklahoma Museum of Natural History, and the public was encouraged to bring in their spiders for identification. This proved a great vehicle for the AAS participants to demonstrate their expertise while also regaling the standing-room only audience with fascinating arachnid trivia and impromptu arachnid stories.

An Oklahoma BBQ complete with live country music at Burr Park capped the Friday sessions, followed by shuttle trips to nearby Thunderbird Lake State Park. Clear Bay Café on the shores of the lake was a comfortable place to gather and share beer and spiders. The local scorpion fauna thought the apocalypse was here as scores of black light toting arachnologists rocked their 400 million years of peaceful evolution.

Saturday afternoon saw a return of AAAFF (Arachnological Association for the Absorption of Federal Funds) hosted by Dr. Alan Cady. Particularly memorable was Dr. Bruce Cutler's novel proposal for increasing AAS membership among the late-night television viewing demographic. The annual business meeting rounded out the afternoon.

The Great Hall of the Natural History Museum was the perfect place for the Saturday evening Banquet and Auction. The George Ahmadi trio provided cool jazz that wafted through the museum's exhibition halls. Dr. Kelvin Droegemeier (Regents Professor and Director of the Center for Analysis and Prediction of Storms) gave an engaging presentation on the science and art of a favorite Oklahoma pastime – Storm Chasing. He reminded us that our meeting's moderate weather bucked the odds of most Oklahoma Junes. The evening ended with the inimitable Dr. Rich Vetter encouraging (and sometimes threatening) us to dig into our wallets to support the AAS as Dr. Alan Cady worked the crowd and merchandise.

The Wichita Mountains National Wildlife Refuge in SW Oklahoma was the site of the Sunday Field trip. Guests enjoyed a picnic beside a quiet lake and later chose from two hiking/collecting areas that spanned flat meadows and boulder-strewn hills. Several animals were spotted and photographed, from stately buffalo to charismatic prairie dogs and mountain boomers. A listing of arachnids identified from the Wichita Mountains field trip as well as the Lake Thunderbird trip is available at http://faculty-staff.ou.edu/G/Douglas.D.Gaffin-1/AAS_Collections/AAS2004_species.htm

2004 AAS Field Trip Report

After being welcomed by a nice colony of *Anelosimus studiosus* in a small tree at the entrance of our check-in point, The Sooner Hotel, it was apparent that the field trips would divulge many interesting local arachnids. Our host, Doug Gaffin, provided a web site (http://facultystaff.ou.edu/G/Douglas.D.Gaffin-1/AAS_Collections/AAS2004_species.htm) to record collected taxa, an immense aid in compiling this report. Possible new state records are indicated here with an asterisk.

Two field trips were on the docket for the Oklahoma meeting. The first on Thursday evening, June 25 was to Lake Thunderbird State Park. The primary collecting area was around a convenient restaurant/bar overlooking the lake. *Loxosceles reclusa* was taken underneath asphalt chunks near the restaurant. Since these were taken by Rick Vetter we can be absolutely, unconditionally, indubitably, positively, utterly certain that these were that species; as opposed to liphistiids, gradungulids, anapids or symphytognathids. In the immediate vicinity were disturbed fields, but some had significant prairie vegetation remnants; small patches of wetland vegetation, and dry oak woods. The latter had *Opuntia* cactus as a component of the understory, a strange sight to many of us from drier or wetter climes. An even stranger sight was a large immature *Rabidosa rabida* ensconced in the funnel of an *Agelenopsis naevia* web, and responding to prey tossed on to the web! An overview of the arachnids collected left the impression of a predominantly eastern fauna with some central and southern elements.

Some of the species taken are listed below:

Eastern - *Agelenopsis naevia, Casteineira amoena*, Casteineira cingulata*, Casteineira longipalpis , Hentzia palmarum. Maevia inclemens, Micrathena gracilis, Mimetus puritanus, Phidippus pius (characteristic of* open areas and prairie*), Phidippus whitmani, Phrurotmpus alarius, Rabidosa rabida, Schizocosa ocreata, Schizocosa stridulans *, Theridion glaucescens*,*

Central - *Aphonopelma hentzi , Centruroides vittatus, Eumesosoma roeweri* (one of the few North American phalangids characteristic of grassland), *Loxosceles reclusa, Pelegrina pervaga* (on red cedar), *Philodromus pratariae (open areas and prairie)*

Southern - *Leiobunum flavum , Peucetia viridans*

After a somewhat rain-threatened start on Sunday June 27, we arrived at the Wichita Mountains Wildlife Refuge to hot sunny weather. We were able to come prepared thanks to an arachnid inventory by James Cokendolpher and Frank Bryce (1980). Charismatic megafauna were in evidence here with numerous birds (painted bunting, summer tanager, etc.) distracting the easily distractible. Starting at the Visitors Center, the building walls produced the phalangids *Eumesosoma roeweri, Leiobunum vittatum* ,the endemic *L. relictum*, and the lycosid *Pardosa mercurialis*. We then moved on to the relatively mesic Lost Lake site where lunch was devoured. Taxa reported from this site were the phalangids *Leiobunum vittatum* and *Vonones sayi*, a *Loxosceles reclusa* with egg sac was also reported, however since it was not taken by Rick the possibility remains that it was a liphistiid etc. etc. We then traveled to the more xeric Sunset Lake locality. On the way we were diverted by more charismatic very-mega fauna, longhorn cattle and bison. Since the bison herd encountered is used to human interlopers one could approach them from an insanely close distance providing a great photographic opportunity. Sunset Lake is a dammed stream with riparian vegetation as taller trees in the immediate vicinity of the lake, and fields with impoverished prairie on higher parts of the floodplain. Under rocks here *Loxosceles reclusa* was found by Rick so we can be absolutely, etc. certain that these were that species; as opposed to liphistiids, etc. Bordering the stream were tall grasses and shrubs. Away from the water are hills of bare rock and patches of small oak and the occasional red cedar and shrubs. The taxa collected here were of more western and central affinities.

Some species collected at this site are listed:

Eastern - *Glenognatha foxi, Latrodectus mactans* (more

common in south), *Mangora placida, Pelegrina galathea*
Central - *Centruroides vittatus, Dictyna bellans, Loxosceles reclusa, Leiobunum relictum, Pardosa mercurialis, Philodromus pratariae, Salticus austinensis*
Western - *Diguetia canites, Nodocion rufithoracicus*
Southern - Drassylus lepidus, *Metacyrba taeniola, Sassacus papenhoei, *, Steatoda fulva, Vonones sayi*

After leaving the Wichita Mts. We stopped for refreshments at the very anachronistic feeling resort town of Medicine Park. For me, at least, it evoked memories of similar resort areas in the Catskill Mts. of New York and the Lake Michigan sand dunes of northern Indiana in the 1950's.

Participants in the two field trips were received enthusiastically by local arachnids of the Ixodidae and Trombiculidae. Those from outside the south-central states can now appreciate the dedication of field researchers in this region.

Thanks to all who contributed records: Bruce Cutler, Mike Draney, Hank Guarisco, Brent Hendrixson, Ron Jenkins, Cami Liggett, Pat Miller, Jeff Shultz, Gail Stratton, Rick Vetter, Tsunemi Yamashita.

Abstracts of Symposium, Poster and, Oral Presentations - 28th AAS Meeting, Norman OK 23 - 27 June, 2004

Podium Presentation Abstracts

? Denotes Scorpion Symposium Paper

***Amaya, Christopher**
Siena College, Department of Biology, Loudonville, NY, USA

Variation in Reproductive Investment in Two Species of Wolf Spider

Patterns of reproductive investment have a profound influence on individual fitness as well as population and community dynamics. This study examined the variation in the life history traits of two sympatric species of wolf spider (*Allocosa mokiensis* and *Pardosa dorsuncata*) over a three-year period (1998-2000) and at three study sites in southeastern Arizona. The time frame examined corresponded with an El Nino/La Nina event (1997-2000), which had significant effects on the total precipitation during those years. It appears that the life histories of both *P.dorsuncata* and *A. mokiensis* appear to be significantly influenced by environmental factors. Both species follow similar patterns of reproduction across years. Females of both species were larger and heavier and produced lighter and bigger offspring in 1998 and females were small and light and produced heavier, though smaller offspring in 2000. There was also limited evidence of size-number tradeoffs.

***?Bost, Karen; Gaffin, Doug**
University of Oklahoma, Department of Zoology, Norman, OK, USA

Proposal: Behavioral Assay to Identify the Important Sensory Cues Involved in Sand Scorpion Navigation to their Home Burrows

Sand scorpions leave their home burrows at night to hunt and mate. After a few hours of surface activity, they return to their home burrows. We are interested in the sensory cues that guide animals in this homing process. These animals present an ideal system for navigational study in that they live in ecologically simple dune environments; also, they are abundant, easily obtained, easily maintained in the laboratory, and fluorescent under ultraviolet light. Additionally, behavior observed in the laboratory is generally consistent with that observed in the field, allowing comparable laboratory and field study. To identify the stimuli that guide animals to their home burrows, we propose a series of directional choice tests, each quantifying the ability of scorpions to orient towards the direction of their burrow under a single stimulus modality (for example: chemical trails or polarized light). Potential cues under investigation include geomagnetism, starlight patterns, polarized light, humidity gradient, chemical trails, and direct vision of the burrow or surrounding landmarks. Stimuli that appear to affect sand scorpion navigation behavior in the laboratory will be re-examined in field experiments. We will discuss our behavioral assay, experimental design, and some of our preliminary findings.

***Bradley, Richard A.**
Ohio State University at Marion, Depr. of EEO Biology, Marion, OH, USA

The Spiders of Glen Helen Nature Preserve, Greene County, Ohio

Glen Helen Nature Preserve is located in rural Southeastern Ohio near the town of Yellow Springs. It is one of the oldest nature preserves in the region, having been protected continuously since 1929. The reserve area is 404.6 hectares; it is bounded on the southeast by John Bryan State Park and is also very near Clifton Gorge Nature Preserve. The primary habitat is mixed mesophytic hardwood forest. In addition to forested areas, spider sampling was conducted in old field and restored tall grass prairie habitats. Samples were collected between 4 November 1993 and 11 September 2001. Sampling techniques included pitfall traps, litter extraction, visual searches at ground level and in the understory, and sweep/beat samples. A total of 104 collections from 29 localities in the preserve produced 3,411 identified specimens. The spider fauna of Glen Helen is relatively diverse in the Ohio context. These specimens include representatives of 22 families and 173 species. Open habitats yielded more species (128) than forested sites (97).

***Brantley, Sandra L.; Lightfoot, David C.**
Univ. of New Mexico, Mus. of Southwestern Biol., Albuquerque, NM, USA

Spiders in Grand Canyon 2001-2003: Ecological Associations with Vegetation and Vertebrates

The impacts of dam construction and subsequent flow regulation on downstream ecosystems are complex, variable, and often indirect on native biodiversity or ecosystem function. We are developing an integrated monitoring program useful for dam operators and other stakeholders by documenting diversity as well as changes in ecological community structure. From 2001 to 2003 we visited 31 sites along the Colorado River, dividing each into a shore zone (SHOR), new high water zone (NHWZ) and old high water zone (OHWZ). Arthropods were sampled with 5 methods; here we discuss results from pitfall traps and sweep samples. Indicator species analysis revealed 17 ground-dwelling arthropod species (including 3 spiders) and 11 foliage species (including 2 spiders) that consistently defined the three zones. Ground-dwelling spiders were significantly correlated with vegetation height and volume in the NHWZ. Plant spiders were not correlated with these vegetation features in the NHWZ and were negatively correlated with vegetation in the OHWZ. Ground spiders were correlated strongly with other arthropods in the SHOR and NHWZ and with some vertebrates in the NHWZ. Plant spiders showed negative correlations with vertebrates in the NHWZ and OHWZ. Possible links underlying these correlations include predator/prey interactions, preferences for shade, open ground or soil type. We are now defining taxa for long-term monitoring; it is important to include arthropod taxa because of their high species numbers and varied interactions with other animals and vegetation. We expect these relationships to change over time in response to factors such as climate and river level.

***Brooks, Amanda E.; Nelson, Shane R.; Steinkraus, Holly B.; Jones, Justin A.; Lewis, Randolph V.**
University of Wyoming, Dept. of Molecular Biology, Laramie, WY, USA

An Investigation of the Mechanical Differences of Major Ampullate Silk Fibers from *Nephila clavipes* and *Argiope aurantia*

Nephila clavipes and *Argiope aurantia* diverged from Macryphantes about 125 million years ago. *Nephila* is considered a derived araneoid, whereas, *Argiope* is an Araneida. Based on a cladogram, it would be expected that the silks of these two organisms would show distinct

variations. Evolutionary divergence can be quantified by a comparison of the amino acid compositions of major ampullate silks from these two species. Major ampullate silk is the dominant constituent of dragline silk. It is composed of two distinct proteins, MaSp1 and MaSp2. Based on the proline content (as determined by amino acid analysis), *Nephila clavipes* major ampullate silk was calculated to consist of 19% MaSp2 and 81% MaSp1, while *Argiope aurantia* was calculated to have a significantly higher MaSp2 content of 59% (MaSp1 content 41%). To investigate the functional implications of the amino acid composition disparities, major ampullate silk fibers from *Nephila clavipes* and *Argiope aurantia* were mechanically tested and compared. Preliminary results, based on stress strain curves, show that there are substantial differences in a single major ampullate silk fiber from *Nephila clavipes* and *Argiope aurantia*. Despite the increased proline content (due to the increased MaSp2 content), which would be predicted to translate into a greater elastic capacity, *Argiope aurantia* major ampullate silk shows a similar elasticity after super contraction than that of the same kind of fiber from *Nephila clavipes*. *Argiope aurantia* silk is also able to withstand a higher peak load stress. Investigations are currently under way to understand the biological relevance of these findings.

***?Brown, Christopher A.**
Tennessee Tech University, Department of Biology, Cookeville, TN, USA

Compensatory Growth in the Scorpion *Centruroides vittatus*

In nature, many organisms are faced with a food supply that varies in space or time, and the ability to adjust growth rates to match food levels may be an important evolutionary adaptation. In particular, many organisms have the ability to grow at an accelerated rate when food levels increase following a period of low food availability; this process is termed compensatory growth. Compensatory growth has been little studied in arachnids, and there is no prior evidence for it in scorpions. In this study, I examined growth rates for two populations of *Centruroides vittatus* from Texas which differ in adult size and second instar size. I maintained juveniles on one of three feeding levels (fed every third, sixth, or ninth day) for six months, then fed all surviving juveniles every third day. Increased feeding rate during the initial six months led to higher survival, shorter instar duration, faster development (that is, more molts during this period), and a greater increase in length and mass. However, growth rates of surviving juveniles from the 6- and 9-day feeding treatments were significantly greater following transfer to a 3-day feeding treatment than were growth rates of juveniles maintained on the 3-day treatment continuously. This suggests that *C. vittatus* juveniles are capable of compensatory growth when food-limiting conditions are relaxed.

***?Brownell, Philip; Grothe, Benedikt**
(PB) Oregon State University, Department of Zoology, Corvallis, OR, USA; (BG) University of Munich, Dept. of Biology II, Munich, Germany

Vibration Sensing in Sand Scorpions, Slit by Slit to the CNS

Sand scorpions (*Paruroctonus mesaensis*) are exquisitely sensitive to nearby mechanical disturbances of dry sand substrates. Behavioral studies show they accurately locate the position and distance of moving objects from vibrational information detected by slit sensilla on their outstretched legs. We imaged the sensory neurons innervating each of 7 to 9 slits in each slit organ and measured their electrophysiological responses to controlled oscillation of the tarsal leg segments. For each slit, one or two neurons responded to broadband (<30 to >5000 Hz) vibrational input. At the threshold of stimulation these acceleration-sensitive neurons had peak sensitivity between 250 and 400 Hz, the dominant frequency band of surface wave signals conducted through sand. Individual slits showed differences in threshold correlated to their relative length and alignment to the leg axis. None of these spike responses were strongly phase-locked to the stimulus as previously predicted. Transmission EM and confocal microscopy of dye-filled slit organs showed at least two neurons (10-20 micron somata) innervating each slit, with an abundance of axo-axonic synapses between primary afferents. These findings contribute to a computational model of peripheral and central sensory processing proposed to explain vibration source localizing behavior.

***Cady, Alan; Marchetti, Sarah; Homsher, Ryan**
(AC, RH) Miami University, Department of Zoology, Middletown, OH USA; (SM) Fairbanks, AK, USA

Experiments Testing Harvestmen as Agents of Biological Control

Harvestmen (Opiliones) are common inhabitants of vegetable gardens. They are an endemic Generalist Predatory Arthropod (=GPA; e.g. spiders, harvestmen, predaceous beetles, ants) with potential biological control abilities. Harvestman natural history is poorly known, especially how they may contribute to biocontrol effects within GPA assemblages. Opilionids are abundant, ubiquitous, and are active scavengers and predators. They will feed on pest species (leafhoppers, beetles, and lepidopterans and their eggs), sometimes impacting pest populations. The gregarious nature of harvestmen would permit coexistence at higher densities than for other GPAs having interpredatory tendencies (e.g. spiders). Experiments have indicated that the presence of these predators in experimental enclosures protected young brussels sprouts plants from damage by early instars of common lepidopteran and aphid pests. Plants in enclosures holding harvestmen had greater growth, less damage, and more biomass than did controls. Energy supplements (chopped earthworms or mealworms) enhanced plant protection. A second year of experiments tested the influence of lowered harvestman densities and of small lean-to shelters within the experimental enclosures. Similar to the previous year, brussels sprouts with harvestmen present tended to have less damage and greater biomass, and dry cucumber weights tended to be higher. Results this year probably were less definitive due to reduced harvestman densities. Early in the season, more harvestmen were found in shelters during daylight, and they gradually moved to the plants for diurnal refuge as the foliage area expanded. These simple shelters placed in vegetable gardens could persuade harvestmen to remain there during the day, an important aspect relative to biocontrol.

***Coddington, Jonathan**
Smithsonian Institution, Washington DC, USA

Modular Measured Elements in Ochyroceratid Webs

Very few spider lineages have evolved the ability to measure, that is, to place threads in a regularly repeating pattern, although exactly what constitutes "regularity" remains ambiguous. Orbwebs are an obvious example, of which there are several specialized sub-categories. Synotaxids, psechrids, and at least one tropical theridiid also measure. This report describes a fifth instance of regular thread spacing in ochyroceratid web "modules". Although the internal structure of these modules is regular, their orientation to each other is not. Neither the function nor the building behavior is known.

***Cushing, Paula E.; Ubick, Darrell; Paquin, Pierre**
(PEC) Denver Museum of Nature & Science, Denver, CO USA; (DU) California Academy of Sciences, San Francisco, CA, USA

Spiders of North America: An Identification Guide

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 Team, or SGNART, was formed. The new manual, entitled *Spiders of North America: an Identification Guide*, (first edition) is scheduled for publication by early 2005. The manual will contain a key to spider families of North America, north of Mexico; well illustrated keys to genera in each of these families; a chapter on the etymology of generic names; a fully illustrated glossary and pronunciation guide; and a complete bibliography. We will provide an overview of the contents and information on how to purchase the guide.

***Cutler, Bruce**
Univ. of Kansas, Dept. of Ecology and Evol. Biol., Lawrence, KS, USA

Distribution of Zinc and Manganese in Spider Cuticle

It has been known for about 25 years that terrestrial arthropods have high concentrations of metallic elements in specialized cuticular structures. For those with electron microscopes, a readily available

technique for elemental determination is electron induced X-ray emission particularly EDS (energy dispersive X-ray spectroscopy). The distribution of zinc and manganese in selected cuticle areas in 18 different spider families was examined by EDS. Studies from the 1980s and 90s on a few genera indicated significant levels of zinc in the surface layer of fang cuticle, and manganese in the cheliceral teeth and tarsal claws. This was confirmed in this study, but some genera differ. *Anyphaena*, *Frontinella*, *Herpyllus*, *Thiodina* and *Titanoeca* lack manganese in the cheliceral teeth. In *Argyrodes* and *Metaltella* zinc replaced manganese in cheliceral teeth, and in *Dysdera* and *Metaltella* zinc replaced manganese in tarsal claws. Fang serrulae have zinc, however in *Herpyllus* manganese replaces zinc. Manganese and zinc never co-occur at the same site. The only clear familial difference seen is that theridiids (3 genera) either lack or have very low manganese levels in tarsal claws. At this point no other higher category pattern of spider elemental distribution emerges. In arachnids the only similar survey was done on scorpions. Buthids had a different pattern of cuticle element distribution that is concordant with its isolated position within the order.

***Draney, Michael L.; Buddle, Christopher M.**
(MLD) University of Wisconsin at Green Bay, Department of Natural & Applied Sciences, Green Bay, WI, USA; (CMB) McGill University, Department of Natural Resource Sciences, Montreal, Quebec, Canada

Subnivean Spiders of Green Bay, Wisconsin: Survey and Evaluation of a New Trapping Device

Winter active spiders and other invertebrates were surveyed during two winters at five distinct habitats (old field, restored prairie, eastern red cedar, forested seep wetland, and deciduous woods) in east-central Wisconsin. An additional objective of the survey was to evaluate the effectiveness of a subnivean pitfall trap designed by the second author and David P. Shorthouse, which allows samples to be collected without disturbing the overlying snow layers. Three snow-pitfall/regular roofed pitfall pairs were operated in each of the five habitats during December through March. Snow pitfall traps captured more spiders and more species of spiders than the regular traps, but the difference was of marginal significance (Wilcoxon signed rank test, p between 0.05 and 0.10). Overall lack of significant differences between the performance of the snow traps and regular roofed traps indicates the new trap does function properly, but is not advantageous in areas with relatively thin average snow cover, such as east-central Wisconsin. 77% of the spiders trapped were adults, belonging to just 14 species. Preliminary evidence suggests that regions both south (South Carolina) and even north (Manitoba) of Green Bay harbor a richer winter-active spider fauna. Further research is needed to determine whether thin, inconsistent snow cover and cold winter temperatures explain this geographic pattern. The red cedar stand yielded about six times more spiders than the average of the other four habitats. This was mainly due to late winter dominance of two species, *Cicurina brevis* and *Lepthyphantes* (*Tenuiphantes*) *zebra*. *Centromerus sylvaticus* dominated the non-forested habitats.

***Edwards, Robert L.**
Woods Hole, MA, USA

Observations on the Life History of *Monoblemma muchmorei* Shear

Monoblemma muchmorei is a diminutive orange-red species of the armoured spider family Tetrablemmidae. Adults average 0.8 mm in length. There are least 30 recognized genera and a very large number of species found in tropical regions around the world. There is virtually no life history information available for any of these species. In Puerto Rico, in the area around El Yunque, *M. muchmorei* occurs uniquely in bamboo litter at elevations of 100 meters or less.

In captivity the species feeds avidly on several species of collembola, in the genera *Sinella*, *Folsomia* and *Protophorura*. In the wild none have been observed feeding nor have any of the abundant ants found in the litter been observed feeding on them. The two most abundant predacious ants that commonly occur in the litter, *Wasmannia auropunctata* and *Monomorium ebeninum* both feed primarily on species of collembola and occasionally on other small species of spiders including *Thiotima*.

Mating apparently takes place without much evidence of courtship. The male approaches the female from underneath, venter side up, and seizes her around the cephalothorax with the first pair of legs. Once insertion has taken place there is little activity observed and they may remain in copula for hours. Hemispherical egg cases are typically attached to a firm surface and decorated with small pieces of dark material. Ecdysis occurs within three weeks at which time a single spiderling emerges. The mother spider usually stays nearby for a week or so, often killing any small creature that approaches the spiderling. The sex ratio is always approximately 50%, and surprisingly few immature spiders occur in any one collection of litter. The spider makes a flimsy network of webbing within the litter. The natural mortality rate appears to be exceptionally low. Adult spiders in the laboratory have lived for many months, up to nine. The immatures also take many months to mature.

***?Farley, Roger D.**
University of California, Department of Biology, Riverside, CA, USA

A Comparison of Ventral Mesosomal Changes in Scorpion Embryos

The SEM was used to compare embryogenesis in species with katoikogenic (*Pandinus imperator*, Scorpionidae) and apoikogenic development. Those studied with the latter developmental mode are: *Paruroctonus mesaensis* (Vaejovidae), *Vaejovis spinigerus* (Vaejovidae), *Hadrurus arizonensis* (Iuridae), *Centruroides exilicauda* (Buthidae) and *Centruroides vittatus* (Buthidae). In scorpion fossils (Devonian, Carboniferous), the transition of the mouth from ventral- to forward-directed with gradual development of the preoral tube is thought to have occurred with terrestrialization. Early in this transition in scorpion embryos there are ventral mesosomal changes that may be transitory expressions of retained genetic material for prebook-lung terrestrial adaptations. In early embryos of *V. spinigerus*, deep bilateral depressions develop in the segments of the ventral mesosoma. Then marginal spiracles appear in flap-like sclerites on the ventral surface of abdominal segments 4-7. The marginal spiracles lead only to sac-like invaginations. The more anterior depressions gradually become shallow, and the specialized walls of these depressions form bilateral longitudinal bands of textured epidermis on the ventral surface of each segment. In studies with *C. exilicauda* and *C. vittatus*, the book lungs (with spiracles farther anterior in the sternites) develop in the first stadium and first molt. The textured epidermal bands and marginal spiracles in flap-like ventral sclerites occur in embryos of the apoikogenic species, but the developmental pattern is different in the ventral mesosoma of embryos of *P. imperator*. In the latter, invaginations appear early at the site of book lung spiracles in juveniles and adults. Previous workers reported structural differences in the book lungs of adult scorpions. These differences and the timing and mode of book lung development should all be further examined as possible indicators of evolutionary history.

***?Fet, Victor; Soleglad, Michael,; Gromov, Alexander V.**
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The Platypus of a Scorpion: Genus *Pseudochactas* (Scorpiones: Pseudochactidae)

A unique monotypic scorpion genus *Pseudochactas* was described from southern Uzbekistan and Tajikistan by Gromov (1998). New material, collected by V. Fet and A. Gromov in 2002 during the field expedition sponsored by the National Geographic Society, allowed confirming and further studying of a relict position of this taxon. It belongs to a separate family, superfamily, and parvorder (Soleglad & Fet 2003), and represents the most basal lineage of extant scorpions (data from both morphology and DNA). A separate trichobothrial pattern was introduced for *Pseudochactas* (Soleglad & Fet 2001). This parvorder could have been established in the Permian/Triassic. The relict character of *Pseudochactas* could be due to its preservation in mild-climate, low-mountain depressions with desert surroundings. Ecologically, *Pseudochactas* is not a desert scorpion: it forages on wet mud, and likely spends most of dry season in hibernation. It could represent one of the few remnants of the Mesozoic littoral fauna of the receded Tethys Ocean, elevated by Tertiary tectonic uplift.

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The Euroscorpion: Genus *Euscorpius* (Scorpiones: Euscorpiidae)

The genus *Euscorpius* Thorell, 1876 includes the most common scorpions in Europe and the Mediterranean area. Multiple specific and subspecific forms have been described, but their validity is not clear. A wealth of information is scattered in the literature but a comprehensive modern revision of the entire genus has never been done. We studied numerous available material from many European museums, starting with the Linnaean type specimen of *E. carpathicus*. Our ongoing comparative studies in 1998-2004 on morphology (especially trichobothrial patterns), mitochondrial DNA, and nuclear gene (allozymes) variation (Gantenbein et al. 1999a, 1999b, 2000, 2001, 2002 etc.; Fet & Soleglad 2002; Fet et al. 2001, 2002, 2003, etc.) revealed unprecedented variability and active speciation process in several delineated species complexes. Currently, 15 species are recognized; status of many populations is still under investigation. Especially interesting are: Alpine refugial relicts *E. germanus* and *E. alpha*; high-mountain Balkan species *E. hadzii*; relict complex of *E. sicanus* (Italy, Malta, Greece); isolated *E. tauricus* (Crimea) and *E. koschevnikovi* (Greek Macedonia); and widespread but genetically impoverished *E. italicus*.

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The Adaptive Value of the Scorpion's Sting

Animal venoms function as defensive mechanisms against potential predators and are important in prey capture, particularly of relatively large prey. The importance of venoms to success of species that utilize them has proven difficult to assess experimentally. This is the result of the problem of isolating the effects of manipulating envenomation capability without impairing feeding structures and behavior. Scorpions are actively venomous animals that are unique in that the venom delivery system is divorced from feeding structures. Data from a population of *Centruroides vittatus* from North Texas indicate that stinger damage does occur naturally (3% of individuals have stinger damage that precludes them from envenomating prey or predators). I examined the importance of the ability of *C. vittatus* to envenomate on prey capture and survival with predators in a series of laboratory and field enclosure experiments.

The ability to envenomate had a significant effect on the scorpions' ability to capture large but not small prey. Outdoor enclosure experiments indicated that scorpions that could not envenomate gained less mass and had lower total lipid mass after a 15 day period than scorpions that were able to successfully envenomate prey. There was a significant effect of envenomation capability on the ability of *C. vittatus* to survive encounters with a centipede predator (*Scolopendra polymorpha*) but not a lizard predator (*Crotaphytus collaris*).

***?Gaffin, Douglas; McGowan, Paul; Walvoord, Mark**
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Scorpion Peg Sensilla: Are They the Same or Are They Different?

Thousands of seemingly identical peg sensilla adorn the ground-facing surfaces of the elaborate chemosensory organs of scorpions called pectines. The answer to the question of whether or not all sensilla behave identically could enhance our understanding of the overall behavior of this chemosensory system. Identical sensilla would suggest a parallel sampling scheme, lending support to an "information enhancement" hypothesis. Conversely, an observation that sensilla do not behave identically would support a "segmentation" hypothesis, similar to the decomposition of sensory elements in the well-studied mammalian visual processing system. We are using a newly developed chemical delivery approach to test peg response patterns to consistent, repeatable stimulation. We will report our findings based on electrophysiological recordings of stimulated peg sensilla of desert grassland scorpions (*Paruroctonus utahensis*, Scorpiones: Vaejovidae). We will also report on other relevant characteristics, including the nature and time course of a typical pecten "sniff" and the density of peg sensilla relative to substrate particle size from the animals' natural sand habitat.

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Seismic Communication and Mate Choice in a Wolf Spider

Male multimodal courtship displays in the wolf spider, *Schizocosa ocreata* (Hentz), consist of two components - visual and vibratory/seismic - which are behaviorally coupled. Females use these multimodal signals in mate choice. Previous research demonstrated that the visual component of male courtship behavior influences female mate choice and that some visual signals (e.g. foreleg tufts) correlate with male condition. However, it has not yet been shown whether the seismic component also conveys information used in mate choice. Central to understanding the adaptive function and evolution of communication in this system is whether male multimodal courtship displays are more effective because they are redundant, or because they contain different information. To address this question, the multi-sensory signals were broken down into their individual components and studied separately. Males and females were paired in a cue isolation apparatus which blocked visual cues but allowed seismic communication. Analysis of female behavior indicated that male seismic signals influence female receptivity, as components of seismic communication differed between successful and unsuccessful males in their rate, total number, and total duration. Despite these differences between successful and unsuccessful males, no morphological measurements correlated with male success. These results suggest that visual and seismic signals may contain different information. Further investigation will be necessary to identify what information is being sent via the seismic channel.

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Studies on the Brain Modulation of Circadian Rhythms in the Scorpion *Heterometrus swammerdami*

The first air breathing land animal scorpion evolved 430 million years ago along with the first vascular plants and the land plants. This was long before the appearance of the mighty dinosaurs. The environmental conditions at that time were different than now. Physiological rhythms are coordinated with the external environmental conditions through the evolution of internal biological clocks. This ensures the success of survival. In *Heterometrus swammerdami* the biological clock is located in the brain.

Rhythmic brain protein variations in the scorpion with respect to time indicate that the then day-night length was different from now. The biological clock was adapted to that environment. Change in the light dark conditions disturbs the rhythms in the proteins. In DD the rhythm curve is monophasic and in the LL it gets attenuated. *Heterometrus* spends most of its time in burrows and is not affected much by the darkness. The night peak in serotonin (5-HT) suggests the light suppression. When dark, the endogenous peak is generated. The metabolite of serotonin, 5-HIAA varies with day night cycle, maximal being at midnight and minimal being at around 4 in the morning. Histamine rhythm in the brain is similar to that of 5-HIAA. Entrainment by light is necessary for its rhythmic stability. Electrophoresis brain protein analysis suggests that 41 KDa protein (product of clock gene) is a probable agent for clock similar to the period like protein in suprachiasmatic nuclei of mammals. This shows that the so called "mammalian biological clock" has been in existence long before the actual mammals evolved. Perhaps, a generalized model based on this study could be successfully formulated.

***Hendrixson, Brent E.; Bond, Jason E.**
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Assessing Species Boundaries in the *Antrodiaetus unicolor* Species Complex (Araneae: Mygalomorphae: Antrodiaetidae)

Spider species have typically been delineated solely on the basis of morphology. However, species constructs are seldom investigated using

multiple lines of evidence (e.g., morphology, molecules, ecology). *Antrodiaetus unicolor* is a highly variable and widespread mygalomorph species, and has been used as a "catch-all" name for all specimens of *Antrodiaetus* from the southern and central Appalachian Mountains. Based on museum material and our extensive fieldwork, a novel species has been described from southwestern North Carolina and surrounding areas. This new species is diagnosed in the traditional sense (i.e., by morphology), but we have also implemented a phylogenetic approach to test for genealogical exclusivity. Based on 28S rDNA and COI mtDNA, the new species is strongly supported in parsimony and Bayesian analyses; however, it is nested within *A. unicolor*, rendering the latter species paraphyletic. This pattern (i.e., gene-tree/species-tree incongruence) may be explained by incomplete lineage sorting, sexual selection by female choice, erroneous taxonomic decisions, or is most likely indicative of a "cryptic species complex". These data further indicate that species boundaries based exclusively on morphological criteria may be potentially misleading. In addition, the resulting phylogenetic analysis has shed some light on interpreting the vast amount of morphological variation first observed by Fred Coyle within the *A. unicolor* complex. Hence, we advocate a total-evidence approach (within a phylogenetic context) to delineating species boundaries.

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Scorpion Diversity of Two Desert Islands in the Northern Chihuahuan Desert

One thousand seven hundred thirty five scorpions representing 16 of Texas' 19 known species and three families were collected within Texas' two mountainous National Parks (Big Bend and Guadalupe Mountains) between 1986 and 2003. These scorpions were found in various habitats ranging from loose shifting sand to rocky substrates with some being highly specialized to habitat and others being generalists and less habitat specific. Both of these desert islands with large elevation changes possess varied life zones and the most diverse scorpion populations in Texas. Big Bend is represented by 16 species and Guadalupe Mountains by seven species (17 of Texas' 19 species). The spatial distribution of these scorpions is partially dependent on several abiotic factors including temperature, precipitation, soil and substrate characteristics.

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Genetic Structure of *Nephila clavipes* Populations in Mexico (Araneae: Tetragnathidae)

The large orb-weaving spider *Nephila clavipes* is very broadly distributed: found from the southeastern US to Misiones Argentina, populations inhabit environments ranging from mid-altitude deserts to tropical rainforests. Previous studies have shown that these populations vary in many aspects of life history and juvenile development, and that much of this variation is environmentally induced (phenotypic plasticity).

Classic models for the evolution of phenotypic plasticity (Via et al. 1995, Scheiner 1998) predict that plasticity is most likely to evolve when populations in diverse environments are connected by gene flow. However, *N. clavipes* may have limited dispersal because spiderlings are rarely observed to balloon and adults are likewise not known to engage in long-distance movement. Our first step toward testing the applicability of this model of the evolution of phenotypic plasticity in *N. clavipes* is to determine the genetic structure of seven populations in Mexico, five on the Gulf coast of Veracruz, one in the Istmus of Tehuantepec, and one on the Pacific coast of Oaxaca. These populations differ in habitat type and in apparent isolation. Using allozyme markers, we have found overall a high level of genetic diversity (He=0.276). F statistics revealed local inbreeding (Fis=0.138) and significant genetic differentiation among populations (Fst=0.127). Deriving the indirect estimator of gene flow, e, from Fst, we believe that there are relatively low migration rates among these populations. The implications of these results for understanding the evolution of phenotypic plasticity in this species will be discussed.

***Hopla, Cluff E.**
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Tick and Cliff Swallow Associations in the Caddo Canyons of West-Central Oklahoma

Ticks associated with the cliff swallows in Caddo canyons are *Ixodes baergi* and *Ornithodoros concanensis*. *I. baergi* is host specific associated only with cliff swallows. The life history may be prolonged, usually is not completed within one calendar year, but requires three to four years. Female *I. baergi* engorge primarily upon the young nestlings. The larvae nymphs feed mainly on the adult birds. The adult birds transport all stages of *I. baergi* between colonies especially when seeking a colony site prior to nesting. *Ornithodoros concanensis* is not restricted to cliff swallows but also feeds on rodents and other mammals associated with the cliff face in the swallow nesting colonies. *Ornithodoros concanensis* is often classified as a "bat tick" and is frequently found wandering on the surface of the cliff at night within the swallow colonies during nesting season. *Ornithodoros concanensis* may be found readily under the superficial rock scale within the colony site, usually throughout the year.

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A Taxonomic and Morphometric Examination of the Eocene Spiders of Florissant, Colorado

An outline morphometric analysis is used to make objective family placements of fossil shale spiders from the Florissant formation in Colorado using available shape characters. The carapace shape is used, as it is intact in many of the fossil spiders found. In addition, linear leg characters are used to make meaningful family placements. Multiple discriminant analysis (MDA) was used to predict family placement initially among a dataset of 202 modern spiders from eight families found in localities similar to the lake environment thought to have existed at the time of deposition. This was to determine the accuracy of the predictions made by the MDA. Our results showed that among the modern spiders, Salticidae (85.4%), Linyphiidae (82%), Dictynidae (76.5%), Tetragnathidae (72.7%) and Araneidae (72.4%) were most often correctly predicted. Then forty-three fossil spiders from Florissant were added to determine their family placement. As a result of this technique, 75% of the previously described fossil spiders were removed and placed into new family combinations or were placed into *Incertae sedis*. This analysis is a promising example of a qualitative technique used for identifications where traditional characters are not visible.

***Marshall, Samuel D.; Hoeh, W. Randy; Wu, Ting; Stratton, Gail; Miller, Pat**
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Evidence for Repeated One-Way Introgression in *Geolycosa* Wolf Spiders in Florida

Currently, 18 species of *Geolycosa* have been described based on a limited number of morphological characteristics. The state of Florida has nine *Geolycosa* sp., seven living in scrubs and sandhills across the state. We have studied the phylogeny of this genus to: 1. test for any biogeographic signal in the tree topologies and 2. to test for the monophyly of morphospecies. We used cytochrome c-oxidase subunit I (COI) in a cladistic analysis. Total DNAs were extracted, amplified, and sequenced from 150 individuals representing the species *G. escambiensis*, *G. micanopy*, *G. patellonigra*, *G. x. xera*, *G. x. archboldi*, *G. hubbelli*, *G. ornatipes*, *G. wrighti*, *G. rafaelana*, *G. turricola*, *G. rogersi*, *G. fatifera*, *G. missiouriensis*, *G. riograndе*, *Lycosa carolinensis*, *Sosippus placidus*, *Pardosa milvina*, and lycosid species South Africa and lycosid species Australia. Results to date suggest that: 1. North American *Geolycosa* is a monophyletic group, within which the Floridian *Geolycosa* + Eastern US *Geolycosa* are a monophyletic assemblage. We also found evidence for repeated introgression events wherein *G. micanopy* females mated with males of *G. hubbelli*, *G.*

pattellonigra, *G. x. xera*, and *G. x. archboldi*. This conclusion is based on a lack of congruence between the mtDNA trees and trees generated using morphology and nuclear markers. These past hybridization events apparently occurred in one area in southeast Florida.

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Temporal Patterns in Microhabitat Use for the Scorpion, *Centruroides vittatus*

For scorpions (e.g., *Centruroides vittatus*), predation risk is often associated with the lunar cycle and prey availability with seasonal changes. Predation risk for scorpions from nocturnal predators can increase when illuminated by the moon in exposed microhabitats. Seasonal changes in precipitation and temperature can affect prey availability and thus microhabitat use by scorpions. Microhabitat use had a significant association with the lunar cycle for *C. vittatus*. Scorpions were on the ground at a significantly lower frequency during the waxing gibbous moon. During the waning gibbous moon, microhabitat use was significantly associated with moon rise. The frequency of scorpions on the ground decreased after moon rise. However, the frequency of prey capture was not associated with the lunar cycle. Microhabitat use had a significant association with monthly classes. Ground use was higher during August, and Blackbrush (*Acacia rigidula*) use was higher during March and April. Scorpion height on vegetation was significantly different among monthly classes. Mean scorpion height was greater during April, March, and October and less during August. Prey capture was significantly associated with monthly classes. Prey capture was low during August and high during April. Scorpion changes in microhabitat use during the lunar cycle supports a change in behavior to reduce predation risk. However, the change in microhabitat use does not appear to require a tradeoff between foraging success and predation risk. Seasonal changes in prey availability can explain differences in microhabitat use and foraging success by *C. vittatus* among monthly classes.

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Genetic Variation in *Paruroctonus boreus* and Data Suggesting the Possible Sister Taxa

The *Paruroctonus* genus has been broken into several smaller infragroups and microgroups, each containing one to multiple species. Eight species are currently placed in the *boreus* infragroup (Haradon 1985). One of these species, the northern scorpion *Paruroctonus boreus* Girard, 1854, is the most northerly occurring scorpion species in the western hemisphere. This species has an extensive range, occurring mainly in the basin and range desert of North America, from northern Arizona to British Columbia. In the southern half of its range, it appears to occur only in elevations greater than 1000m. Many locations within its distribution lie below this elevation, creating the potential for populations to be isolated from each other. New mitochondrial DNA from six populations were used to verify the validity of the species throughout its range and to establish the sister taxa of the species. Populations of *P. boreus* were 0.3%-4% divergent from each other. *P. utahensis* showed 7% divergence from *P. boreus*. Currently, *P. utahensis* is grouped in a different microgroup than P. boreus, yet, it exhibits the least amount of divergence among the other *Paruroctonus* species. There is strong support in both the parsimony and Bayesian analysis for two populations of *P. boreus* to group outside of the other populations. Both analyses give strong support for *P. utahensis* to group sister to all *P. boreus* populations.

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Inflorescence Structure and Spiderling Substrate Use

Upon emerging from their nests, crab spiderlings (*Misumena vatia*: Thomisidae) frequent goldenrods (*Solidago* spp.), the commonest flowers and richest attractors of prey. When small dance flies are abundant, the spiderlings grow rapidly. Goldenrod also attracts small juvenile jumping spiders, formidable predators of the spiderlings. A serendipitous discovery revealed that spiderlings on dense goldenrod inflorescences initially bury themselves among the flower heads, while those in less dense inflorescences capture prey at a prodigious rate. Density of these flower heads differs widely among clones. Results of an initial experiment, in which parts of several inflorescences were artificially thinned, and prey absent, resembled the initial observations. Simultaneous experiments also revealed that the jumping spiders are important predators of the spiderlings. Results thus far suggest a complex tradeoff between growth and predator avoidance by the spiderlings, details of which remain to be separated.

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Quantification of Variation in Ventral Pigmentation in the Wolf Spider *Hogna carolinensis* in the Southwestern United States

Before digital photography was available, the measurement of color patterns was a very difficult task. However, the ability to analyze photographs digitally has made the quantification of most color and shading patterns possible. Pigmentation patterns can be measured quickly and easily. I used standardized digital images to measure patterns of pigmentation on the ventral surface of the wolf spider *Hogna carolinensis* from 5 populations in the southwestern United States. Because all images were acquired in the same way, under the same conditions, these measurements of coloration serve as an objective way to examine differences in pigmentation within and among populations. For each individual, I obtained coloration measurements for the abdomen length, abdomen width, sternal width, and sternal length. In some individuals, the ventral surface of the abdomen was not entirely black, but possessed a pattern consisting of a black background with two light spots separated by a black longitudinal bar coinciding with the longitudinal midline of the ventral aspect of the abdomen. In these cases, I measured the area and perimeter of the spots. Quantifiable differences in pigmentation patterns were documented among populations.

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Population Structure of the Marine Coastal Spiders *Amaurobioides maritimus* and *Amaurobioides picunus* (Anyphaenidae) from New Zealand's South Island

Amaurobioides species occupy rocky marine coasts deep in the southern hemisphere, where they build silk retreats near the high tide mark. Two of New Zealand's eight species are restricted to the South Island's southern coast. *Amaurobioides maritimus* Cambridge 1883, is found on the mainland and *Amaurobioides picunus* Forster 1970, is restricted to Stewart Island. During the Pleistocene, Steward Island formed the southern tip of the mainland. It was isolated about 11,000 years ago when the sea level rose and is now separated from the mainland by the 27 km wide Foveaux Straight. Parsimony and distance analyses of DNA sequences of the ITS 1 nuclear gene and the 16S and ND1 mitochondrial genes show that *A. maritimus* and *A. picunus* form a monophyletic lineage distinct from representatives of other South and North Island species. Parsimony analyses of the more informative 16S and ND1 genes and TCS analyses of ND1 sequences show that *A. picunus* forms a monophyletic lineage that nests within *A. maritimus*. Although this pattern is consistent with geological history, the paraphyly of *A. maritimus* suggests that the status of *A. picunus* should be reconsidered. Gene flow between Stewart Island and the mainland is much more restricted than gene flow among even more distantly separated mainland sites. Most mainland dispersal may involve movements along the shore, although there is evidence for long-distance, water- or wind-born dispersal.

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Spinnerets Morphology of Ground Spiders of Australia (Araneae, Gnaphosidae)

Study of the anterior lateral spinnerets (ALS) of ground spiders of

Gnaphosidae family in Australia and New Zealand shows a new structure located at each ALS. This structure is called a "hood" and located on the dorsal side of the tip of spinnerets. The "hood" was found only in a native Australasia genera of gnaphosids. In resting condition, when spigots retracted, "hood" covered the tip of spigots. The "hoods" are varies in shape and size on generic level of gnaphosids.

***Porterfield, Zach; Gaffin, Douglas; Porterfield, Caitlin; Johnston, Curtis**

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Screening for Scorpions: A Non-Invasive Approach to Tracking the Movements of Arachnids in Sand

Piezoelectric materials are highly sensitive devices that transduce mechanical energy into electric voltage. They find application as sensors in a wide variety of commercial and research fields, including geophysics, in which piezoelectric materials are used to measure the transmittance of a wave front through a substrate and to locate the epicenter of an earthquake. We will use an array of piezoelectric transducers on a much smaller scale to triangulate the position of a scorpion in sand as it leaves its burrow. This approach will rely on our ability to resolve the surface waves created by a scorpion's footsteps and identify them against a background of other waves. We hope to use this system in behavioral studies of scorpion navigation. This passive form of measurement should eliminate environmental factors associated with other monitoring systems, such as camera lights, that could change the scorpion's behavior. Our work to date has yet to yield a fully functional tracking system, but we have identified the major obstacles that, when resolved, should yield a sensitive, accurate, and dependable technique. We will report on our progress in improving sensitivity and reproducibility of signal measurement.

***?Shultz, Jeff**

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New Perspectives on the Skeletomuscular Anatomy of the Scorpion Prosoma

Skeletomuscular anatomy of scorpions (*Centruroides*, *Hadrurus*, *Heterometrus*) was examined by dissection and compared to that of other chelicerates. Main findings: 1) The scorpion prosoma has a simple metameric pattern of muscle attachments distorted ventrally by anterior placement of the genital opening and dorsally by posterior placement of large cheliceral and pedipalpal muscles. 2) The lateral walls of the epistome are fused to the medial walls of the pedipalpal coxae allowing the transverse epistomal muscle to function as a palpal adductor. 3) Cuticular posterior epistomal processes serve as an endoskeleton for attachment of four pairs of suspensor muscles, lateral pharyngeal dilator muscles, extrinsic cheliceral muscles, extrinsic pedipalpal muscles and the endosternite. This arrangement is most readily explained as cuticularization of the anterior horns of the primitively mesodermal endosternite, an explanation that requires a re-examination of assumptions about the evolution of endoskeletal structures in arthropods. 4) A muscular diaphragm separating the prosomal and opisthosomal compartments is a composite structure formed by posterior tergocoxal and endosternocoxal muscles of leg 4, ventral suspensor muscles of post-oral somites VI and VII, posterior oblique suspensor muscle of somite VI, and dorsal endosternal suspensor muscle of somite VII. I conclude that despite the widespread assumption that they are "primitive" arachnids, scorpions have many derived characters that are unique or shared with other arachind groups, especially Opiliones.

***Smith, Deborah; Warrit, Natapot**

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Do Social Spiders Exhibit Low Genetic Variation?

Allozyme studies indicate that cooperative, permanently social spiders exhibit unusually low genetic variation. In general, cooperative social spiders have few polymorphic allozyme loci and variation tends to be partitioned among colonies. This has been attributed to colony foundation by one or a few females or by colony fission; high levels of inbreeding within colonies; and or low movement of individuals among colonies. However, very few studies have compared genetic variation in cooperative spiders to non-social congeners.

More importantly, allozyme data may not be the best tool to address this question. Allozymes sample only a small fraction of the genome. In addition, nearly all loci sampled are part of major pathways in cellular respiration, and may be subject to different levels of selection even in related species.

AFLPs (amplified fragment length polymorphisms) sample a large number of sites scattered throughout the coding and non-coding regions of the genome. We use AFLPs to investigate genetic diversity in the genus *Stegodyphus* (Eresidae): cooperative species *S. dumicola* and *S. sarasinorum* and non-cooperative species *S. lineatus* and *S. tentoriicola*. We quantified genetic variation in each species as mean genetic distance among conspecific individuals. Our preliminary results indicate that cooperative species show less genetic variation than the non-cooperative species but the magnitude of the difference is not as large as the allozyme data would suggest.

***Snavely, Samantha**

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Spatial Distribution of a Guild of Riparian Wolf Spiders in South Texas

The spatial distribution of several species of wolf spider (*Pardosa mercurialis*, *P. delicatula*, *P. milvina*, *P. steva*, *P. vadosa* and one *Pirata* species) along the South Llano River in Kimble County, TX was examined. I looked at the influence of proximity to water (soil moisture) and the presence of other wolf spider species on the distribution of spiders within the rock and cobble habitat. Five transects of 4 quadrats each were established along a 20 meter stretch of the river in June 2003. Each quadrat was one meter square, and 3 meters away from the next closest quadrat. All spiders found in each quadrat were collected, and a soil sample taken to assess moisture content. *Pardosa mercurialis* was most abundant in the quadrats followed by *P. delicatula*, *P. milvina*, *P. steva.* A species of *Pirata* was present but rare and *Pardosa vadosa* was collected from the area but not within the transects. All species were more abundant closer to the river. To examine this further, soil moisture preferences of *P. mercurialis* males and females and *P. vadosa* males were examined in the laboratory. All spiders tested showed a preference for damp (10% moisture) soil over dry (1% moisture) soil after a 24 hour period.

***Gail E. Stratton**

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Evolution of Ornamentation and Courtship Behavior in *Schizocosa* Wolf Spiders: Insights from a Phylogenetic Study Based on Morphology

Males of several of the North American species in the genus *Schizocosa* have sexual ornamentation in the form of pigmentation on all or part of the first pair of legs and/or dark bristles located on the tibia of legs I. By mapping the characters of pigmentation, bristles and central movements of courtship behaviors onto a phylogeny generated by morphological characters, preliminary inferences are suggested about numbers of independent origins of these characters and their correlation. The phylogeny is based on 50 characters scored for 31 taxa. Courtship behavior was studied in 21 of the taxa by pairing males and females in courtship arenas that allowed for audio and visual recording. By mapping pigmentation, bristles and main courtship movements onto the preferred phylogeny (characters not used in making the phylogeny) I suggest that the tibial bristles evolved 5 or 6 times in the *Schizocosa* and were secondarily lost in *S. rovneri*, *S. uetzi* and *S. floridana*. Palpal drumming as a major component in courtship behavior is seen in 6 species, none of which have tibial bristles. Conspicuous visual signals (arching, waving or tapping first legs) are seen in 8 taxa. Of these, 6 have tibial bristles suggesting a strong correlation between visual signals and the bristles. However, courtship behavior is not yet known for 4 of the species with bristles, so strong conclusions on the correlation are not possible. This study suggests that for several species, courtship behavior evolved by loss of complex movements of the first pair of legs.

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Univ. of Wyoming, Department of Molecular Biology, Laramie, WY, USA

Genetic Analysis of Major Ampullate Silk Gene from Non-Orb Weaving Spider *Agelenopsis aperta*

Compared to other arthropods, spiders are unique in their use of silk throughout their life span and the extraordinary mechanical properties of the silk threads they produce. Studies on orb-weaving spider silk proteins have shown that their silk proteins are composed of highly repetitive regions, characterized by alanine and glycine-rich units. We have isolated and sequenced a partial cDNA clone representing major ampullate spider silk gene transcript from the non-orb weaving spider *Agelenopsis aperta*. Its cDNA sequence was compared to the previously published orb-weaver silk gene sequences. The results indicate that repeats encoding conserved amino acid motifs like polyGA that is characteristic of some orb-weaving spider silks are also found in the *A. aperta* major ampullate silk. However, we found other unusual motifs such as polyGS and polyGY in the cDNA sequence from this non-orb weaving spider. The amino acid composition of the silk gland extracts shows that alanine and glycine are the major components of the silk of *A. aperta* as is the case in orb-weaver silks. Sequence alignment shows that *A. aperta*'s cDNA displays a C-terminal encoding region that is about 44% similar to the one present in *N. clavipes*'s MaSp1. In addition, as previously observed for spider silk sequences, the analysis of the codon usage for *A. aperta*'s cDNA demonstrates a bias for A or T in the wobble base position.

***Vetter, Richard; Edwards, G. B.; James, Louis**
(RV) University of California at Riverside, Department of Entomology, Riverside, CA, USA; (GBE, LJ) Florida State Collection of Arthropods, FDACS/DPI, Gainesville, FL, USA

Reports of Envenomation by Brown Recluse Spiders Outnumber Verifications of *Loxosceles* Spiders in Florida

Bites attributed to the brown recluse spider, *Loxosceles reclusa*, are frequently reported by medical personnel throughout Florida whereas the extensive arachnological evidence contradicts the alleged widespread occurrence of *Loxosceles* spiders in the state. We compared reports of brown recluse spider bites made by medical personnel from a 6-year Florida poison control center database to the known verifications of *Loxosceles* spiders from 100 years of Florida arachnological data. Medical personnel diagnosed 124 brown recluse spider bites from 31 of Florida's 67 counties in 6 years. In contrast, only 11 finds of approximately 70 *Loxosceles* spiders have been made in 10 Florida counties in 100 years. Florida does not have sufficient widespread populations of *Loxosceles* spiders to warrant consideration of brown recluse spider envenomation as a probable etiology of dermonecrosis. Florida health care would improve if medical personnel would consider the multitude of other etiologies that manifest in dermonecrosis. At the time of abstract submission, this article was in press and will be published in the Journal of Medical Entomology in 2004.

***Wrinn, Kerri; Uetz, George**
University of Cincinnati, Department of Biology, Cincinnati, OH, USA

The Effects of Leg Loss and Regeneration on Prey Capture in Wolf Spiders

Spiders frequently utilize autotomy (self-amputation) of appendages to avoid predation. Many species that autotomize appendages are also able to regenerate them, but this may be at potential costs to fitness. In order for regeneration to be advantageous, the benefits of this process should outweigh the costs. To address this, we examined the costs and benefits of leg loss and regeneration in the wolf spider *Schizocosa ocreata*. Leg loss was found to be common in field populations (14-19%). Frequency of leg loss was not affected by year or by side (right vs. left), but was significantly different by position, with the first and fourth legs being lost most often. Additionally, body condition of field caught spiders missing or regenerating legs was significantly lower than intact spiders. A group of lab-reared spiders were induced to autotomize a randomly selected foreleg. For these spiders, initial regeneration increased molt interval significantly, but had no effect on the spider's weight gain. Taken together, these results suggest that leg loss can be developmentally costly. Further studies will address the effects of autotomy and regeneration on prey capture rate and efficiency in order to determine additional costs and possible benefits of regrowing a leg.

***? Yamashita, Tsunemi**
Arkansas Tech Univ., Dept. of Biological Sciences, Russellville, AR, USA

Surface Activity, Biomass, and Phenology of the Striped Scorpion, *Centruroides vittatus* in Arkansas

A population of the striped scorpion, *Centruroides vittatus*, was monitored for two years at an upland site in Pope County, Arkansas. This surveillance was conducted to better understand the scorpion's surface activity, feeding rates, cannibalism, and biomass. The survey results indicate that scorpions are active at this site from April to November, with male and female density generally equivalent during the surveyed months. The calculated feeding rate was 0.0-11.5% per survey night and the cannibalism rate (% of diet) was 9.5%. For 2000-2001, the calculated density/100m^2 was 2.92 and the population biomass was 0.133 kg/ha. In 2003, the calculated density/100m^2 was 2.41 and the population biomass was 0.111 kg/ha. In 2001 a Peterson mark/recapture estimate for adults was 140 individuals in the study site (CI = 85-276). A 2003 Jolly-Seber mark/recapture estimate for adults was 110 (CI=15-434). Females with young were observed in June, July, and August. Lastly, no matings were observed during the survey period.

Poster Presentation Abstracts

* Denotes presenter ? Denotes Scorpion Symposium Poster

***Beamer, David A.; Bond, Jason E.**
East Carolina University, Department of Biology, Greenville, NC, USA

Predicting the Occurrence of *Apomastus* Species across the Los Angeles Basin Using Geospatial Analyses

Information regarding species distributions can have important implications for conservation, investigating historical demographic factors, or developing sampling strategies for systematic studies. Geographic information system (GIS) software provides a powerful analytical tool that can be used to predict and document species distributions. The mygalomorph genus *Apomastus* is distributed throughout the Los Angeles Basin and is primarily associated with oak woodlands. In order to better assess the fine-scale distribution of this genus, we developed a binary multiple logistic regression model (using *Apomastus* presence/absence information as the response variable) to predict the probability that *Apomastus* would occur at a given site. The following environmental variables were entered into the initial model to investigate their explanatory importance: land cover, gap vegetation, recent vegetation, elevation, slope, aspect, precipitation, and soil type. Only slope, elevation, and precipitation significantly ($P < 0.05$) contributed to the model. Our model suggests that additional populations of *Apomastus* remain to be discovered and that other populations have probably become extinct due to human-induced habitat modification. These data, when combined with phylogeographic information, provide insight into factors that have influenced the distribution of *Apomastus* populations and species.

***Bond, Jason E.**
East Carolina University, Department of Biology, Greenville, NC, USA

The Californian Euctenizine Genus *Apomastus*: Species "Paraphyly", Biogeography, and Conservation

The genus *Apomastus* is a relatively small group of mygalomorph spiders with a limited geographic distribution. Restricted to the Los Angeles Basin, San Juan Mountains, and San Joaquin Hills, *Apomastus* occupies a fragile habitat rapidly succumbing to urban encroachment. Although originally described as monotypic, the genus was hypothesized to contain at least one additional species. However, females of the two reputed species are morphologically indistinguishable and the authors were unable to confidently assign specific status to populations for which they lacked male specimens. Using an approach that combines geographic, morphological and molecular data, all known populations are assigned to one of two hypothesized species. Mitochondrial DNA Cytochrome c Oxidase I sequences are used to infer population phylogeny, providing the evolutionary framework necessary to resolve population/species identity issues. Conflicts across analyses raise questions about species delineation,

species paraphyly, and the application of molecular taxonomy to these taxa. Issues relevant to the conservation of *Apomastus* species are discussed in light of the substantive intraspecific species divergence observed in the mtDNA data.

***Carrel, James E.**
Univ. of Missouri, Division of Biological Sciences, Columbia, MO, USA

Responses of Burrowing Wolf Spiders in Florida Scrub to Wildfires: A Long-Term Study

Florida scrub, a relictual habitat restricted to ancient sand dunes, is replete with endemic plants and vertebrates that require periodic fires for their persistence. I hypothesized that subterranean spider species found primarily in sandy gaps in the scrub matrix also might benefit from wildfires. To evaluate this idea, since 1987 I have monitored the densities of two burrowing wolf spiders (*Geolycosa xera archboldi* and *G. hubbelli*), both endemic to the Lake Wales Ridge in central Florida. I performed spider censuses annually in February on fifteen 100-m^2 quadrats located in oak scrub at the Archbold Biological Station. All sites were burned in May 1989 and again in February 2001 by wildfires during my 17-year study. Most *Geolycosa* survived a burn because they were deep in the soil. I found a significant increase in density of burrowing wolf spiders within 1 year of each burn, relative to pre-burn values, then spider densities declined rapidly as gaps of open sand disappeared due to sprouting of woody shrubs from underground stems and accumulation of leaf litter. Additional measurements using bowl traps and aerial interception traps indicated that insect prey was less diverse and less abundant in burned scrub for 4-8 months after the fire event, relative to unburned control sites. Hence, increases in *Geolycosa* densities after a fire appear to be driven primarily by habitat modification (gap creation) rather than an increase in prey.

***Edwards, G.B.**
Florida State Coll. of Arthropods, FDACS/DPI, Gainesville, FL, USA

Eye Characters Support Sister Group Placement of Salticidae with Thomisidae

Old World Thomisidae of the genus *Amyciaea* are atypical in body shape and leg proportion for crab spiders, instead having characters of the type that resemble jumping spiders. The eye arrangement of this genus is also very nearly like that of Salticidae, with the PME advanced forward and moved laterally. Examination of the eyes of typical thomisids reveals that these also have eyes in three rows, rather than two rows as has been assumed. This realization has been obscured by the presence of large rings of pigment surrounding the small eye lenses of thomisids. Salticids also have their eyes surrounded by large rings of pigment. One hypothesis for the presence of heavy pigment rings would be to shield the retinae from light penetrating through the cuticle in diurnal hunters.

***?Fet, Victor; Soleglad, Michael E.; Gantenbein, Benjamin; Fet, Elizabeth V.**
(VF, EVF) Marshall University, Department of Biological Sciences, Huntington, WV, USA; (MES) Borrego Springs, CA, USA; (BG) University of Cambridge, Department of Genetics, Cambridge, United Kingdom

Systematics and Molecular Phylogeny of *Euscorpius* from the Julian Alps of Slovenia (Scorpiones: Euscorpiidae)

The scorpion genus *Euscorpius* is common in Europe, including high mountains (up to 2,400 m). An mtDNA study by Gantenbein et al. (2000) defined the Alpine refugial relict species *E. germanus* (C. L. Koch) from Italy, Switzerland, Austria, and Slovenia. Fet et al. (2001) reviewed fauna of scorpions from Slovenia, including the most southeastern populations of *E. germanus* in the Julian Alps. New data from both morphology and mtDNA confirm the separate position of Slovenian populations (known as subspecies *E. g. marcuzzii* Valle et al., 1971). Especially important is (an unprecedented for the genus) reduction in trichobothrial number from 4 to 3 in the external suprabasal (eba) series on pedipalp patella, which can be interpreted as a reversal to an ancestral character state. Taxonomy, morphology, and biogeography of Slovenian populations are discussed as compared to *E. germanus* from Italy, Switzerland, and Austria, and other related taxa. We thank Prof. Boris Sket (University of Ljubljana, Slovenia) and Matjaz Kuntner (Smithsonian Institution) for their enormous help in loaning scorpion collections.

***?Fet, Victor; Soleglad, Michael E.; Neff, David P. A.; Stathi, Iasmi**
(VF) Marshall University, Department of Biological Sciences, Huntington, WV, USA; (MES) Borrego Springs, CA, USA; (DPAN) Marshall University, Department of Chemistry, Huntington, WV, USA; (IS) University of Crete, Natural History Museum of Crete, Irakleio, Crete, Greece

Tarsal Spinule Clusters and Evolution of the Superfamily Iuroidea (Scorpiones)

Five scorpion genera of superfamily Iuroidea exhibit ancient disjunct ranges (South America, North America, Mediterranean), and are an important object in the study of scorpion phylogeny. They have an exceptional variety of tarsal leg setation/spination (Soleglad & Fet 2003). New SEM data from all five genera and two families: Caraboctonidae (*Caraboctonus*, *Hadruroides*, *Hadrurus*) and Iuridae (*Iurus*, *Calchas*) are characterized in detail. We demonstrate two major patterns: (1) an irregular median row of grouped spinule clusters, found in juvenile to subadult but reduced in adult (*Calchas*); or (2) a median row of highly concentrated spinule clusters. Pattern (2) is either forming "spinule tufts" (*Caraboctonus*, *Hadruroides*, *Iurus*), or individual "spinule-looking" protuberances (*Hadrurus*). We suggest that the latter are a derived feature as a result of fusion of separate spinules into a solid structure.

***Guiher, Tim; Marshall, Samuel D.**
(TG) Hiram College, Department of Biology, J. H. Barrow Field Station, Hiram, OH, USA; Hiram College, Environmental Studies Program, J. H. Barrow Field Station, Hiram, OH, USA

Tarantula Sericophily

We studied the effect of prior residency cues on retreat-site selection in an arboreal tarantula, *Avicularia avicularia* (Araneae, Theraphosidae, Aviculariinae). We presented *Avicularia* with a choice of an artificial retreat that it been confined to for one week and an artificial retreat that had never been used. We also presented *Avicularia* with the choice of a different individual's artificial retreat and an artificial retreat that had never been used. We constructed artificial `trees' that consisted of a 1.27 cm diameter 77.0 cm tall PVC tubing trunk with two 3.81 cm diameter, 13.5 cm long PVC tubing retreats oriented vertically on each side of the top of the vertical support. The test trees were anchored in water-filled trashcans enclosed in a mosquito netting tent to deter the spiders from leaving the test apparatus. Each of 50 test *Avicularia* were confined to each retreat tube for five days by fiberglass mesh secured with rubber bands. After the five-day period the *Avicularia* were removed from the tube and the used tube was placed at the top of the apparatus along with a new tube. The *Avicularia* were placed into open cups at water level at the base of the trunk. The following morning the retreat selected by the *Avicularia* was noted. Based on a prior study we expect to find that the *Avicularia* will show a preference for their own retreats, but not for a strange retreat. The results will be presented at the meeting.

***Hataway, Drew; Jenkins, Ron L.; Howell, W. Mike; Ramsey, Kristen**
Samford University, Department of Biology, Birmingham, AL, USA

Correlation of Population Density of *Arctosa sanctaerosae* to Human Impact on Native Beaches along the Northern Rim of the Gulf of Mexico

Arctosa sanctaerosae is a wolf spider, existing only on the white beaches of the northern Gulf of Mexico. *A. sancterosae* was first described by Gertsch and Wallace in 1935 on Santa Rosa Island, FL. Dondale and Redner (1983) described its range eastward from the Mississippi through the panhandle of Florida. McNatt, et al (2000) described the specific habitat preference of this spider to native secondary dunes. They suspected populations of *A. sanctaerosae* to be very sensitive to commercial encroachment. According to the Alabama Beach Management Plan, natural beaches on the northern rim of the Gulf of Mexico have been cut by one third between 1970 and 1997 by commercial development. The objective of the present study was to

assess the current ecological status of *A. sanctaerosae* populations in the spider's range and to evaluate the impact of commercial expansion on healthy populations of the spider. *A. sanctaerosae* were counted inside 40-foot square quadrants in 21 locations from the western border of Mississippi to St. George Island, FL. The 21 sites were categorized as a (1) native beach, (2) partial commercial development, or (3) extensive commercial development. All counts were made on secondary dunes during clear warm summer nights due to the spider's specific nocturnal preferences. Mean population densities of *A. sanctaerosae* on native beaches were significantly greater ($p<0.002$) than on beaches with extensive commercial development. There was also a significant difference ($p<0.01$) between population densities on the native beaches and those only moderately impacted beaches.

***Henderson, Takesha; Dean, Allen; Harris, Marvin; Calixto, Alejandro**
Texas A&M Univ., Department of Entomology, College Station, TX, USA

Preliminary Study of Spiders of Lick Creek Park in Texas

Lick Creek Park is a local nature park acquired in 1987 by the city of College Station, Texas. It is comprised of 515 acres. The site has a variety of plant and animal species indigenous to the area with several miles of trails. 965 species of spiders are recorded from Texas with 213 in Brazos Co. Reviewing previously collected material and small collections this spring, 70 species are presently known from Lick Creek Park with 25 new records for Brazos Co. and one new species to Texas. The spider collection was made using pitfalls and tree band traps distributed evenly throughout different habitats such as tall grass, short grass, sandy, and sandy with water area. Results illustrate generalized populations of different spider families and species found in pitfalls and tree band traps. Little was known about the spiders in Lick Creek Park before this study. Many additional species can be expected to be found in this habitat with additional collecting. This area merits its attention for conservation for the enjoyment and education of future generations. Annually Bioblitz takes place on this important area, attracting many hundreds of people that join biologists to learn and share experiences about the fauna and flora of this particular ecosystem. There is a long-term commitment to inventory the natural park to monitor the changes as our urban community expands to surround the park.

***Huber, Ryan; Stratton, Gail**
University of Mississippi, Department of Biology, University, MS, USA

Comparison of Palps in *Geolycosa* Wolf Spiders; Development of Affordable Methods for Observing Three Dimensional Structures

Meaningful comparison of complex structures such as male spider palps is hindered when dissecting scopes can only display one portion of the structure sharply in focus due to limited depth of field. Although commercial hardware and software have been developed to generate a fully focused image from multiple images with different depths of view (Syncroscopy, 2004), it remains impractical for many researchers due to high cost. Generating a fully focused image of a structure can be accomplished, however, using relatively inexpensive and commercially available Adobe Photoshop software with no additional hardware. This technique makes it possible to measure structures with greater precision and to more accurately describe morphological relationships between multiple structures. Although similar techniques have been used and described elsewhere (Colloff, 1997), this appears to be the first application of this technique to spiders. Another inexpensive and fairly simple technique yet to be utilized for spider imaging is the creation of Quicktime Virtual Reality (QTVR) Object movies using digital images and free software. QTVR Object movies allow the researcher to scale and rotate the specimen on the screen by clicking and dragging.

***Jakob, Elizabeth M.; Gazmuri, Cristian; Whalen, Michael; Skow, Christa D.**
Univ. of Massachusetts, Department of Psychology, Amherst, MA, USA

The Responses of Jumping Spiders to Simplified Visual Stimuli

In spite of their renowned visual capabilities, including their apparent ability to perceive details in images, salticids also respond to very simplified visual stimuli. We presented jumping spiders (*Phidippus princeps*) with video images generated with Flash animation software. We presented a variety of simple shapes, including a square, a circle, a horizontal rectangle ("worm"), and a vertical rectangle ("antiworm"), both smoothly moving and pausing. We found significant differences in the amount of time spiders attended to the screen, with "worm" shapes receiving the most attention. Our results are quite similar to those found in a diversity of taxa with very different visual systems, including toads and praying mantids.

***McKee, Ryan; Gaffin, Douglas**
University of Oklahoma, Department of Zoology, Norman, OK, USA

Non-Visual Orientation of Sand Scorpions

Desert grassland scorpions, *Paruroctonus utahensis* (Scorpiones: Vaejovidae), are nocturnal arthropods that live underground and leave their burrows mostly during periods surrounding the new moon. Although scorpions have sensitive eyes, vision is not the primary sense used in prey detection. Instead, on their legs and pedipalps, scorpions have mechanoreceptors that detect mechanical disturbances in the sand and air. Because scorpions can detect vibrations and airflow pattern disturbances caused by moving prey, they may also be able to detect vibrations and airflow disturbances created by their own movements. We are conducting experiments to determine if scorpions orient in the dark via non-visual sensory systems and to determine the responsible sensory organs. We will release scorpions onto a Y-shaped Plexiglas arena with walls 10 cm tall. The arena will be filled to the top with sand to create a wall-less sand platform that will prevent the scorpions from detecting and orienting toward the walls of the arena. Removable gates will slide vertically on the two arms of the arena to create solid objects protruding from the sand. Trials will be conducted in total darkness to eliminate the use of vision. Scorpions will be tested to determine if they demonstrate a preference for the solid objects. Preliminary research has indicated that scorpions prefer to orient toward the gated arm of the arena when given the choice between a gated arm and an open arm.

***Nicholas, Amy; Reed, David; Stratton, Gail**
University of Mississippi, Department of Biology, University, MS, USA

Use of Burrows and Turrets by Females of *Rabidosa punctulata*

Among wolf spiders, burrow construction and use is best known in the obligate burrowers, the *Geolycosa*. However, a growing number of species from several genera have now been documented to use burrows. We document for the first time the construction and use of burrows and turrets by *Rabidosa punctulata*. In the southeast U.S.A., *R. punctulata* mature and mate in the fall, and females over winter and construct egg sacs in the spring. As part of a large population study, 36 females of *R. punctulata* were brought into the lab prior to egg sac construction, were placed in containers and monitored for egg sac and burrow construction. Containers were 14 cm wide X 21 cm tall and were provided with an average of 6.7 cm of top soil and 8 cm of dried grass. Of the 36 females, 30 constructed burrows and 34 constructed turrets made of silk and grass prior to making their egg sacs. The average burrow depth was 4.0 cm and burrow width was 2.2. Silken turrets were conspicuous, heavily silked and varied from 0 to 12 cm (average height was 4.7mm). In the field, we have noted that at the time when females are laying egg sacs, they become difficult to find and we have not yet seen burrows in the field. This study may provide insight into the evolution of burrow construction and use in the Lycosidae.

***Richards, Lindsay M.; Shillington, Cara**
Eastern Michigan University, Department of Biology, Ypsilanti, MI, USA

Effects of Prey Consumption on the Metabolic Rates of Tarantulas (*Avicularia avicularia*)

Tarantulas are sedentary spiders that live for many years within the same burrow or retreat. They are typically sit-and-wait predators that do not move far from their retreats in search of food. As a result, during their lifetime they will likely face periods of unpredictable food supply. Because the amount of energy available to animals depends on the amount of food available to them, limited food acquisition may reduce the energy available for growth, maintenance and reproduction. In this study we

compared the influence of recent feeding history on metabolic rates of young tarantulas (*Avicularia avicularia*). Spiderlings were maintained in the laboratory on three different feeding regimes: 1) three times a week, 2) once every two weeks, or 3) once every four weeks. We measured mass and metabolic rates at the beginning and end of the study. We found significant differences in metabolic rates (MR) and weight gain among the groups. The group at the lowest feeding level was the only group to show a reduction in MRs and this group also had the least weight gain. Differences between the groups fed three times a week and every two weeks were less distinct. We propose that these long-lived spiders are well adapted to food shortages and may show minimal physiological changes over short time periods.

***Richman, David; Brantley, Sandra**
(DR) New Mexico State University, Department of Entomology, Plant Pathology and Weed Science, Las Cruces, NM, USA; (SB) University of New Mexico, Museum of Southwestern Biology, Albuquerque, NM, USA

Spiders (Araneae) of the Jornada, Doña Ana County, New Mexico

The Jornada Experimental Range (USDA) and the nearby New Mexico State University Chihuahuan Desert Rangeland Research Center including the Jornada Long Term Ecological Research site (LTER) in Doña Ana County, New Mexico, comprise an area larger than many U.S. counties (a total of nearly 104,000 ha). Spiders have been collected from the area for nearly 30 years and we now have a reasonably accurate picture of at least the major elements of the spider fauna of the southern Jornada. The area contains Chihuahuan Desert grasslands, mesquite dunes, creosote desert, tarbush desert, bajadas (slopes), and playa lakes. More than 20 families and about 100 species are now known from the two research stations and the immediate vicinity south to U.S 70. Highlights include at least three undescribed species and large range extensions for *Ebo macyi* and *Habronattus icenogli*, among others. Abundant and widespread species included *Micaria nye, M. gosuita, Oxyopes tridens, O. apollo* (associated more with grassland), *Euryopis mulaiki, Misumenops coloradensis* and *Dictyna personata*. Unusual and localized spiders included *Zorocrates karli, Neoanagraphis chamberlini* and *Diguetia signata*. *Phidippus vexans* Edwards was just described (Edwards 2004) from the vicinity of the LTER and we expect that more undescribed species are yet be found.

***?Santiago-Blay, Jorge A.; Fet, Victor; Soleglad, Michael E.; Anderson, Scott R.**
(JAS) National Museum of Natural History, Smithsonian Institution, Department of Paleobiology and Department of Entomology, Washington, DC, USA; (VF) Marshall University, Department of Biological Sciences, Huntington, WV, USA; (MES) Borrego Springs, CA, USA; (SRA) Tetra Tech NUS, Inc., Pittsburgh, PA, USA

A New Genus and Subfamily of Scorpions from Cretaceous Burmese Amber (Scorpiones: Chaerilidae)

A new species, genus, and subfamily of scorpions are described from Lower Cretaceous Burmese amber (Burmite) (Upper Albian; approximate age 98.9–112.2 Ma) from Burma (Myanmar). The observable trichobothrial pattern of the pedipalp chela and other morphological details allow for the definitive family placement of this fossil in the Chaerilidae, so far represented by its sole extant genus, *Chaerilus*. This fossil is the most ancient known record for any of the four extant scorpion lineages ("trichobothrial Type B", or parvorder Chaerilida; Soleglad & Fet 2003), and the first Mesozoic record of an extant scorpion family. This paper is currently in press in Revista Ibérica de Aracnología.

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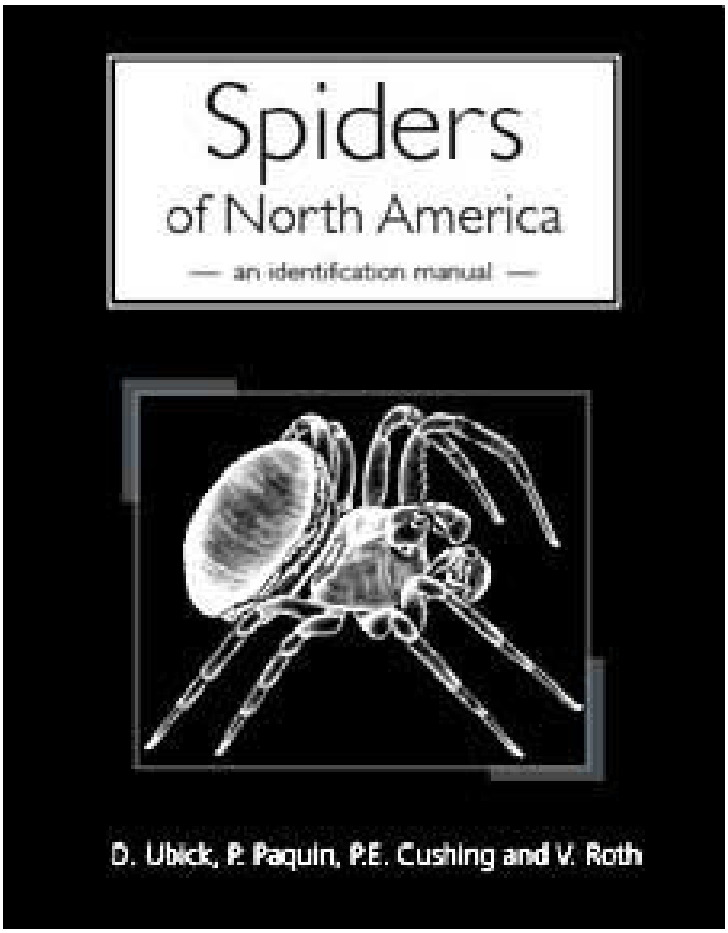
Spiders of North America An Identification Manual

Edited by Darrell Ubick, Pierre Paquin, Paula E. Cushing, & Vince Roth.
Original drawings by Nadine Dupérré



Important Notice

Revised Publication Date: July 2005
Extension of pre-publication pricing:
special pricing now available through June 2005

The team working on *Spiders of North America: An identification manual* has been confronted with unexpected delays as we enter the final phase of the project, delays linked closely to our insistence that the final product be of the highest quality. There are over 40 arachnologists working on this project, requiring an impressive degree of coordination in the preparation of taxonomic keys and original illustrations, and requiring careful proofreading by specialists in each family. We sincerely apologize that these delays have caused a several-month shift of publication date, we hope you will remain patient, and we assure you the end product will be well worth the wait. For additional information about the delay, contact Chris Buddle (c_buddle@yahoo.ca).

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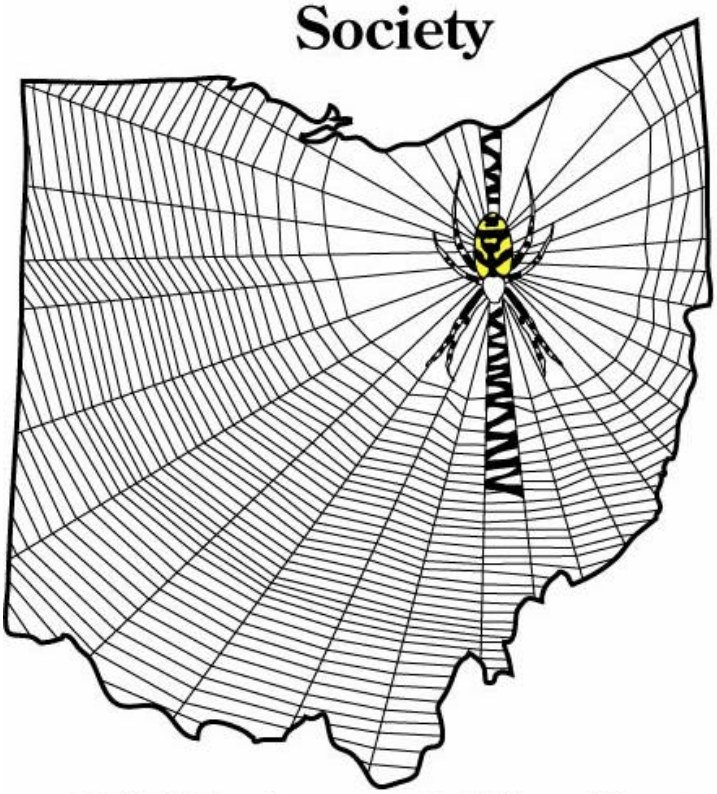

2005 Annual Meeting
The University of Akron

Sunday, June 26 - Thursday, June 30

Deadline for Registration & Submission of materials is 20 May 2005

Hosted by Todd Blackledge, Maggie Hodge **&** Sam Marshall

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On campus housing will be in the brand new Honors Complex Residence Hall. Each reasonably priced room ($35/night single, $25/night double) has its own bathroom. Every floor has a social lounge and two study lounges, and the residence hall has a computer room, laundry and kitchen facilities. Information on area hotels will be forthcoming on the meeting website.

You can fly into the area via two airports. The Akron Canton Airport is most convenient, about a 20-30 minute drive from campus. The Cleveland Hopkins airport is another alternative, and is about a 45 minute drive from campus.

Meeting Highlights:

This year's symposium is "Spider silk: form and function across biological levels". It will integrate research on the function and evolution of spider silk from diverse perspectives including biomechanics, chemical and molecular structure, ecological function, genetic expression, and production of silk. There will be a box to check when you submit your abstract to indicate whether you are interested in participating.

There will be a choice of two field trips on Thursday, June 30. We will organize a collecting trip to the Bath Nature Preserve and Field Station. This 404 acre tract was once the country estate of tire magnate Raymond Firestone, and is managed through a partnership between The University of Akron and Bath Township. There will be collecting opportunities in habitats encompassing the range of types found in northeast Ohio.

An alternative "field" trip will venture to Cleveland's Rock and Roll Hall of Fame. It takes at least half a day to tour the museum, and there is a restaurant and excellent music store within. We can organize opportunities for dinner in "The Flats", a string of restaurants and brew pubs along the infamous Cuyahoga River, for those interested.

Preliminary Schedule:

Sunday, June 26	Check-in & reception
Monday, June 27	Silk symposium & Paper sessions
Tuesday, June 28	Paper sessions; Poster session
	Informal evening
Wednesday, June 29	Paper sessions
	Business Meeting; Banquet & Student Awards, Auction
Thursday, June 30	Field Trips

Local Host Contact Information:

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American Arachnology

The Newsletter of the American Arachnological Society

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American Arachnological Society

2005 Annual Meeting
The University of Akron

AMERICAN ARACHNOLOGICAL SOCIETY WEBSITE

HTTP://WWW.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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A request from David Penny:

Request for information

I am in the process of compiling a systematic/taxonomic catalogue of fossil spiders to complement those that exist for the living fauna. This will not only include taxonomic citations, but also any mention of a fossil spider species in the literature and it will be possible to differentiate between such citations. It is often the case that bibliographic databases do not pick up on brief mentions of taxa in larger papers. I would therefore be very grateful if those of you reading this who are aware of having cited a fossil species in any of your recent works, such as revisions of extant taxa, could inform me of the reference of the work, and even better, send me a reprint if available. All assistance will be acknowledged and much appreciated. Many thanks! David Penney, Earth Sciences, The University of Manchester, Oxford Road, Manchester, M13 9PL, United Kingdom.

E-mail: DAVID.PENNEY@MAN.AC.UK