



MEETING ABSTRACTS

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A, B and C

Karyotype and sex determination for the yellow sac spider, *Cheiracanthium mildei*.

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Abstract: Only a small fraction of the known spider species has been karyotyped. Karyotyping can be useful for determining phylogenetic relationships. In addition, because spiders commonly have multiple sex chromosomes, understanding their mechanisms of sex determination can help us to determine how these mechanisms can lead to different chromosome behaviors. We have determined the karyotype and sex determination mechanism for the yellow sac spider, *Cheiracanthium mildei*. *C. mildei* has a $2n=24$ karyotype, with an X_1X_2O (male), $X_1X_1X_2X_2$ (female) sex determining system. The X_1 and X_2 chromosomes migrate together in male meiosis, but form no chiasma and are separable using a micromanipulation needle. These results add to the known karyotype knowledge for spiders. These data form the basis for studying chromosome behavior in X_1X_2O (male), $X_1X_1X_2X_2$ (female) sex determination systems, which are most commonly observed in spiders. posted 5-13-2010

Molecular architecture of functionally distinct spider silks revealed by complete gene sequences in the Western black widow, *Latrodectus hesperus* (Araneae, Theridiidae).

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Abstract: Orb-weaving spiders and their relatives (Orbiculariae) spin up to eight task-specific silk fibers each originating from specialized abdominal glands. These ecologically essential, high performance fibers are composed primarily of one or more unique proteins termed spidroins. For instance, the infamously strong dragline silk synthesized in the major ampullate glands is composed of two proteins, MaSp1 and MaSp2. The toughest known spider silk fiber, which is used in prey wrapping, consists mainly of AcSp1 produced in the aciniform glands. All described spidroins display highly repetitious amino acid sequences throughout the bulk of the protein. Furthermore, the repetitive region is flanked by short conserved sequences indicating that all spidroins belong to a single gene family. Here we describe complete gene sequences encoding black widow (*Latrodectus hesperus*) MaSp1, MaSp2, AcSp1, and the minor ampullate silk protein MiSp. They display striking variability in the complexity of individual repeats and the homogeneity among repeats. Differences in repeat structure and total protein length likely contribute to the divergent mechanical properties among the fiber types. Comparisons with partial gene sequences of the brown widow (*L. geometricus*) further demonstrate the unusual molecular evolutionary dynamics of spider silk genes. posted 5-21-2010

Multigene approach to evaluating species boundaries and the evolution of male genitalia in the trapdoor spider genus *Myrmekiaphila* (Araneae: Mygalomorphae: Cyrtachenidae: Euctenizinae).

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Abstract: The euctenizine trapdoor spider genus *Myrmekiaphila* comprises 11 species and is widely distributed throughout the southeastern United States. This group is probably best known for their interesting burrow architecture – they are the only mygalomorph spiders in North America that conceal their subterranean side chambers with a secondary trapdoor. These spiders were recently revised and placed into three informal species groups based upon differences in male genitalia, but a phylogenetic analysis has never been performed to assess monophyly of these groups. We present the first phylogeny for *Myrmekiaphila* based on DNA sequence data obtained from three mitochondrial (12S, tRNA-V, 16S) and two nuclear gene loci (28S and glutamyl- and prolyl-tRNA synthetase). We used this phylogeny as the evolutionary framework to examine the monophyly of these species groups, to test hypothesized species boundaries, and to comment on the evolution of male genitalia. Our phylogeny demonstrates that species groups (and some species) are paraphyletic, and results from ancestral character state reconstruction analyses show that the distinct forms of genitalia – particularly the absence of a secondary prong – have evolved in parallel (i.e., they do not form clades). These data suggest that characters ordinarily given heavy weight for delineating taxa in *Myrmekiaphila* need to be reconsidered and interpreted in light of this new phylogenetic evidence. posted 5-26-2010

Habitat refugia grown in corn supports greater spider & generalist predatory arthropod numbers with larger corn yields.

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Abstract: Using Generalist Predatory Arthropods (GPAs) as biological control agents involves various assemblages of spiders, harvestman, beetles, hemiptera, and ants. These arthropods attack a variety of pests in different places in crop fields across the growing season. Since spiders exit fields after tilling, placing discrete habitat refugia (small straw piles) in cornfields after planting leads to increased spider and GPA numbers, decreased plant damage, and increased stalk growth. Experiments across 6 years have consistently shown greater corn yields in the presence of refugia. However, it is impractical to place these discrete refugia at the commercial scale of production. Thus, it was hypothesized that an inexpensive grain, grown in the incipient cornfield would create thatch, functioning as an overwinter and pre-planting refuge for GPAs.

This idea was tested by planting strips of hardy ryegrass after harvesting soy in half of 6 half-hectare plots at the Ecology Research Center of Miami University. The other half of each plot served as a control. The rye grew all winter and into the spring, then killed using Roundup before planting then over-sown with corn. Pitfall traps monitored epigeal arthropod active density. Corn was harvested mechanically.

More of the dominant GPAs were found in thatch areas than the control, in particular, spiders. The thatched areas had higher corn yields than control areas. An experiment to determine the best planting time, grain, and planting density found that rye planted at half density in mid-September provided the best thatch.. posted 5-31-2010

Exploring multiple sources of selection on the courtship display of a wolf spider: *Schizocosa crassipalata*.

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Abstract: Previous studies on wolf spiders in the genus *Schizocosa* have shown female mate choice to be dependant on both signaling environment and male condition. These studies also suggest that both efficacy-based and content-based selection are important in the evolution of male courtship signals. Efficacy-based selection relates to how well a signal propagates through an environment and how well it is received and processed. Where as content-based selection relates to the information content of the signal. We conducted mate choice trials to simultaneously examine both efficacy-based and content-based selection on the courtship signals of a previously unexplored species, *Schizocosa crassipalata*. Male *S. crassipalata* lack foreleg ornamentation, yet seem to utilize both a vibratory signal and a visual signal, in the form of a leg wave when courting females. Environmental conditions were manipulated using a fully crossed 2 x 2 design with a visual treatment of present (in the light) versus absent (in the dark) and a vibratory treatment of present (on filter paper) versus absent (on granite). Condition was altered by placing immature individuals on either a low diet treatment of one cricket per week or a high diet treatment of two crickets per week. The results of these mate choice trials will be discussed in the context of female mate choice and signal evolution. posted 5-10-2010

Predator coexistence: the role of chemical cues in the interactions between *Hogna helluo* and *Scarites quadriceps* and between *Hogna helluo* and *Rabidosa* spp..

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Abstract: In Ohio agricultural fields, numerous generalist arthropod predators coexist, creating the potential for interference or intraguild predation. Wolf spiders are sensitive to chemical cues (silk, feces, excreta), meaning they could potentially use these cues to mediate interactions with other predators in the same trophic level. In this study, we examined the effect of chemical cues from one predator on the activity of the predator with which it was paired, using *Hogna helluo* (Araneae: Lycosidae) and *Scarites quadriceps* (Coleoptera: Carabidae), as well as *Hogna* and *Rabidosa* spp. (Araneae: Lycosidae). We assembled an arena covered half in blank filter paper and half in filter paper that had chemical cues from the opposite predator on it. After placing one predator in the arena, we quantified predator activity, including distance traveled, time spent on each half of the arena, number of visits, speed, and proportion of time spent ambulatory, in non-forward movement, and at rest. None of the species tested preferred one side of the arena over the other, and no predators showed any significant difference in activity in response to chemical cues. These results suggest that the chemical cues of these predators do not provide information that can be used to reduce interference or intraguild predation. This may be due to size similarity between the predators or because they use spatio-temporal habitat partitioning to avoid interacting. posted 5-21-2010

Next-generation sequencing as a tool for obtaining phylogenomic data: an example using the transcriptome of *Aptostichus stephencolberti* Bond & Stockman (Araneae: Mygalomorphae: Cyrtauchenidae)

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Abstract: Recent advances in sequencing technology potentially provide access to a tremendous number of loci that can be used to assemble large data sets for phylogenetic inference. While specific regions can be targeted for amplification, one of the most promising applications of next-generation sequencing technologies, such as Roche 454 pyrosequencing, is *de novo* exploratory sequencing. Researchers can choose from thousands of unique sequences obtained via these techniques and develop novel markers (introns, coding regions, anonymous sequences, etc.) for phylogenetic studies. Additional data can be mined from Genbank for use in subsequent analyses, as a reference map for novel sequence annotation, or for orthology assessments. A single 454 pyrosequencing run was carried out on mRNA isolated from an entire adult female of *Aptostichusstephencolberti*. The resulting transcriptome sequences comprised 236,119 high quality reads with 22,386,958 bp of data. The reads were assembled into 11,514 unique contigs with coverage ranging from 2 – 2,886 and lengths from 40 – 2,262 bp. The resulting contigs were analyzed via BLAST and orthology searches. From these, 17 ribosomal proteins were identified, combined with orthologs from Genbank, and used to create a phylogenetic data matrix that was analyzed via Bayesian inference. The result is a phylogeny of the Metazoa. This work demonstrates the efficacy of next-gen sequencing technologies for systematic endeavors in spiders. posted 5-27-2010

Reproductive investment in the scorpion *Vaejovis cashi* (Scorpiones; Vaejovidae) at two elevations in southeastern Arizona: a long-term study.

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Abstract: Arachnids exhibit a number of interesting life history patterns, yet little is known about long-term variability (or stability) in these patterns, as most studies examine one or a few breeding cycles. In this talk we present data on reproductive investment (litter size, offspring size, and female size) in the small montane scorpion *Vaejovis cashi*, gathered between 1997 and 2009 from two elevations in the Chiricahua Mountains of southeastern Arizona. Females from the higher elevation site, Turkey Creek, are consistently larger than females from the lower elevation site, Cave Creek. Turkey Creek females also produce larger and heavier litters in most years, and less often produce larger offspring. Within populations, both female size and total litter mass are more strongly linked to litter size than offspring size, and there is little evidence of an offspring size-number trade-off. However, these general patterns hide some interesting year-to-year variation in investment, which we shall discuss in more detail. posted 5-21-2010

Phylogeny of eastern North American leiobunine harvestmen (Opiliones: Sclerosomatidae) and coevolution of male and female reproductive structures.

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Abstract: Species-specific variation in reproductive structures is a pervasive theme in arthropod evolution, but researchers differ on the mechanism of sexual selection that produces and maintains genitalic diversity. Here we reconstruct the phylogenetic relationships of North American leiobunine harvestmen using molecular data to determine the direction and frequency of evolutionary change in male and female genitalia to assess female choice and sexual conflict hypotheses. Our results show that the sacculate (nuptial gift-giving) condition is primitive within North American leiobunines and that it has been replaced by the lanceolate condition at least five times. Females in each lanceolate lineage have evolved different pregenital barricades. This pattern is consistent with evolution of male mating strategy from female enticement to female coercion. Thus, current evidence favors a sexual conflict explanation over female choice in shaping male and female genital structure and diversity. posted 5-26-2010

Burrowing wolf spider in Florida Scrub has a bivoltine life cycle.

Author

Institution

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Abstract: The rare burrowing wolf spider, *Geolycosa xera archboldi*, is restricted to native Scrub on the narrow Lake Wales Ridge in one county (Highlands) of south Florida. Early accounts posited that this species likely has a biennial life cycle. However, because it is endemic to a nearly tropical habitat, I suspected that its development might take considerably less a year. To determine the life cycle of *G. x. archboldi*, I performed three complimentary field studies over the course of 1.5 years. Study 1: visual surveys of 300 randomly chosen burrows every 2-3 wks, totaling 9600 burrows, revealed two peaks of spiderling dispersal from maternal burrows yearly: mid-April and early October. Study 2: trapping surveys of spiders using 36 randomly placed bowls on the ground filled with soapy water, run for five consecutive days every 2-3 weeks, for a total of 5960 trap-days, revealed two peaks of surface activity by wandering adult males: mid-March and mid-September. Studies 1 and 2 strongly indicated that this species has two generations a year: a fast one in the warm/wet season and a slow one in the cool/dry season. Study 3: Longitudinal monitoring of selected burrows from spiderling to adult stage between April 2008 & February 2009 documented maturation in ~4 mo and survivorship of adult females for an additional 5 mo, confirming the bivoltine life cycle for *G. x. archboldi*. posted 5 - 3 - 2010

Maximizing collection and minimizing risk: does vacuum suction sampling increase the likelihood for misinterpretation of food web connections?

Authors

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Abstract: In recent years, the structure and trophic connectedness of complex food webs has been widely characterized using molecular tools. However, error can be encountered when characterizing the intensity of predator-prey interactions. While mass collection devices (e.g., vacuum suction samplers) maximize collection success, they also have the potential to surface-level contaminate predators with damaged prey or facilitate direct consumption within the sampling device, leading to erroneous increases in prey DNA detection. In this study, we tested the hypothesis that such erroneous increases will not be encountered when vacuum suction sampling is employed, thereby causing false increases in the assessment of trophic interaction strength. Using general Aphidoidea primers that we designed and previously published general Collembola primers, we used PCR to compare the predation rates of *Glenognatha foxi* (Araneae: Tetragnathidae) on these soft-bodied (i.e., easily damaged) prey taxa when collected by hand versus with a vacuum sampler. In all, 8.7% of *G. foxi* specimens tested positive for aphid predation and 24.8% for Collembola predation. With both primer pairs, the vacuum sampler caused no significant increase in positive results for prey DNA over those collected by hand. Furthermore, no evidence of predation inside the vacuum sampler was found: feeding was never observed by specimens upon removal from the sampling device and the frequency of positive PCR results was not greater than hand collected specimens. Therefore, the use of a vacuum suction sampler to collect predators for molecular gut-content analysis of predator-prey interactions is clearly validated by the results of our study. posted 5 - 3 - 2010

D, E and F**Differential dispersal patterns of male cellar spiders (Araneae: Pholcidae) in response to local demography.**

Authors

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Abstract: Sexual selection that is imposed on the cellar spider, *Pholcus phalangioides*, makes it an interesting organism in which to study behavior. In the field, adult sex ratios vary widely among populations, which can affect the intensity of sexual selection. Here I report the results of a laboratory experiment that explored the effect of the sex ratio in an area on the dispersal of males in

this species. I manipulated the sex ratio by placing six uninhabited recently constructed webs in the center of a large terrarium. Webs in each treatment were constructed either by all females or all males. A male was placed in the center and allowed 24 hrs to either take over one of the available webs (remain) or occupy a separate corner area (disperse). Using a log linear analysis, we found that sex of the web builders has an effect on the location of the subject while time of exposure in the arena does not seem to affect the dispersal of these individuals. Therefore, movement of these spiders between patches is caused, at least in part, by the demography of the population, which is an indication of the level of sexual selection these individuals are under.
posted 5-21-2010

Effects of a glyphosate-based herbicide on mate location in the wolf spider *Pardosa milvina*.

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Abstract: Anthropogenic chemicals have been shown to disrupt chemical communication among many different animals, but most of such studies to date have been conducted in aquatic habitats. The wolf spider *Pardosa milvina* is a terrestrial arthropod abundant in agroecosystems of eastern North America, where glyphosate-based herbicides are regularly applied. Mating in *P. milvina* is mediated by chemical signals; females attract males with an airborne signal, and substrate-borne chemicals from females allow males to assess female quality. In a field experiment, we tested the hypothesis that exposure to a glyphosate-based herbicide (Buccaneer® Plus) affects mate location in *P. milvina*. We sequestered virgin females in small containers inside pitfall traps and quantified the number and frequency of males captured after seven hours. Our design included four treatments and a control: two treatments consisted of females' exposure to either water or herbicide via filter paper substrate while inside the vial; two other treatments consisted of placing a water- or herbicide-laden filter paper ring around the outside of the trap. Traps containing herbicide-exposed females captured fewer males than those containing water-exposed females. Traps with a ring of water-treated filter paper surrounding their opening were more likely to capture a male than traps where the ring of filter paper was treated with herbicide. These results suggest that the herbicide reduced the efficacy of female signaling and reduced the likelihood that a male would approach a female. Such findings have implications for these spiders' reproductive success, and consequently their role in the food web. posted 5-26-2010

G, H and I

Phylogenetic comparative analysis of courtship behavior in funnel-web spiders.

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Abstract: Courtship plays an important role in species recognition and the process of speciation. Sexual selection on courtship may actually cause speciation, and there are even species that appear to only differ in their sexual signals, ethospecies. *Agelenopsis* (Araneae:Agelenidae) spiders are an interesting group in which to investigate the evolution of courtship, as within this genus, groups of closely related species typically have overlapping ranges, similar habitat requirements, and similar morphology. Some species groups also show little genetic divergence. What factors have allowed speciation to occur in these groups? To address a possible answer to this question, divergence in courtship behavior, and to characterize the behavioral diversity in this genus, courtship patterns were described for 11 *Agelenopsis* species and two outgroup species and were analyzed in a historical context. Courtship behaviors were mapped onto an mtDNA-based phylogeny; it was found that closely related species groups exhibited the same behavior patterns. posted 5-14-2010

Colonization of remote islands: How predictable is it?

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Abstract: The biota of the central Pacific region has long been considered enigmatic, with biogeographic relationships elusive. Biotic similarities across far-flung islands were initially explained by former land connections, an idea not supported by geological evidence, leaving questions of affinity unexplained. The advent of molecular techniques has provided tools, but the predictability of colonization remains unclear. Two primary mechanisms have been proposed (1) rafting over water between islands and (2) aerial dispersal from a mainland source; these generate a suite of testable predictions. Using different lineages of spiders, we test the following predictions: Taxa that cross the ocean by rafting should (i) colonize remote islands sequentially by means of stepping stones; these taxa are not expected to be highly dispersive, so (ii) there will be little selection to reduce their ability to disperse upon colonization of a remote land mass, and (iii) differentiation within an archipelago will tend to occur between islands. Finally (iv) the habitat that they colonize will likely be coastal strand, with the presence of lineages at higher elevation requiring shifts in habitat. In the case of aerially dispersing taxa, the predictions are that they should (i) colonize remote islands directly from a mainland source, with (ii) selection acting to reduce their ability to disperse upon colonization of a remote land mass (an argument initially developed by Darwin). Also (iii) differentiation may occur both within and between islands of an archipelago; and (iv) the habitat that they colonize is likely to match that from whence they originated. posted 5-21-2010

Evidence for circadian rhythm and the role of serotonin in antipredator behavior in a nocturnal spider, *Larinioides cornutus* (Araneae; Araneidae).

Authors

Institution

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Abstract: Ecologically, spiders are both predators and prey. Therefore they must balance being aggressive enough to successfully forage, but not so bold that they become overly exposed to predation. Some species of spiders have clearly defined periods of the day when they actively forage, leading to the hypothesis that they should be less bold (or more fearful) during periods when the spiders are not foraging. Thus, we predict that antipredator behavior should be more pronounced during inactive foraging times. We explored the antipredator 'huddle response' in a nocturnal foraging orb-weaver *Larinioides cornutus* and found that, as predicted, the spiders huddle longer in the day than at night. We then tested to see if the cycling of the response was regulated by an internal clock (circadian), and found that huddle duration continued to cycle under DD (with a periodicity of less than 24 h), but was masked under LL. Finally, we tested the effect of experimentally elevating levels of serotonin (5-HT) on diel rhythmicity in the huddle response. Previous work found that 5-HT lengthens the duration of the response in the short term. We treated spiders housed under L/D with 5-HT, with one group dosed just prior to lights on, and another prior to lights off. We found that 5-HT elevated the huddle response in both groups for several days, but did not affect the periodicity in either.

This work adds to the surprisingly short list of studies demonstrating circadian rhythm in spiders. We have also identified circulating levels of 5-HT as a potential regulatory mechanism for the antipredator huddle response. Overall, this system provides a unique opportunity to explore connections between the neurochemistry and ecology of circadian rhythm. posted 5-26-2010

Mitochondrial DNA sequences identify geographic barriers and corroborate morphological diversity in the North American tarantula *Aphonopelma mojave* (Araneae: Mygalomorphae: Theraphosidae).

Authors

Institution

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Abstract: Previous studies on the tarantula *Aphonopelma mojave* have shown that this interesting species from the Mojave Desert comprises two morphologically distinct populations ("western" and "eastern"). We used mitochondrial DNA (*cytochrome c oxidase subunit I*) in conjunction with niche-based distribution modeling to explore species boundaries and to identify geographic features that may have promoted divergence within the species. Our distribution model predicts that *A. mojave* can be found throughout the Mojave Desert but also defines two regions with low probability of finding individuals (i.e., potential barriers to gene flow): the Death Valley drainage system and the Colorado River Valley. Phylogenetic analyses of the genetic data corroborate the morphological variation observed in these spiders (i.e., western and eastern populations are reciprocally monophyletic) and further support the hypothesis that the Death Valley drainage system and Colorado River Valley have restricted gene flow between populations (i.e., geographic barriers are concordant with genetic breaks). These data suggest that we should recognize at least one additional nominal species from this lineage. Furthermore, our results add to a growing body of literature that highlights the importance of employing multiple lines of evidence for delineating species boundaries and unveils a promising approach for resolving some of the problems that have hampered progress in tarantula taxonomy. posted 4-16-2010

Taxonomy and genitalic diversity of the *Leiobunum nigropalpi* species group (Opiliones: Sclerosomatidae).

Authors

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Abstract: The *Leiobunum nigropalpi* group is a well-defined clade endemic to eastern North America that encompasses two established and at least two undescribed species. Its members are united by distinctive morphologies of the male genitalia and palps and a female pre-genital barricade. These characters provide evidence useful in delimiting morphospecies and illustrate a case of genitalic coevolution. The development of the male clasping mechanisms and overall robustness of the penis are positively associated with each other and with aspects of the female pre-genital barricade, especially the length of a posterior process that appears to function as a lever arm used in reinforcing the closing mechanism of the pre-genital opening. posted 5-19-2010

J, K and L

Octopamine and serotonin have opposite effects on anti-predator behavior in two spider species.

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Abstract: Neurotransmitters are known to have broad hormone-like effects on aggression in arthropods. In this study we experimentally elevated levels of octopamine and serotonin in *Anelosimus studiosus* (Araneae, Theridiidae) and *Larinioides cornutus* (Araneae, Araneidae). We observed the effects on the anti-predator huddle response, activity level, and running speed. In both species we found that octopamine significantly shortened the duration of the huddle response, and its effect wore off over 24 hours. We also found that serotonin significantly lengthened the huddle response, but in this case, the effect persisted for over 24 hours. Neither octopamine nor serotonin affected the general activity or running speed of the spiders. To our knowledge, this is the first study to directly explore the role of biogenic amines on an aggression-related behavior in spiders. Given that spiders must be both aggressive toward prey, yet wary of predators, we believe that this system will be an outstanding model to explore connections between behavioral ecology and neurochemistry. posted 5-26-2010

Musings on the molecular nature of silk inside the spider: a decade of spectroscopic exploration.

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Abstract: Spiders have evolved sophisticated systems to produce and store proteins (spidroins) at high concentrations as well as to control the rapid conversion of these soluble proteins to form insoluble silk fibers that are among the toughest materials known. In 2002, it was found that spiders employ a molecular mechanism similar to that of amyloids; i.e., a structural refolding that increased the beta-sheet content of spidroin leading to fibrous aggregation. A technique vital to this discovery is circular dichroism (CD) spectroscopy. CD employs a unique differential absorption measurement that is highly sensitive to the chiral nature of protein molecules even at low concentrations and under physiological conditions. CD allows for not only the determination of the secondary structure (e.g. beta sheet), but can also be used to follow the molecule's structural response to environmental changes. Since 2002, CD has been used to investigate the molecular behavior of silk. Studies have shown that changes in both pH and the concentrations of various salts are employed by spiders to spin soluble spidroin into solid silk fibers. Furthermore, CD has allowed the comparison of silk solutions extracted from different glands of the same spider (*Nephila edulis*), correlating their structure and behavior with their mechanical properties. Lately, CD has been used to explore the evolutionary relationship of silk solutions extracted from phylogenetically-distinct spiders. These studies suggest that in order to achieve specialization in mechanical performance, the spider's silks require higher structural flexibility at the expense of reduced stability and increased conversion-energy cost. These results lead to the hypothesis that silk elastomericity evolved in tandem with specializations in the process of silk spinning. posted 5-31-2010

Can male wolf spiders assess female number, male competition, and order of silk deposition by silk cues alone?

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Abstract: Female *Pardosa milvina* wolf spiders deposit dragline silk to attract prospective mates and induce male courtship. Male *P. milvina* also produce draglines but the function of this silk remains unclear. Male draglines may mask female signals from competing males or indicate to other males that a female is already being followed by a male. Males could also benefit by determining the order of male and female silk deposition to assess whether other males are currently pursuing a female or if females were in the area last. If males can discriminate between individual spider's silk, they could also potentially evaluate local sex ratios indirectly via silk. We measured male courtship intensity and silk deposition over a 30 minute period in the presence of silk from seven different combinations of conspecific males and females that deposited silk over different time periods and in different sequences. Males tended to produce more silk on substrates that previously held females but did not vary silk deposition based upon the number of females that produced silk. Males showed significantly more courtship when encountering silk from two rather than one female and nearly ceased courtship when encountering male silk deposited over female silk. Results suggest that different types of male dragline silk have different functions. Males can discriminate between one vs two females and can perceive the order of silk deposition by males and females. Male silk may function to deter other males from

following female silk. posted 5-27-2010

Biological control of insect pests in winter wheat: potential role of spiders in reducing transmission of Barley Yellow Dwarf virus.

Authors

Institution

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Abstract: In winter wheat, aphids (Hemiptera: Aphididae) cause substantial yield loss through direct feeding but, more significantly, as vectors of Barley Yellow Dwarf virus (BYDV). They transfer the virus from infected to healthy plants as they feed, causing discoloration, stunted growth and sterility, with yield loss averaging 17% worldwide. Importantly, these aphids are preyed upon by foliage dwelling predators and, when they fall to the ground, epigeal spiders which play a major role in preventing re-colonization of the plant. In the absence of such predation, re-colonization rates are as high as 95%. Spiders are therefore important generalist predators in agroecosystems and, as part of the community of natural enemies that frequent such habitats, can help to reduce herbivorous pest populations. Thus in this system, spiders have the potential to reduce the spread of BYDV if preying selectively on infected aphids which may be more susceptible to spider predation due to changes in behavior. A study was therefore undertaken to examine the incidence of BYDV in winter wheat and aphids (*Rhopalosiphum padi*, *Sitobion avenae*) and, to identify predation rates on infected aphids by common spiders within this agroecosystem. Enzyme linked immunosorbent assay (ELISA) was used to test for the virus throughout this food web and ultimately identify potential effects of epigeal spiders on aphid population dynamics and disease transmission. The results are discussed in the context of biological control and habitat manipulation, as we seek to reduce our reliance on chemical inputs and move towards more sustainable methods of pest control. posted 5-21-2010

M, N and O**How do ant-acacia-inhabiting *Eustala* spiders (Araneidae) avoid ant aggression? The potential role of chemical crypticity.**

Authors

Institution

Kaitlin Marvin**Department of Biological Sciences****Lynchburg College****John D. Styrsky****Lynchburg, VA USA**

Abstract: Neotropical ant-acacia mutualisms involve several *Acacia* species that provide food and shelter for specific *Pseudomyrmex* ant species in return for ant protection from plant-feeding animals. We have documented a novel interaction between two closely related orb-weaving spiders (*Eustala oblonga* and *E. illicita*) and two ant-acacia systems (*A. melanocera* and *A. collinsii*, respectively) in central Panama. In these particular systems, the *Eustala* spiders spin their webs among the branches at night, but inhabit the plants' surfaces by day, somehow avoiding ant detection and attack. We hypothesized that the spiders mimic the chemical 'smell' of the ants or of the acacias, thus rendering the spiders chemically cryptic to the ants. To test this chemical crypticity hypothesis, *E. oblonga* and *E. illicita* were swapped between host and non-host acacias in an attempt to present 'chemically familiar' and 'chemically unfamiliar' spiders to patrolling acacia ants. We recorded the length of time until the swapped spiders were detected and attacked by ants on host and non-host acacias. We also categorized the behavioral response of ants (ignore, antennate, or lunge) that encountered the spiders and recorded the frequency of these behaviors over the course of the trials. Chemically unfamiliar *E. oblonga* were attacked more rapidly than chemically familiar spiders. Further, ants more frequently lunged at chemically unfamiliar *E. oblonga* than at chemically familiar spiders. In contrast, there was no difference in ant response to chemically familiar and unfamiliar *E. illicita*. These results partially support the chemical crypticity hypothesis. posted 5-21-2010

Complexity in dimorphism: The interaction of phenology and sexual selection.

Authors

Institutions

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Abstract: Many models have been proposed examining the extreme male dwarfism in the genus *Nephila*. Two of the models, scramble competition and female choice during opportunistic mating, suggest selective advantage for small males. Two other models, male-male competition and sperm competition, suggest selective advantage for large males. Over decades of research, data have been collected that support all four models. There has yet to be one comprehensive schematic that pulls together all observed phenomena, and explains how the different selective forces might interact. We are proposing a way to organize previously determined models into a single "seasonality model." By considering the changing operational sex ratios of populations as the breeding season progresses, in addition to the cycle of female receptivity, we find that the conflicts suggested by previous work are only apparent and not real: different selective pressures are important at different points in time. We suggest that when the full scale of a breeding season is taken into account, selective pressures favoring large males are predominant only for a very short amount of time. Afterwards, selective forces favoring small male dominate. We end with consideration of the role the shifting selective pressures may play in the evolution of sexual size dimorphism in populations experiencing shorter or longer breeding seasons. posted 5-12-2010

Fine structural aspects on the cribellate silk production in the spider *Nurscia albofasciata* (Araneae: Titanoecidae).

Author

Institution

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Abstract: It has been known that the cribellar silk is considered as a quite different sort of catching silk with dry-adhesive properties. Here, we describe the functional significance of the cribellar silk spigots for capture thread production and its peculiar sieve-like structure in the titanoeid spider *Nurscia albofasciata*. By our fine structural observation using the field emission scanning electron microscopy (FESEM), microstructures of the spinning tubes of the cribellar spigots are quite different from those of the spigots on the spinnerets with respect to size. The surface of the cribellum is covered by hundred of tiny spigots which producing numerous cribellate silk fibrils. All of these spigots are composed of five segments, and are all approximately the same length (10 μm). These segmented and flexible structure enable to bent itself and conjoin together with adjacent other spigots to form congregate bundles of spigots. Thus, the calamistrum of the spider draws silk fibrils from its cribellum and helps combine them with supporting strands to form a cribellar prey capture thread. posted 5-10-2010

Fine structural analysis on the nanoscale fibrillar attachment system of the jumping spider *Plexippus setipes* (Araneae, Salticidae).

Authors

Institution

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Abstract: Although the cuticle of spider's exoskeleton is a hydrophobic and non-adhesive material, the jumping spiders have the distinctive attachment apparatus for adhesion on smooth dry surface without sticky fluids. It has been reported that the van der Waals interaction plays a dominant role of the dry attachment by fibrillar adhesion system for smooth surface. We have examined the whole tarsal appendages of the jumping spider, *Plexippus setipes* with using scanning electron microscope to reveal the fine structural characteristics of the dry adhesion system. All eight legs have the scopula with a pair of claw on the tip of feet. Each scopula is composed of two groups of setae that are capable of dry adhesion on smooth surface, and the hook structure of the claw is advanced to move on the rough surface. The setae toward the bottom of the tarsal segment are densely covered by numerous setules on the underside which broadened from middle to distal portion. It has been revealed by this research that the contact area of the setule is always a triangular shape, and these cuticular surfaces are connected by the elongated stalks from the underlying setae. Moreover, adhesion between the numerous setules and the setae was prevented by the microscopic hairs, since these were interspersed on the upper side of the setae. posted 5-10-2010

Potential interactions between female age, nutrition and reproductive development in *Schizocosa ocreata* (Hentz) wolf spiders (Lycosidae).

Authors

Institution

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Abstract: In spiders, female age, nutrition and reproductive development can be important factors in mate choice, sexual selection, and sexual cannibalism. The maturation of reproductive structures and hormones released by developing gonads initiates sex-specific behaviors, and may influence trade-offs between mate selectivity, timing of mating, and egg maturity. Previous studies on *Schizocosa ocreata* (Hentz) wolf spiders have demonstrated temporal plasticity in female mate selectivity, with a peak at three weeks post-molt. However, this pattern may also be condition-dependent, and vary with feeding history. The end result is a complex suite of factors linking feeding success, age, sexual cannibalism and reproductive physiology to mate choice decisions. To address these potential interactions, we conducted an exploratory study to determine how feeding treatment impacts gonad development and female reproductive timing. Our aims were to: 1) identify female gonad development relative to the onset of maturation, 2) determine how female age and receptive state correlate with gonad size (number and size of oocytes ovulated), and 3) examine how female feeding history impacts these developmental events. Results suggest that female gonad development and egg maturation likely explain observed temporal patterns of variation in receptivity and timing of mating, and that gonad development is strongly impacted by diet, with shifts in female reproductive timing due to feeding history. posted 5-28-2010

What kinds of human pathogenic bacteria are found on spiders?

Authors

Institutions

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Abstract: It is well documented that a number of animal species serve as mechanical vectors for pathogenic bacteria. Little research however, has been conducted on the role of spiders in this relationship. Our primary interests were to determine what bacteria different species of spiders carry and if any of them would be considered potential human pathogens. We collected and identified spiders from urban and rural areas in and around Augusta, GA. At the time of capture, spiders were immersed in sterile tryptic soy broth. This broth was incubated and individual bacterial colonies were isolated. Bacteria were sent to Mullins Laboratory (Augusta, GA) for species identification of bacteria. We collected 213 spiders and identified over 50 different species, from 43 genera and 19 families. From these spiders we isolated 27 different species of bacteria that are considered potential human pathogens. These data indicate that some spiders do carry potential human pathogens. posted 5-28-2010

Building a transcriptome for the Western black widow, *Latrodectus hesperus* (Araneae, Theridiidae).

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Abstract: The dragline silk of orb-weavers and their relatives is one of the strongest biomaterials in the world. In terms of tensile strength, it is stronger than bone, cellulose, rubber, and some weak steels. Also some silks, depending on the moisture content and type, can be stretched by 300% of its original length. These properties have potentially vast industrial applications ranging from lightweight body armor to biomedical sutures; however, efforts to produce recombinant silks have yet to accurately mimic natural spider silks. This can be attributed, in part, to the limited genetic resources available for spiders. Here we describe our efforts to build a complete black widow (Araneae, Theridiidae, *Latrodectus hesperus*) transcriptome using high-throughput sequencing, *de novo* assembly, and experimental validation of gene models. Validations will focus on genes we determine to be important in silk synthesis. A preliminary sequencing run on the Illumina platform resulted in 34 million 75-base sequence reads and greater than 2 billion base pairs of high quality data that were assembled into 19,896 contiguous sequences greater than 200 base pairs in length. Approximately one third of these contiguous sequences could be annotated by comparison to known proteins in public databases. We have thus effectively increased the number of annotated black widow genes greater than 100 fold. A complete spider transcriptome will not only add to the limited genetic information about spiders, but it will also help us to discover the chaperons and regulatory mechanisms involved in natural silk production. posted 5-26-2010

Bergmann's size cline in New Zealand marine spray zone spiders (Araneae: Anyphaenidae: *Amaurobioides*).

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Abstract: Members of the spider genus *Amaurobioides* are restricted to the spray zone of rocky marine coasts, where they construct and hunt from silk retreats. Collecting for this study shows these spiders to be distributed around the entire New Zealand coast. A TCS analysis of the ND1 mitochondrial gene places specimens from the North Island and the northern half of the South Island into a group distinct from *A. maritimus*, which is restricted to southern half of the South Island. Females of this northern group exhibit latitude and temperature related clines in body length, body mass, and residual index of condition, with larger, individuals having greater indices of condition being found at cooler, southern sites. This size cline also appeared in a broader geographical analysis that included *A. piscator* from the Sub-Antarctic Auckland and Campbell Islands. Thirteen ND1 haplotypes are represented in the northern group. Both independent contrast analyses and standard regressions of the mean body lengths and mean masses of these haplotypes and the mean latitudes and temperatures of the sites where haplotypes were present document a Bergmann's size cline and provide evidence for an underlying genetic component. posted 5-10-2010

P, Q and R

Establishing a faunistic survey of the spiders of South Dakota: current knowledge and goals.

Author	Institution
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Abstract: Spiders (Araneae) are a diverse group of predators that can significantly impact community and ecosystem dynamics in a wide variety of habitats. Spiders can affect nutrient cycling in grasslands and agroecosystems, and spiders can be used as

biological control agents for integrated pest management of crops. Yet, despite the ecological and potentially economic importance of spiders, the South Dakota fauna is woefully understudied. Only Peterson's 1939 statewide study exists, a smaller study from a single location near Brookings, and a handful of additional state records exist in sporadic publications, but the taxonomy is often outdated. To date, only approximately 130 species are documented in publications. Based on the fauna of other states of similar size and with comparable habitat variability, a moderate estimate of the total number of spider species found in South Dakota would be 650 species. A comprehensive survey of the state spider fauna is needed, so I have established the South Dakota Spider Survey (SDSS) to collect, document, and catalog the diversity and distribution of these ubiquitous predators. Modeled after other state spider surveys, the SDSS will generate a general list of species, complete state distribution maps for all species, as well as the development of an atlas of the spiders of South Dakota. The atlas will include for each species high quality images of the dorsal and ventral general habitus, male and female reproductive structures needed for correct identification, and any other unique or important diagnostic characters. posted 4-13-2010

Effects of ornamentation on wolf spider foraging.

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Abstract: As a secondary sexual trait that can increase reproductive success, ornamentation is believed to be costly for organisms to acquire and possess. This study investigates possible costs of ornamentation on wolf spider foraging by comparing foraging abilities of two male forms that differ in ornamentation upon maturation. The two male forms, found syntopically in a mixed population in Mississippi, USA, resemble two sibling species: *Schizocosa ocreata*, in which males develop large black brushes on their forelegs upon maturation, and *Schizocosa rovnieri*, in which males lack ornamentation following maturation. Individuals of both forms participated in foraging trials as penultimates (juveniles) and as matures. Analyses were conducted to compare behaviors and determine changes in foraging abilities between male forms (non-ornamented vs. brush-legged) and between age groups (penultimate vs. mature). Most foraging behaviors of the two male forms during immaturity were similar with the exception that brush-legged males attacked more frequently than non-ornamented males. Brush-legged males attacked less, spent more time moving, and improved capture abilities as matures, while non-ornamented males retained similar trends for these behaviors with age. Additionally, while capture abilities improved with age among brush-legged males, killing abilities remained constant. This disparity was due to increased escapes made by captured prey items, possibly due to hindrances caused by brush presence preventing secure holds onto crickets. In summary, differences in foraging exist between brush-legged and non-ornamented males prior to sexual maturation, and the development of/presence of brushes appears to influence adult male foraging efficiency. posted 5-20-2010

Transgenic crop risk-assessment: uptake of *Bacillus thuringiensis* proteins in the non-target spider community.

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Abstract: With an increasing percentage of agricultural acreage planted to transgenic crops, the exposure of the spider community to *Bacillus thuringiensis* proteins via consumption of Bt-containing prey or plant materials, such as pollen, has become an essential aspect of genetically modified crop risk-assessment. The Araneae have been an under-studied group of arthropods within the genetically-modified crop risk-assessment literature, despite their important role as natural enemies in agroecosystems. It is therefore essential to quantify exposure pathways in spider food webs across a variety of transgenic events. Spiders (Araneae) were collected from multiple transgenic events and non-transgenic isoline corn and screened for Bt-endotoxins using enzyme-linked immunosorbent assay (ELISA). Significant numbers of spiders screened positive for Bt-endotoxins targeting lepidopteran and/or coleopteran pests from each transgenic field. Spiders exhibiting a diversity of foraging strategies screened positive for uptake of Bt-endotoxins, including ground-based, cursorial hunters (Gnaphosidae, Lycosidae), as well as both aerial (Araneidae, Tetragnathidae) and ground-based web-building spiders (Linyphiidae, Theridiidae). These results indicate that there are multiple pathways to Bt-endotoxin exposure for Araneae in a transgenic corn agroecosystem, including direct and indirect consumption of pollen. The interaction pathways for potential Bt-endotoxin flow through the non-target spider food web are outlined. Implications for the future of transgenic crop risk-assessment and the compatibility of transgenic crops with biological control by the spider community are discussed. posted 5-21-2010

Respiration in locomotion and recovery from locomotion in *Eremobates* sp. (Solifugae).

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Abstract: Solifugids rely on trachea for respiration. When forced to run, female and male *Eremobates* sp. showed brief (<1 s.) speed bursts but otherwise ran steadily. Noticeable slowing occurred only after 2-3 mins. of continuous running. By contrast, many spiders and at least one scorpion run more rapidly at first but lose most of their speed within 30 s. and are often immobile after 1 to 2 mins.

We obtained simultaneous measurements of O₂ consumption and CO₂ production in 4 healthy resting, active, and recovering *Eremobates* at 25 °C. As noted by others, resting respiration is cyclic with exchange of both gases varying between near zero to several hundred µl of gas over 5 to 10 minute periods.

By contrast, gas exchange during exercise and recovery followed two patterns. Sometimes cyclic respiration continued. More commonly, gas exchange reached a peak value and then decayed exponentially to minimal resting values followed by a resumption of cyclic respiration. It was common for peak gas exchange to occur well after the end of activity.

These perplexing results suggest that solifugids are probably less constrained by O₂ delivery than are species that rely on book lungs and that they are also less reliant on anaerobic metabolism. The exact mechanism of respiration in these animals remains to be determined. Solifugids contain hemocyanin; this argues that the trachea function in a lung-like manner as in spiders with most gas exchange occurring between the trachea and hemolymph. However, it is possible that there is significant trachea-to-tissue exchange and that the hemocyanin stores O₂ that can be used during activity. posted 5-21-2010, revised 6-4-2010.

Octopamine levels correlate with population level differences in social structure in the polyphenic spider, *Anelosimus studiosus*.

Authors

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Abstract: Social behavior is extremely rare in spiders. Only 23 of approximately 38,000 species exhibit social tendencies, and all of those, except for one, reside within the tropics. The anomaly is the Northern social spider, *Anelosimus studiosus*. Populations observed between 26 °N latitude (Florida) and 36°N latitude (Tennessee) exhibit striking behavioral differences and considerable variation in social structure. These observations have spawned curiosity regarding the physiological differences which may underlie social and aggressive behavior in spiders. Octopamine (OA) is a neurotransmitter, neuromodulator, and neurohormone that has been found to elevate aggression in several invertebrate species. OA is commonly thought of as the invertebrate counterpart of Norepinephrine. We used HPLC-ECD (High Pressure Liquid Chromatography - Electrochemical Detection) to quantify levels of OA naturally occurring in both the social and asocial varieties within the species *A. studiosus*. We have found relative differences in the levels of OA present in the two behavioral phenotypes, with higher levels of OA correlating with asocial behavior and lower levels correlating with social behavior. posted 5-27-2010

The effects of the lunar cycle and scorpion size on microhabitat selection of the scorpion (*Centruroides vittatus*).

Authors

Institution

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Abstract: Microhabitat preference in the scorpion (*Centruroides vittatus*) can be affected by environmental and biological factors such as the lunar cycle and scorpion size. A scorpion can have a preference for a particular microhabitat based on the amount of illumination reflected from the moon or the size of the scorpion. Data on microhabitat use by the scorpion was collected in Laredo, Texas February 2009 to February 2010. Microhabitat use by *C. vittatus* was compared to the lunar cycle and scorpion size classes. The phase of the moon had a significant effect on microhabitat use for the scorpion. Even though the scorpions are always found in low proportions in open areas on the ground, during phases of low lunar illumination (e.g., waning crescent) the proportion of scorpions in open areas increased while the proportion of scorpions under the canopy of vegetation was higher during phases of high lunar illumination (e.g., waxing gibbous). Size class had a significant effect on scorpion microhabitat use. Scorpions in the largest size class were found at higher proportions on trunks of vegetation while smaller size class scorpions were found on branches but did not differ significantly in use of open areas vs. canopy. The results indicate that scorpions may use the canopy to reduce the risk of predation especially when lunar illumination is high. The size classes of scorpions differ in microhabitat use perhaps because smaller size classes are better climbers, but all size classes will utilize the canopy to reduce the risk of predation. posted 5-31-2010

Testing phylogenetic and biogeographic hypotheses in *Acuclavella* (Opiliones, Ischyropsalidoidea) from the Western Hemlock Zone of the Pacific Northwest.

Authors

Institution

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Abstract: In 1986 Shear described the morphologically diverse genus *Acuclavella* with four new species of the ischyropsalidoid harvestmen. All four species are found in a limited geography of northern Idaho. Additionally, one individual was reported from western Washington, which was assigned to *A. merickeli* of Idaho. Other than *A. merickeli*, these species were known only from their type localities. Shear's descriptions were based on few individuals; in one case from a single female. Focused surveys for *Acuclavella* have resulted in a much larger sample size of individuals (n=272) and localities (n=62) which allow for testing the species hypotheses put forth in 1986. Here, molecular phylogenetics and morphological analyses are used to test these species hypothesis. Results support the discovery of three new species of *Acuclavella*, but reject *A. shoshone* Shear 1986 as valid. Biogeographic patterns in *Acuclavella* are compared to expected models of evolution. An ancient vicariance caused by Cascade

Mountain orogeny best explains the disjunct distribution of western WA and northern ID groups. Within these two geographies, rivers appear to play a large role in the evolutionary history of this non-vagile group. Finally, the possible cause for rapid morphological evolution in northern Idaho is discussed. posted 5-28-2010

Testing the limits of body condition indices: evidence of hyper-hydration during short-term starvation in wolf spiders.

Authors

Institution

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Abstract: An animal's body condition may affect its survival, mating success, and thereby fitness. Debate over which non-invasive body condition index (BCI) most accurately and reliably predicts the energetic state and/or physiological health of an animal is ongoing, especially for spiders. Here we test the power of four different BCI's to detect differences in recent feeding and hydration histories in spiders. Juvenile (mixed sex) and adult male *Schizocosa ocreata* (Hentz) were maintained in the lab for 5 days on one of four food/water regimes including, 1) food and water (F+W+), 2) food only (F+W-), 3) water only (F-W+), 4) no food or water (F-W-). Although by day 5, body condition of both juvenile and adult male spiders in F+W+ and F-W- treatment groups clearly differed (regardless of the BCI used), none of the indices detected a difference between spiders in the F+W- and F-W+ treatments. This suggests that spiders may compensate for short-term starvation by increasing water intake, allowing them to maintain weight and/or internal hydrostatic pressure (and apparent body condition) even after multiple days of food deprivation. These findings pose a serious challenge to the use of BCIs to make inferences about current energetic stores in spiders, but also reveal previously unrecognized aspects of ecological physiology of spiders. Future studies will need to closely evaluate which indices are most sensitive to short-term diet deprivations. posted 5-31-2010

Differences in spider community composition among adjacent sites during initial stages of oak woodland restoration.

Authors

Institution

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Abstract: Decades of fire suppression have radically altered the uplands of northern Mississippi. Once blanketed by grassy open oak woodlands, this region is now experiencing mesophytic tree invasion, canopy closure, reduced oak regeneration, and herbaceous understory loss. In an attempt to reestablish historical conditions, experimental restoration was initiated through thinning and burning treatments. Our research, part of a comprehensive monitoring effort, strived to determine the impact of woodland restoration on both habitat structure and spider community. We predicted that spider community composition of the treatment site would be markedly diverse, as well as intermediate between that of forest and field ecosystems, reflecting a transitional habitat structure. To test our predictions, habitat structure and spider community were sampled within four habitats located at the restoration site: fire-suppressed forest, moderately treated forest, intensely treated forest, and old field. Two main conclusions resulted from this study. 1) Open specialists appear to be responding positively to increased understory light levels regardless of the availability of herbaceous vegetation. 2) Woodland restoration can initially increase spider diversity, perhaps through the formation of diverse habitat structure and/or by altering species dominance patterns. A rise in open specialist diversity was observed as treatment intensity increased, with no compensatory reduction in the diversity of forest specialists. What remains to be seen is whether or not the continued transition to open woodland habitat will result in major losses of forest specialist species. To fully achieve this transition, we recommend that a higher intensity of overstory tree thinning be administered to encourage the growth of herbaceous grasses and forbs. posted 5 - 8 - 2010

Personality influences the effects of recent feeding history on web defense by males and females of the cellar spider, *Pholcus phalangioides* (Araneae, Pholcidae).

Authors

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Abstract: Recently there has been increasing attention paid to the fact that individuals may vary in their tendencies to engage in specific types of behaviors. We explored the role of these behavioral syndromes in the context of trying to understand resource holding potential of males and females of the squinty-eyed cellar spider, *Pholcus phalangioides* (Araneae, Pholcidae). The prey capture behavior of individuals was quantified before placing them on either a low quality (fruit flies reared on commercial medium) or high quality (fruit flies reared on medium amended with dog food) diet for three weeks. In a completely crossed design, intruders were placed in the existing webs of resident spiders and the interaction documented. The behaviors of intruders and residents were combined using principal components analysis. The nature of the interaction between males was substantially different from the interaction between females so they were treated separately in further analysis. The number of

lunge recorded in the preliminary prey capture trial was highly correlated with the first principal component derived from the web defense behaviors. The feeding status of the spiders influenced the outcome of contests but the relationship was much stronger when the aggressiveness level measured in the preliminary prey capture trial was included as a covariate in the analysis. This effect was especially important in female-female contests. Thus spiders fed on a high quality diet are more likely to retain or take over webs but this is much more evident when individual personality is taken into account. posted 5-21-2010

S, T, U and V

Multigenic species delimitation and species tree inference in the *Aliatypus thompsoni* (Mygalomorphae, Antrodiaetidae) species complex.

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Abstract: Species delimitation in taxa that combine morphological cryptic with deep genetic structuring can be very challenging. Traditional techniques relying on morphology tend to underestimate species diversity, while the use of a single molecular marker (e.g. mitochondrial DNA only) may oversplit diversity. Additionally, gene trees may not strictly reflect species limits and interrelationships, for reasons including introgression, gene duplication, and/or incomplete lineage sorting. In this study we explore the use of multigenic DNA sequence data to understand species limits and interrelationships within the *Aliatypus thompsoni* (Mygalomorphae, Antrodiaetidae) species complex. This single nominal species occurs in the diversity-generating mountains of southern California, where prior studies have revealed distinct phylogeographic and phylogenetic breaks in a variety of taxa. Data collected from four independent genes (CO1 mtDNA, 28S rRNA, 18S rRNA, EF-1g nDNA) reveal three to four divergent, geographically cohesive genetic groupings. Two of these groupings ("Frazier", "Isabella") are consistently recovered by all genes, and clearly represent new (cryptic) species. Alternatively, the species status for two other groupings ("Piute", "Southern") is unclear; we apply newly-developed methods to statistically test for species-level distinction of these groups. Finally, the interrelationships of delimited species are estimated using several different methods, including concatenation, consensus, and coalescence methods. Overall, this study reveals the power of a multigenic genealogical approach for species discovery in short-range endemic mygalomorph spiders. posted 5-26-2010

Foraging time and prey community structure influence predation frequency in a generalist predator.

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Abstract: Given the cryptic feeding mode of wolf spiders (Lycosidae), it has been challenging to determine what factors influence consumption of different prey types. Laboratory studies suggest that they actively select prey, and so we expect that they should alter consumption frequency to exploit such prey groups in the field. To explore the effects of proportional prey abundance on prey consumption by a wolf spider, *Pardosa milvina*, common in disturbed habitats in eastern North America, we conducted a mesocosm experiment in the field. Using a factorial design, we manipulated the absolute and proportional abundance of Diptera, Orthoptera and Homoptera available to this *Pardosa* population. After allowing 6, 30 or 72 hours for *Pardosa* to forage, we collected all *Pardosa* and any remaining insects from the mesocosms. The prey remaining were counted, and the proportion of *Pardosa* that had consumed Diptera in the most recent 12 hour period was determined using monoclonal-antibody based enzyme-linked immunosorbent assay. As expected, the prey community decreased over time but insects of each type remained available during all time intervals. The proportion of spiders testing positive for Diptera increased between low and medium fly densities but there was no difference between medium and high levels. By 72 hours, prey levels were low and the likelihood of consuming a Diptera was correspondingly low, suggesting that the spider population had exhausted their primary prey. *Pardosa* appeared to over consume Diptera when they are rare but were less sensitive to proportional availability when Diptera were common. These results ultimately allow us characterize *Pardosa* as a generalist predator that potentially balances consumption among the available prey types. posted 5-27-2010

Energy absorption in spider orb webs.

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Todd Blackledge	

Abstract: The kinetic energy of flying insect prey represents a formidable challenge for orb weaving spiders who rely on their webs to first absorb the kinetic energy of flight and then to adhere to insects. While spider silks are renowned for their exceptional material properties, the micron-sized diameters of threads also results in low Reynolds numbers and hence viscous interactions

with air. This leads to the aerodynamic dissipation hypothesis that suggests that drag of silk threads moving through air plays a dominant role in how orb webs stop flying insects. However, evidence for the aerodynamic dissipation hypothesis is derived primarily from studies of single silk threads from *Araneus* webs. Here, we present a comprehensive study of how orb webs deform under prey impact for diverse species of Araneidae. We calculate energy dissipation budgets using data derived from high speed images of web deformation in conjunction with material tensile testing. Our findings emphasize the importance of the intrinsic work performed by silk molecules within radial threads for stopping prey while downplaying the roles of aerodynamic dissipation and capture spiral deformations in many webs. posted 5-31-2010

Feeding metabolics and feeding behaviors in naïve tarantula spiderlings (*Theraphosa leblondi*).

Author	Institution
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Abstract: For most animals, an integral portion of their energy budget is associated with foraging and the metabolic response that accompanies digestion and food assimilation (= specific dynamic action or SDA). Previous studies have shown that the magnitude and duration of SDA is influenced by many factors including meal size and composition as well as various environmental factors and body size of the predator. In this study, I examined the SDAs of naïve predators feeding for the first time. Model animals for this study were tarantula spiderlings (*Theraphosa leblondi*) that had just emerged from their eggsac. I measured resting metabolic rates (RMRs) over three successive molts as well as SDAs after their first feeding and again after their next molt. Spiderlings were divided into three groups that received prey with a specific mass in relation to tarantula body mass (Group 1: 5-15%, Group 2: 25-35%, Group 3: 45-55%). I also compared prey capture times over successive feedings trials to determine the role of experience in hunting success. Few differences were found between the two higher feeding groups in either metabolic rates or body mass. However, Group 1 had significantly lower body mass after their second molt post-emergence and had lower RMRs and thus a higher metabolic scope. Among all three groups, prey capture times were faster at their second feeding compared to their first feeding. posted 5-20-2010

Taxonomic expansion of *Hadrobunus* (Opiliones: Sclerosomatidae).

Author	Institution
Jeffrey W. Shultz	Department of Entomology University of Maryland College Park, Maryland USA

Abstract: Eastern North America is an unlikely place for a radiation of large-bodied terrestrial arthropods to go undetected until the 21st Century, but recent studies of the harvestman genus *Hadrobunus* have revealed new species and significant genitalic diversity. Three groups can be recognized: the macropenis group with 5 known species (3 new), the micropenis group with 4 species (2 new, 2 currently in *Leiobunum*) and the longipenis group with 2 species (1 new). Given the poor geographic coverage within existing collections, it is likely that such relatively unexplored regions as the southeastern and midwestern U.S. will reveal additional species. Diversity within newly developed character systems, especially genitalia and sexually dimorphic "sternalia" (labrum, labium, sternum, coxapophyses, dorsal pregenital sclerites, female opercular sclerites) is consistent with a sexually antagonistic coevolution that has intensified in a general west-to-east trajectory across the U.S. posted 5-19-2010

Effect of experience with predation cue on the behavior of *Pardosa milvina*

Authors	Institutions
Michael I. Sitvarin	Department of Zoology Miami University Oxford, Ohio USA
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Abstract: In order to survive and reproduce, prey must effectively detect and avoid their predators. Individuals that have had previous experience with predators may respond to current predation risks differently than naïve individuals. Wolf spiders are sensitive to chemical cues from predators (e.g., silk, feces, excreta), and exhibit effective anti-predator behavior in the presence of these cues. In this study, we examined how previous experience with predator chemical cues affected the behavior of *Pardosa milvina*. Spiders were exposed to either predator chemical cues or a control substrate, and their activity, foraging behavior, and success in avoiding predation were documented during juvenile and adult periods. While significant differences attributable to sex and age were found, there was no effect of treatment on any measured aspect of *Pardosa* behavior. These results suggest that experience with a predation cue may not be indicative of future encounters with a predator, possibly due to spatiotemporal variability in predation risk. Furthermore, innate responses to predator cues could explain the similarities in anti-predator behavior between naïve and experienced spiders. posted 5-19-2010

The problem of *Pardosa*; the phylogenetics of the *Pardosa groenlandica* species complex.

Author	Institution
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Abstract: The genus *Pardosa* comprises one of the largest genera in the Lycosidae with over 550 species described worldwide. Phylogenetic studies have found the genus to be monophyletic using a variety of species and methods. However, subgeneric relationships and species demarcations are not as clear. I examined seven species which comprise the *groenlandica* species complex (including the five proposed by Dondale as the *groenlandica* subgroup). Multiple species hypothesis were tested using: first a summative morphological evaluation, then using the COI, ITS1, ITS2, and 5.8s genes. The results are not clear. Morphologic evidence leans towards the complex consisting of four species, however there is little genetic evidence to support the morphologic demarcations. This lack of correspondence between genes and morphology may be explained by introgression or incomplete lineage sorting; the latter resulting from a potentially short time of divergence during North America's last glacial period, as each species of the complex occurs in a hypothetical glacial refugium. posted 5-5-2010

Dynamic locomotion with an aerial phase in grass-spiders.

Authors	Institution
Joseph C. Spagna Edgar Valdivia Vivin Mohan	Biology Department William Paterson University Wayne, New Jersey USA

Abstract: Grass-spiders of the genus *Hololena* (Araneae: Agelenidae) are capable of high-speed running on a variety of surfaces, often exceeding 70 body lengths (~50 cm) per second. Preliminary data showed that some take all 8 legs off the ground at once during their step-cycles while running, though such aerial phases are thought to be rare in arthropods. Two species, *Hololena curta* and *Hololena adnexa*, were studied in an attempt to attempt to capture running with an aerial phase, and to better understand the kinematics of high-speed horizontal running. Two high speed cameras were set up orthogonally (top and side views) to record spider runs at 1000 frames per second. The videos were then analyzed to estimate the spiders' speed and gait patterns, with the data further tested for relationships between speed, frequency, stride-length and duty factor. The spiders used their legs in alternating sets of four, distributed in staggered pairs along the body axis-- an alternating-tetrapod gait. Both stride length and stride frequency increased with speed in a linear manner. There was also an inverse, linear relationship between speed and duty factor, meaning that as speed increases, the relative amount of time spent by the legs on the ground during each full leg cycle decreases. Based on duty factor vs. speed regressions, both species were capable of aerial phases during high-speed running, generally above 60 body lengths per second. We conclude that further experimentation with fast arthropods will uncover many species capable of dynamic (and possibly aerial) locomotion. posted 5-11-2010

Araneae and the importance of habitat structures for diversity.

Authors	Institution
Sarah Stellwagen Joe Culin	Clemson University Department of Entomology, Soils, and Plant Sciences Clemson, South Carolina USA

Abstract: The purpose of this study is to gain baseline data of the epigeic spider (Araneae) species composition and assess their habitat distributions in Kings Mountain National Military Park (KMNMP) in the Piedmont of South Carolina. As humans influence environments, it is becoming evident that many habitats are in need of conservation efforts. Environments in their natural state are a cache for biodiversity, and maintaining the quality of these areas plays a crucial role in our future. Biological indicators such as spiders can be used as indicators of environmental quality, but baseline data for making these comparisons must be available. Three habitats types (riparian, ridge top, hardwood forest) in KMNMP are being monitored using pitfall trapping techniques to assess the habitat distributions of ground dwelling litter spiders. Sampling is conducted monthly for one year from August 2009 through July 2010. This type of data is important because it provides researchers and park officials with information needed to determine the effects of both use and management decisions on maintaining the health of an environment, it is relevant for conservation, and adds knowledge of field protocols to the pool of existing data. posted 5-21-2010

Allometric and phylogenetic origins of diminutive fangs in *Scytodes* (Araneae, Scytodidae).

Authors	Institutions
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Abstract: Spitting spiders eject silk and glue from their fangs when attacking prey. The ejection is complete in less than 35 ms and involves high-frequency fang oscillations that can approach 1700 Hz. Because of Newtonian physical constraints, these oscillations, which cause the spit to be dispersed in a zig-zag pattern, could not occur at such high frequencies if the fangs themselves were not very small. We measured the fangs, chelicerae, carapaces, and sterna of many sizes of spitting spiders

(*Scytodes thoracica*), brown recluse spiders (*Loxosceles reclusa*), and wolf spiders (*Varacosa avara*), to discover whether the fangs of spitting spiders grow unusually slowly, and found that they do. We argue that the diminutive fangs of adult spitting spiders constitute an instance of allometric neoteny. We also compared the ratio of fang length to sternum width in the three species above and in adults of representative Drymusidae, Plectreuridae, Digeuetae, and Pholcidae, four families that are in the same clade as the spitting and brown recluse spiders. These comparisons were equivocal with respect to the hypothesis that diminutive fangs are plesiomorphic in this clade. posted 4-13-2010

Failure to cospeciate: an unsorted tale of millipedes and mites.

Authors

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Abstract: Mites form symbiotic relationships with many animal taxa including fish, amphibians, reptiles, birds, mammals, mollusks, and arthropods. They also adapt to a wide variety of habitats and lifestyles, including those considered symbiotic. Thus, mites are suitable for use in coevolutionary studies, which evaluate the interdependent evolution of two or more ecologically associated organisms. Many mite species are found living on millipedes, and it has often been speculated that these two groups of arthropods have, in some cases, undergone coevolution. However, this hypothesis has never been formally tested. Millipedes of the family Xystodesmidae Cook 1895 (Diplopoda: Polydesmida), especially those in the genus *Appalachioria* Marek & Bond 2006, and their symbiotic mites of the genus *Stylochyris* Canestrini & Canestrini 1882 (Mesostigmata: Ologamasidae) were collected in broadleaf forests of the eastern United States. DNA from two mitochondrial regions (*16S/12S* and *COI*) was sequenced for all collected millipede and mite specimens. Phylogenetic trees were reconstructed for both millipede and mite taxa using Bayesian inference. Pairwise distance data was used in distance-based coevolutionary analyses, and reconstructed phylogenies were used in tree-based coevolutionary analyses. The phylogenetic analyses indicate *Stylochyris* and xystodesmid millipede evolutionary history is incongruent. Moreover, the evolutionary relationships among mite individuals and populations have very low support values and indicate little to no geographic structuring. The coevolutionary analyses likewise detected no pattern of coevolution among these millipede and mite lineages. Unlike many arthropod species, *Stylochyris* mites appear to be highly vagile. posted 5-21-2010

The effects of male body condition on female mating and remating decisions in the wolf spider *Pardosa milvina* (Araneae: Lycosidae).

Authors

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Abstract: Female *Pardosa milvina* wolf spiders frequently engage in sequential mate choice where they must choose to mate or reject a courting male with incomplete information about future mating opportunities. Consequently females may occasionally mate with poor quality males. We hypothesized that females may compensate for poor mating decisions by selectively choosing to mate again if additional males are of higher quality than the first-mated male. We examined the effects of male body condition on female mate selection and remating frequency. We presented virgin female *Pardosa* with either a virgin male that had been withheld food for one week after maturity (poor condition) or one that had *ad libitum* access to food (good condition). We then documented courtship and copulatory intensity. After 48 hours, females were presented with a second virgin male of either good or poor body condition and again recorded courtship and copulatory behaviors as well as whether females remated. We found significant decreases in male courtship and copulatory intensity among poor condition males. Males in poor condition also had significantly more missed insertions during mating. Females that previously mated with a poor condition male remated 30% of the time if the second pairing was with a good condition male. Females that mated with a good condition male chose to remate less than 5% of the time when paired with a second male in poor condition. We conclude that females may remate as a conditional strategy when they make an initial poor mating decision. posted 5-27-2010

Weapon size predicts dominance in the jumping spider *Lyssomanes viridis*.

Authors

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Abstract: The colorfulness and exaggerated chelicerae of many male jumping spiders (Salticidae) make them potentially excellent models for studying badges of status and weaponry. We investigated the relationship between dominance and secondary sexual traits in *Lyssomanes viridis*. Male dyads were allowed to interact in the presence of female silk. Dominance was determined by observing threat posturing, chelicerae-to-chelicerae physical fights, and retreat behavior. On average, the redness of the dominant male's forehead and chelicerae did not differ from the subordinate's. However, the dominant male was significantly more likely to have a wider prosoma and longer forelegs and chelicerae than the subordinate. Male and female foreleg breadth and cheliceral length were tightly correlated with prosoma diameter. Male cheliceral length scaled positively allometrically with prosoma diameter, whereas all other male and female body parts scaled isometrically. This suggests that long chelicerae are under strong selection in males but are constrained by some non-linear correlate of body size (e.g. mass). Exaggerated chelicerae likely evolved as weaponry but may have been co-opted as a visual signal since they exaggerate small differences in body size. Similarly-sized spiders were more likely to escalate to physical combat. posted 5 - 8 - 2010

Potential fitness costs of multimodal signaling for male *Schizocosa ocreata* (Hentz) wolf spiders (Lycosidae).

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Alan B. Cady	Department of Zoology Miami University Oxford, Ohio USA

Abstract: While complex signals of male *Schizocosa ocreata* wolf spiders increase mating success, they may also incur higher fitness costs in a number of ways. The multimodal courtship of *S. ocreata* is significantly more energetically expensive than routine locomotion, in contrast with the (unimodal) courtship of its sibling species *S. royneri*. In forest leaf litter, signals of courting males (visual leg waving, seismic percussion and stridulation) may be perceived by both intended receivers (females) and eavesdroppers (competitor males, predators). Field estimates of overlapping signal active space within a communication network suggest that eavesdropping on courting conspecifics by male *S. ocreata* is highly likely in the field. In particular, the social context of signaling (prior exposure and courting male density) affects male responses to conspecifics. Field-collected (experienced) males were more likely to initiate courtship when exposed to male signals, even in the absence of females, and the number of courting males nearby increased the tendency to respond. Field and lab studies confirm that avian and amphibian predators affect survival of male *S. ocreata*. Lab studies of responses of vertebrate (toad) and invertebrate (spider) predators to audio/video playback of male *S. ocreata* courtship demonstrate that ornamental traits and multi-modal courtship displays affect detection. Taken together, results suggest that for wolf spiders in a communication network, multimodal signaling behavior may be shaped by selection from several opposing forces, with fitness costs arising from energetic expense, environmental constraints and social contexts of signaling. posted 5-14-2010

Preliminary report on spiders (predominantly *Heteropoda* (Sparassidae), *Cupiennius* and *Phoneutria* (Ctenidae)) found in international cargo (predominantly bananas).

Author	Institution
Richard S. Vetter	Department of Entomology, University of California Riverside, California USA

Abstract:

There once was a spider from Brazil	Another spider's quite placid
Of which, many said it can kill	But people turn white and go flaccid
In bananas, it'd hide	<i>Heteropoda venatoria</i>
And go for a ride	Creates no euphoria
Giving us Yanks here a thrill	When folks find this leggy sparassid
With evil red cheliceral hairs	These spiders are thought rather charmless
And venom-dripping, opened-fang stares	With bite victims ending up armless
Oh, this fearsome <i>Phoneutria</i>	Dire warnings of danger
And what it might do to ya	It can't get much stranger
It'll whip up some pretty good scares	The beasts here are quite nearly harmless
Yet <i>Cupiennius chiapanensis</i>	Tradition, I just seem to buck it

Likewise, jumps international fences	A criticism such I can't duck it
Its got quite a gimmick	Well, it could be much worse
It's almost a mimic	At least this here verse
When mislDed, causing loss of one's senses	Doesn't mention the girl from Nantucket

posted 4-2-2010

W,X, Y and Z

Specific dynamic action of *Grammostola aureostriata* in response to variable prey availability .

Authors	Institution
Jude Walser	Eastern Michigan University
Cara Shillington	Department of Biology
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Abstract: An organism's specific dynamic action (SDA) response encompasses an increase in metabolic activity associated with feeding. This response includes energy used for ingestion, digestion, absorption and assimilation of a meal, and the increased rate is typically compared to the animal's standard or resting metabolic rate (RMR). The characteristic SDA response can be affected by many factors, including meal size, meal composition, animal physiology, and body temperature. Despite numerous experiments on SDA responses in various species, there are currently no publications focusing on spiders. In this study, we examined in the influence of prey availability on SDA response in the tarantula *Grammostola aureostriata*. Animals were deprived of food for 10, 30, 60, and 90 days. After each of these time periods, each spider was fed a single cricket with a mass of 1.5% of the tarantula's body mass. Rates of CO₂ production were measured as indicators of metabolic activity levels. RMRs were measured prior to each feeding, and SDAs were measured immediately after the feeding. Increasing food-deprivation periods resulted in an increased duration in the SDA response. Furthermore, tarantulas exposed to increasing periods of food-deprivation exhibited significantly lower RMRs, suggesting an energy conservation mechanism. posted 5-22-2010

Molecular phylogeny of the social spider, *Anelosimus studiosus*, in East Tennessee.

Authors	Institutions
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Abstract: *Anelosimus studiosus*, in east Tennessee, exhibits two genetically-influenced behavioral strategies: solitary and social. Solitary webs are ubiquitous throughout the range and consist of a mother and her offspring. Social colonies consist of several, to hundreds, of adult females and their offspring. Social colonies are typically clustered in distinct mostly isolated populations in specific habitats. Two mutually exclusive hypotheses are tested to determine if these pockets of social behavior represent multiple independent origins of evolution, or a single (or few) origins that have spread through the population. Populations along the Tennessee River water shed in east Tennessee are analyzed using seven microsatellite loci. These loci are used to investigate observed heterozygosity, inbreeding, and geographical patterns in phylogeny. posted 5-21-2010

The role of web placement in structuring web-building spider communities and food webs.

Authors	Institution
Kelton D. Welch	Department of Entomology
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Abstract: For sedentary, trap-building predators, prey capture is usually proportional to the availability of prey at the location of the trap. Therefore, the placement of a spider web is crucial for the spider's success in obtaining food, and will be an important factor in the structuring of web-building spider communities. It was hypothesized that predators will select trap sites based on prey-interception potential, and therefore, predicted to uncover a correlation between the diet of web-building spiders and the placement of their webs. Quadrat-based sampling of spider webs in alfalfa revealed that web sites differed significantly between species in terms of height above the substrate, size of the web and the structures used for attachment. Sticky-trap collections established a correlation between web height and availability of *Collembola*, an important non-pest prey item for web-building spiders. Finally, the gut contents of spiders were screened for *Collembola* DNA by polymerase chain reaction. Results show highly significant dietary differentiation between species, with species attaching their webs to the soil substrate consuming significantly more *Collembola* than species suspending their webs one centimeter or more above the substrate. These data support our hypothesis that prey availability is an important factor in trap-placement decisions by sedentary predators, and provides valuable insights into the structure and dynamics of web-building spider communities and trophic webs. posted 5-19-2010, modified 5-21-2010

Development of novel molecular markers for widow spider systematics (Araneae, Theridiidae, *Latrodectus*).

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Abstract: Molecular phylogenetic studies of spiders (Araneae) have expanded dramatically in the last few years but still rely primarily on a handful of mitochondrial genes or a few ribosomal RNA genes encoded by the nuclear genome. Expanding beyond this small repertoire of molecular markers has been hampered by the limited genomic information available for spiders. In the search for silk encoding genes we have constructed multiple complementary DNA (cDNA) libraries for the Western black widow, *Latrodectus hesperus*. Sequencing cDNA provides an excellent resource for developing molecular markers because cDNA is synthesized from messenger RNA and thus represents protein-coding genes. As part of a Genetics lab course at Washington and Lee University we sequenced 70 cDNAs, assigned each a putative function based on homology, and designed primers for seven different protein-coding genes. We successfully amplified and sequenced four of these genes from the genomes of both black widows and brown widows, *L. geometricus*. Two of these genes contained introns that displayed much higher levels of divergence than the coding regions and should be ideal for reconstructing species level relationships among widow spiders. Designing primers from the coding region, on the other hand, should facilitate their successful amplification in more distantly related genera. Our results indicate the utility of cDNA sequences for rapidly developing phylogenetic markers that can span a breadth of evolutionary distances. posted 5-26-2010

Costly courtship: male wolf spiders alter mating tactic expression in response to perceived predation risk.

Authors	Institution
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Abstract: The use of alternative mating tactics is thought to maximize a male's reproductive success given various internal and external factors. Males of the wolf spider, *Rabidosa punctulata*, exhibit condition-dependent alternative mating tactics. Small, poor-condition males utilize a multimodal courtship display, while large good-condition males adopt a direct mount tactic that forgoes courtship and instead engages the female in grappling. Tactic-specific costs could help explain this counterintuitive tactic expression pattern. One such cost associated with broadcast signals like courtship is predator attraction. We specifically tested whether courtship in the presence of a predator, a larger relative *R. rabida*, is costly to males. We found that courting males tended to be attacked more often than non-courting males, and the likelihood of being attacked is best predicted by courtship activity rather than other male attributes. Given this cost of courtship, it would benefit males to alter their mating tactic expression given cues about their perceived predation risk. In a second experiment, we manipulated perceived predation risk by providing different silk cues (none, conspecific, predator, mix), and found males indeed alter their mating tactic expression depending upon the silk cues encountered. Males were significantly more likely to adopt the direct mount tactic when presented with either the predator or mixed silk cues when compared with conspecific female cues, where they were more likely to court. Our results indicate that predator cues tend to override the presence of conspecific cues, influencing males to adopt a potentially less conspicuous tactic. posted 5-10-2010

Shake a leg: Determining the function of the visual component of courtship signals in the wolf spider, *Rabidosa rabida*.

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Abstract: In the wolf spider, *Rabidosa rabida*, males use complex multimodal courtship displays that incorporate both a vibratory signal, consisting of brief stridulation, and a visual signal, consisting of conspicuous waving of an ornamented (dark pigmentation) foreleg. Using diet manipulations, we determined that male foreleg pigmentation is condition-dependent. The darkness of pigmentation and proportion of the foreleg that is pigmented depended upon the quantity of food intake during development. This condition-dependent ornamentation could convey information on male condition that females could potentially use in mate choice decisions. In order to determine the relative importance of the male's visual versus seismic courtship signals in female mate choice decisions then, we conducted mate choice trials across different signaling environments (i.e. presence/absence of visual/seismic). We found the signaling environment influences copulation frequency with a significant effect of both the visual and seismic signaling environment. Additionally, we found that males alter the proportion of their courtship bouts containing foreleg-waves depending on the visual signaling environment; incorporating leg-waves during courtship significantly more often in light vs. dark conditions. Finally, we show that females are paying attention to the degree of foreleg ornamentation, mating with males expressing darker forelegs more often than lighter legged males. From this study, we found: 1) male foreleg pigmentation is condition-dependent in *R. rabida*; 2) the deployment of foreleg waving varies with the signaling environment; 3) visual signaling is important but not essential for copulation success; and 4) one visual component, the degree of ornamentation, influences female mate choice decisions. posted 5-10-2010

Chemical complexity in *Loxosceles* spider venom and the functional contribution of components to insect immobilization.

Authors	Institution
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Abstract: Venoms of *Loxosceles* spiders have been extensively studied because of the ability of bites to cause dermonecrotic lesions in humans. However, very little focus has been placed on venom composition of *Loxosceles* in the context of its functional role in prey immobilization. Moreover, an overwhelming amount of research effort on venom in this lineage has focused on the toxin sphingomyelinase D (SMase D) because it is the central chemical culprit in lesion formation in mammals. Other toxins in the large complex of venom components have received very little focus, and the relative contributions of components to prey immobilization are not understood. We present results of insecticidal bioassays on crickets of purified SMase D from *L. arizonica*. Our data demonstrate that potency of crude venom and purified SMase D are comparable indicating that SMase D is a key contributor to prey immobilization.

We also present preliminary characterizations of *L. arizonica* whole venom composition (the "venome") from cDNA library screening and mass spectrometry analyses. It is clear that proteins from multiple gene families are part of the venom functional complex. By comparing the *L. arizonica* venome data to that from other Sicariidae species a picture is emerging of degrees of evolutionary conservation among species in this lineage with respect to the expression of these different gene families in sicariid venoms. posted 5-27-2010

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