

Biology Oral Presentation Abstracts

B1. Summary of Previous and New Records of the Least Darter (*Etheostoma microperca*) in Arkansas

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Arkansas Game and Fish Commission

The Least Darter, *Etheostoma microperca*, has an extremely limited distribution in Arkansas and is designated as a species of greatest conservation need by the Arkansas Game and Fish Commission. It is restricted in the state to the Illinois River basin in Benton and Washington counties and was first documented in the state in 1938 in Wildcat Creek west of Springdale. Additional discoveries in 1960, 1973, 1981, and 1982 documented its general distribution in the state prior to this study. A 1997 study documented the persistence of the species in 2 of the historic streams. Field sampling in 2004-2005 and 2010-2011, provided more concentrated sampling efforts in the basin. Herein we report on the state of previously documented populations, document additional populations in the vicinity of previously reported ones, and document a population discovered in an additional sub-basin. These efforts update the status of this rare member of the state *ichthyofauna* and greatly improve the resolution of the distribution of this species within Arkansas. Abstract ID: 47

B2. Searching for harvester ants (*Pogonomyrmex*) in Arkansas

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Documents searches for rare *Pogonomyrmex* harvester ants in Arkansas in 2010. Abstract ID: 76

B3. Distribution, Life History Aspects, and Conservation Status of the Spothanded Crayfish, *Orconectes punctimanus* (Creaser) (Decapoda: Cambaridae), in Arkansas

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The Spothanded Crayfish, *Orconectes punctimanus* (Creaser) is an endemic crayfish of the Interior Highlands of Arkansas and Missouri. Fieldwork within the Arkansas portion of its overall distribution from 2001–2011 revealed a state distribution of 7 counties in northern Arkansas. Eighty-seven collections of this crayfish were made in Baxter, Fulton, Independence, Izard, Lawrence, Sharp, and Stone counties. This crayfish inhabits areas under rocks and rubble in clear streams and is found primarily in pool regions. Form I males were found mainly in September and October. We document additional new localities for *O. punctimanus* as well as provide a summation of all known localities for the species in Arkansas. In addition, various aspects of the biology of *O. punctimanus* are discussed. Based on our recent collections, we recommend a conservation status of “Currently Stable” (CS) for *O. punctimanus* in the state. Ab ID: 77

B4. New Geographic Distribution Records for Centipedes (*Chilopoda: Scolopendromorpha*) in Arkansas, Including the First from Crowleys’s Ridge and the Grand Prairie

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New geographic distribution records are reported for six species of scolopendromorph centipedes in the families Cryptopidae, Scolopendridae, and Scolopocryptopidae in Arkansas. We document 24 new county records, including several important records of *Scolopocryptops rubiginosus* L. Koch in the state, formerly known from only two counties. We also correct the initial historic locality record for *S. rubiginosus*. In addition, we report, for the first time, several species from Crowley's Ridge and the Grand Prairie. Ab ID: 81

B5. New Geographic Distribution Records for Horsehair Worms (*Nematomorpha: Gordiida*) in Arkansas, Including New State Records for *Chordodes morgani* and *Paragordius varius*

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Between March 1980 and June 2000, collections of several freshwater horsehair worms were made in 13 counties of Arkansas. These were subsequently identified as *Chordodes morgani* Montgomery, 1898, *Paragordius varius* (Leidy, 1851), and *Gordius* sp. "complex." This is the first time *C. morgani* has been reported from Arkansas as well as the first report of *P. varius* being definitively reported from the state. The only previously reported gordiid worm from Arkansas was *Gordius robustus* Leidy, 1851. In addition, we report new geographic distribution (county) records in Arkansas for horsehair worms of the *Gordius* sp. "complex". Detailed information on the biology of these horsehair worms will be presented. Ab ID: 82

B6. A New Host and Geographic Distribution Record for the Leech, *Myzobdella reducta* (Hirudinea: Piscicolidae), from Arkansas

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During July and November 2011, 6 adult pirate perches (*Aphredoderus sayanus*) were collected from Mill Creek, Independence County, Arkansas, and examined for leeches. Two of 6 (33%) were found to possess a single leech on its caudal fin which was subsequently identified as *Myzobdella reducta* (Meyer, 1940). This leech is an opportunistic blood-feeding species on fish and has been collected infrequently with a scattered distribution in eastern North America, including the Great Lakes and Mississippi River drainages. *Myzobdella reducta* was previously reported from Arkansas; however, no locality data was provided. Therefore, our specimens represent the first definitive record for the state as well as a new host record. Ab ID: 88

B7. The Combined Effects of Exercise and Music on the Cognitive Functioning of College Students

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In previous decades, localization and lack of plasticity held sway over neuroscientists and psychologists thinking regarding the human brain. Pioneering work by researchers has demonstrated that the brain is much more malleable than previously thought. We now know that neuronal networks are continually modified, new neurons can be developed through neurogenesis, and humans can substantially influence brain capabilities and function. In recent years, many studies have been conducted showing how exercise positively impacts cognitive functioning. Also, research has shown that music listening can affect how the brain works. This

study assessed the combined effects of exercise and music listening on cognitive performance among college students at Arkansas Tech University. The student volunteers were monitored during various cardiovascular exercise sessions. In some sessions, the students were instructed to listen to music, while in other sessions, no music was provided. Before and after each session, the participants completed a cognitive test known as the Trail-Making Test as well as a mood-assessment test. It was hypothesized that there would be greater improvements in cognitive performance and mood after exercise sessions accompanied by music than those without music present. Results will be presented. Recent neuroscience advances hold great promise for enhancing student academic performance. Ab ID: 169

B8. New Vertebrate Records and Natural History Notes from Arkansas

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We provide additional records and natural history of selected fishes, birds, and mammals from Arkansas. Recent collections, by the authors, augmented with mammal museum records reveal new distribution records for these species. Additionally, we discuss natural history notes along with the vertebrate records. Ab ID: 75

B9. Morphology of Rathke's Glands in the Snapping Turtle, *Chelydra serpentina*, with Comments on the Presence of Multilaminar Lamellar Bodies in Turtles

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I examined the histology and ultrastructure of Rathke's glands in hatchling, juvenile, and adult snapping turtles (*Chelydra serpentina*). This species possesses four pair of Rathke's glands that are embedded beneath marginal bones and are named according to their anatomical location (i.e., one axillary and three inframarginals). These integumentary glands are similar anatomically and ultrastructurally to one another. Each gland is comprised of a single, highly vascularized secretory lobule, which is surrounded by a thick tunic of striated muscle. Two types of large secretory vacuoles characterize most of the holocrine cells produced by a relatively thin secretory epithelium. My results suggest that the chief secretory material of the smaller dark-staining Type 1 secretory vacuole appears to be a glycoprotein complex. The larger, mostly translucent Type 2 secretory vacuole may contain variously sized osmophilic lamellar bodies, whose structural design is reminiscent of an epidermal lipid delivery system in vertebrates. I also compared the ultrastructure of Rathke's glands in the snapping turtle to those of other chelonian genera (*Apalone*, *Kinosternon*, *Sternotherus*, and *Terrapene*). The functional role of Rathke's glands in *Chelydra serpentina* and in other turtles remains unknown. Ab ID: 72

B10. The Testicular Histology and Germ Cell Cytology of Spermatogenesis of the Mississippi Map Turtle, *Graptemys pseudogeographica kohnii*, from Northeastern Arkansas

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We examined the testicular histology and cytology of spermatogenesis in *Graptemys pseudogeographica kohnii* using specimens collected between July 1992 and May 2004 from counties in northeastern Arkansas. Testes were obtained from 21 specimens deposited in the Arkansas State University herpetological collection. Standard histological techniques were used to prepare tissues for light microscopy. A histological examination of the testes, elucidated using histochemistry and an analysis of germ cell cytology, indicated a postnuptial testicular cycle of spermatogenesis and a fall spermiation event. The majority of the germ cell population in May specimens is represented by resting spermatogonia, spermatogonia A, spermatogonia B, and numerous Sertoli cells at the basement membrane. The Sertoli cells are accompanied by numerous lipid droplets, which occupy the luminal space. Large hypertrophic cells from the previous spermatogenic cycle are also present in

May. Major proliferation events occur in the June specimens resulting in increased height of the seminiferous epithelium and increased diameter of the seminiferous tubules. The germ cell population during this time is represented by spermatogonia (A, B, and resting), hypertrophic cells, and primary spermatocytes. By September, the majority of the germ cell population within the seminiferous tubules has entered meiosis II with the appearance of secondary spermatocytes and early to late stage spermatids. There is also a marked increase in diameter of the seminiferous tubules. By early October, the seminiferous epithelium is marked by a decrease in height, as well as a decrease in the diameter of the seminiferous tubules. The majority of the germ cell population is developing through spermiogenesis with close association to the basement membrane. Round and elongated spermatids constitute the largest portion of the germ cell population. Following the spermiation event, the testis enters a period of quiescence until the next spermatogenic cycle beginning in mid May to early June. Based on the cytological development of the seminiferous tubules revealed by our study, *Graptomys pseudogeographica kohnii* demonstrates a temporal germ cell development strategy similar to other temperate reptiles. A single generation of germ cells progress through spermatogenesis each year as a single population resulting in a single spermiation event. Ab ID: 107

B11. History and current status of Egyptian Goose (*Alopochen aegyptiaca*) in northwestern Arkansas

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The Egyptian Goose first appeared in northwestern Arkansas in spring of 1988 at the fish hatchery in Centeron in Benton County. The origin of these birds is unknown, but they were probably locally released feral birds. During the 1990s, the population grew, with the largest concentration of 40-50 birds associated with a pig farm in Hiwasee. Since 2000, there have been scattered breeding records in Benton County and small numbers of birds wintering at the fish hatchery, with very few records from Washington County. Currently the largest concentration of about 35 birds is associated with a drive-through zoo in Gentry. The Egyptian Goose population meets most of the American Birding Association's criteria for an established population, except that they still may be dependent on human support. Ab ID: 91

B12. Population Structuring and Transmission Dynamics of *Gromphadorholaelaps schaeferi*, A Symbiotic Mite of the Madagascar Hissing Cockroach *Gromphadorhina portentosa*

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Gromphadorholaelaps schaeferi is a symbiotic mite associated with the Madagascar hissing cockroach, *Gromphadorhina portentosa*. Mites from a large colony of *G. portentosa* were examined to describe the population structuring of *G. schaeferi*. Of 1,915 roaches examined, 971 (50.7%) were infested with 19,421 mites exhibiting a mean intensity (\pm SE) of 20.0 (\pm 0.6), with an infection intensity range of 1-116, and relative abundance (\pm SE) of 10.1 (\pm 0.4). Both prevalence and mean intensity of infestation exhibited a dramatic increase with increasing roach size/age. By the time roaches reach 40 mm the prevalence is nearly 100%. Mean intensity increases until the roaches achieve a length of about 60 mm and then levels off at about 43. Mites on adult females (\geq 50 mm) exhibited a significantly greater intensity of infestation than on male roaches over 50 mm long. The mite distribution among the roaches exhibited the negative binomial distribution with a variance to mean ratio of 30.136. The 184 most heavily infested roaches accounted for over half of the total mites collected; thus, more than half of the parasite community was aggregated on 9.6% of the roaches examined. To examine the extent to which transmission occurs from roach to roach, the mites from adult roaches were removed and roaches were marked and re-introduced into the colony. One week after introduction, infestation of mites on roaches was approaching the original intensity suggesting that a substantial degree of cross transmission of mites occurs among roaches. The ease with which large numbers of individual *G. portentosa* may be quickly raised in the laboratory make *G. schaeferi* on *G. portentosa* an

excellent laboratory model for studying disease transmission. These data constitute a valuable baseline for further study. Ab ID: 92

B13. Life History Notes of the Brown Tarantula (*Aphonopelma hentzi*) from Arkansas

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Recent survey work by the Arkansas Department of Natural Heritage suggests that one species of tarantula, *Aphonopelma hentzi*, occurs in the state of Arkansas and that its population is primarily found within the uplands of the western portion of the state (Warriner 2008). There is a distinct lack of recently published information concerning the ecology of this species in Arkansas. Since 2009 we have observed, measured and photographed several tarantulas in glade habitats located in northern Carroll County. Three of these were adult females with egg sacs. The egg sacs were collected, preserved and examined in the laboratory. The number of spiderlings found within egg sacs varied from 268 to 743 (mean = 430). All tarantula burrows observed were constructed under large flat rocks located in the glades. We have attempted to expand the study to include other physiographic regions of the state. Herein we update our search attempts and include a recent natural emergence date from the Ozarks. We also include an observation of an adult male feeding on a snake (*Thamnophis* sp.). Ab ID: 106

B14. A Possible New Arkansas Endemic Plant Revealed by DNA Sequence Analysis

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Cardamine angustata var. *ouachitana*, a wildflower in the mustard family (Brassicaceae), was described by Smith in 1982 to include a form of *Cardamine* found only in the Ouachita Mountains of Arkansas. This variety is morphologically very similar to typical *Cardamine angustata*. The major difference noted for the two varieties was the complete lack of leaf hairs (trichomes) in the new variety, whereas typical *Cardamine angustata* normally possesses trichomes. However, Al-Shehbaz rejected the variety *ouachitana* and reduced it to synonymy with the typical *C. angustata* in 1988. The recommendation of Al-Shehbaz has been followed and the taxon *Cardamine angustata* var. *ouachitana* is currently not accepted by plant taxonomists. We were curious about the actual status of *Cardamine angustata* var. *ouachitana* and proposed to evaluate the variety using DNA sequence analysis. The UAM Regional Flora class of Spring, 2011 performed a preliminary evaluation of this question by producing ribosomal internal transcribed spacer region DNA sequences from specimens of *Cardamine angustata* var. *ouachitana*. The students then compared sequences of *Cardamine angustata* var. *ouachitana* to published sequences of *Cardamine angustata* and other related species of *Cardamine*. Analyses of these data produced an unexpected result; specimens of *C. angustata* var. *ouachitana* were actually closely related to *C. concatenata*, rather than the expected close relationship with *C. angustata*. However, *C. angustata* var. *ouachitana* is morphologically distinct from *C. concatenata*. These results suggest that *Cardamine angustata* var. *ouachitana* is actually a new species found only in the Ouachita Mountains of Arkansas. Ab ID: 108

B15. Herpetological Inventory of five protected areas in South-central Arkansas

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We present distributional and ecological data on amphibians and reptiles collected from five protected areas consisting of public lands owned by the Arkansas Natural Heritage Commission, Arkansas State Parks and

Arkansas Forestry Commission. These lands protect diverse habitats that are home to many types of wildlife; however, an extensive herpetological inventory is lacking in many of these areas. Several species of conservation need were documented during this survey, which highlights the importance of protected areas to these rare herpetological species. The results of this study may help state land managers in making important decisions regarding habitat restoration and maintenance projects. Ab ID: 112

B16. Twenty-four year study of starling-blackbird roosts in northwestern Arkansas

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Over 24 years in northwestern Arkansas, 21 roosts occupied mainly by starlings and blackbirds we counted primarily in late winter. Roost sizes varied from a maximum of more than 150,000 to a low of around 600 birds. Usually numbers were in the tens of thousands. Of the four major habitats used as roost sites, over half were in cane thickets. Ab ID: 116

B17. Understanding Floristic Diversity Through a Database of Greene County Specimens

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We present a flora of Greene County, Arkansas, based on accessioned collections from the Arkansas State University Herbarium (STAR). Currently, there are 1571 specimens representing 549 species from Greene County in STAR. Using the USDA Plants Database, plant species were analyzed according to whether or not they are native to the state as well as whether or not they have been previously documented as species occurring in the county. Having analyzed all the Greene County collections from STAR, we found 227 previously undocumented species. The data suggest that most of the specimens were found in wooded areas and/or near water. This may be a reflection of sampling bias as two of the primary collectors of these specimens were primarily interested in bogs. For these reasons, the Greene County collections may not fully represent all habitats in the county, but it is likely that they are a good representation of the county's seeps and bogs. The STAR Herbarium is emerging as a critical resource for understanding botanical diversity in the eastern counties of Arkansas. Ab ID: 117

B18. Effects of Drosophila Ribosomal Protein S6 Kinase on Wing Growth

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In multicellular animals, organ and cell size as well as total organism size is regulated by signaling through the insulin receptor and TOR signaling pathways. The ribosomal protein S6 kinase is a key component of these pathways. It has been shown that mice or *Drosophila* lacking this kinase have a reduced body size that is associated with a decrease in cell size. Ectopic expression of activated or dominant negative transgenic variants of the *Drosophila* homolog of ribosomal S6 kinase (dS6K) has been shown to cause phenotypes that are consistent with a role for dS6K in growth. However, whether the phenotypes were due to changes in cell size, cell number, or other causes has not been shown. We show that ectopic expression of dS6K transgenes in the posterior wing compartment alters compartment size primarily by changes in cell size. Ab ID: 167

B19. Phosphorylation-independent regulation of Atf1-promoted meiotic recombination by stress-activated, p38 kinase Spc1 of fission yeast

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Stress-activated protein kinases regulate multiple cellular responses to a wide variety of intracellular and extracellular conditions. The conserved, multifunctional, ATF/CREB protein Atf1 (Mts1, Gad7) of fission yeast binds to CRE-like (M26) DNA sites. Atf1 is phosphorylated by the conserved, p38-family kinase Spc1 (Sty1, Phh1) and is required for many Spc1-dependent stress responses, efficient sexual differentiation, and activation of Rec12 (Spo11)-dependent meiotic recombination hotspots like ade6-M26. We sought to define mechanisms by which Spc1 regulates Atf1 function at the ade6-M26 hotspot. The Spc1 kinase was essential for hotspot activity, but dispensable for basal recombination. Unexpectedly, a protein lacking all eleven MAPK phospho-acceptor sites and detectable phosphorylation (Atf1-11M) was fully proficient for hotspot recombination. Furthermore, tethering of Atf1 to ade6 in the chromosome by a heterologous DNA binding domain bypassed the requirement for Spc1 in promoting recombination. Therefore, the Spc1 protein kinase regulates the pathway of Atf1-promoted recombination at or before the point where Atf1 binds to chromosomes, and this pathway regulation is independent of the phosphorylation status of Atf1. Since basal recombination is Spc1-independent, the principal function of the Spc1 kinase in meiotic recombination is to correctly position Atf1-promoted recombination at hotspots along chromosomes. We also propose new hypotheses on regulatory mechanisms for shared (e.g., DNA binding) and distinct (e.g., osmoregulatory vs. recombinogenic) activities of multifunctional, stress-activated protein Atf1. Ab ID: 122

B20. A Preliminary Comparison of Macroalgae Cover in Upper Illinois River Watersheds Categorized by Land Use and Wastewater Treatment Plant Existence

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As part of an ongoing U.S. Geological Survey study of biological communities, water quality, and habitat, percent macroalgae cover values at 14 sites in upper Illinois River watersheds were compared based on land-use categories. Sites were assigned to one of four categories (agricultural, n=7; urban, n=4; agricultural with wastewater treatment plant, n=1; urban with wastewater treatment plant, n=2) based on land-use percentages and the existence or non-existence of a wastewater treatment plant in the watershed upstream from the site. At each site, macroalgae cover was estimated visually (as a percent) in each of five 2 foot by 2 foot areas along each of 11 transects; these 55 estimates were then averaged. When macroalgae cover was compared by land-use category, category averages indicated that the least amounts of macroalgae occurred at sites in agricultural and urban watersheds. The average macroalgae cover values for the two wastewater treatment plant categories were approximately four to six times greater than the averages for the agricultural and urban land-use categories. Because of extreme low-flow conditions in the summer of 2011, sites in more forested watersheds will not be sampled until the summer of 2012. The greatest macroalgae cover occurred at sites with less shading and higher nutrient (dissolved nitrate and total phosphorus) concentrations. Macroalgae cover was negatively related to riparian shading and positively related to base-flow concentrations of total phosphorus. Although these comparisons are somewhat limited by the low number of sites in some categories and because watersheds with higher amounts of forest are yet to be sampled, there are indications that this method will provide valuable information in the future. However, these results are comparable to similar evaluations conducted at the same sites with fish and macroinvertebrates; therefore, there are multiple lines of evidence indicating that biological assemblages are responding to different forms of land use in the upper Illinois River watershed. ID: 125

B21. A Preliminary Comparison of Invertebrate Communities in Upper Illinois River Watersheds Categorized by Land Use and Wastewater Treatment Plant Existence

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As part of an ongoing U.S. Geological Survey study of biological communities, water quality, and habitat, invertebrate communities at 14 sites in upper Illinois River watersheds in northwestern Arkansas were compared based on land-use categories. Sites were assigned to one of four categories (agricultural, n=7;

agricultural with wastewater treatment plant, n=1; urban, n=4; urban with wastewater treatment plant, n=2) based on land-use percentages and existence or non-existence of a wastewater treatment plant in the watershed upstream from the site. Five ecologically relevant metrics were calculated for each site and were averaged by land-use category. Two of the metrics (invertebrate taxa richness and relative abundance of taxa belonging to three orders that are relatively intolerant Ephemeroptera, Plecoptera, and Trichoptera) were expected to have positive relations to ecological conditions, while the other three metrics (abundance weighted tolerance, dipteran relative abundance, and abundance weighted [pollution] tolerance) were expected to have negative relations to ecological conditions. Most metric averages indicated that invertebrate communities at the agricultural or urban sites without wastewater treatment plants in the watersheds were less disturbed than sites with wastewater treatment plants in the watershed. For all but one of the five metrics, sites having the most favorable average metric score occurred in agricultural and urban watersheds without wastewater treatment plants. For the remaining metric, the average for Baetidae relative abundance, agriculture sites with no wastewater treatment plant in the watershed had the most favorable score but metric averages for the agricultural site with a wastewater treatment plant and the urban sites with no wastewater treatment plant were comparable. For three of the metrics (Ephemeroptera, Plecoptera, and Trichoptera relative abundance; dipteran relative abundance; and abundance weighted tolerance), average values were comparable for agricultural and urban sites; however, for the two remaining metrics, average values indicated that ecological conditions at agricultural sites were less disturbed than at urban sites. The usefulness of these preliminary comparisons is somewhat limited because watersheds with higher amounts of forest are yet to be sampled, because of the low number of sites in some categories, and by the current lack of comparison to habitat factors such as streambed substrate size and embeddedness, riparian shading, and stream morphometry. Results are comparable, however, to results from other biological assessments conducted at the same sites with fish and macroalgae. Therefore, there are multiple lines of evidence indicating that biological communities are responding to different forms of land use in the upper Illinois River watershed. . ID: 129

B22. Does the importance of crayfish as shredders differ with flow permanence?

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Many headwater streams in the north-central Arkansas Ozarks are characterized by upstream ephemeral segments containing residual pools and downstream perennial segments. We examined the contribution of crayfish to leaf breakdown in stream segments with differing hydrology. We compared leaf breakdown rates in mesh litter bags with either an added crayfish or no crayfish in paired ephemeral and perennial segments of three Ozark streams. We expected faster breakdown in perennial segments because of mechanical breakdown associated with greater water velocity. We also expected non-crayfish invertebrates to contribute more to breakdown in perennial segments and crayfish to contribute more to breakdown in ephemeral segments. On average, breakdown was slightly faster in perennial segments ($k=0.0150\text{ d}^{-1}$ vs. ephemeral segments: $k=0.0144\text{ d}^{-1}$) after 22 days. Breakdown was also faster in bags with an added crayfish in both perennial ($k=0.0169\text{ d}^{-1}$ vs. bags with no crayfish: $k=0.0137\text{ d}^{-1}$) and ephemeral segments ($k=0.0150\text{ d}^{-1}$ vs. bags with no crayfish: $k=0.0141\text{ d}^{-1}$). Crayfish contributed more to breakdown in perennial segments; breakdown was 0.0032 d^{-1} faster in bags with an added crayfish in perennial segments compared to 0.0009 d^{-1} faster in ephemeral segments. Crayfish activity may be reduced in ephemeral segments because of harsh environmental conditions such as lower temperatures and dissolved oxygen concentrations. These data, along with investigation of other shredding invertebrates associated with leaf bags, will clarify the influence of crayfish on leaf breakdown in streams with variable flow permanence. Ab ID: 130

B23. Population Dynamics of Mole Salamanders (*Ambystoma talpoideum*) in a Northeast Arkansas pond

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We examined the population dynamics of the Mole Salamander, *Ambystoma talpoideum*, in a pond in Greene County, Arkansas from 26 January to 16 March 2007. Salamanders were captured with seines and dip nets during four sampling events. Snout-vent length was recorded for each individual and visible implant elastomer marks were given for mark/recapture analysis. A total of 17 adult salamanders was captured including 6 males and 11 females. No statistically significant differences were found in average snout-vent length between sexes (56.52 mm in males and 60.10 mm in females, $P = 0.383$) or average mass between sexes (8.83 g in males and 8.54 g in females, $P = 0.843$). The maximum estimated size of the breeding population was 37.3 individuals. In Arkansas, *Ambystoma talpoideum* is listed as a Species of Greatest Conservation Need. Ab ID: 131

B24. New State Record Insects from the Burrows of Baird's Pocket Gopher in Arkansas.

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Pocket gopher burrows provide a stable environment for a variety of invertebrate and vertebrate inquilines. Most of the arthropods inhabiting pocket gopher burrows are restricted to this microhabitat. The current results of our sampling efforts are part of a state-wide biotic survey project of insects inhabiting the burrow of Baird's pocket gopher in Arkansas. Pitfall traps were established in pocket gopher burrows in 2011 in Drew, Ouachita, and Nevada Counties. Retrieved samples contained several families of beetles, cave crickets, and anthomyiid flies. Significant results include the discovery of the small carrion beetle *Ptomaphagus geomysi* Peck. Ab ID: 132

B25. Diet of Radiotracked Musk Turtles, *Sternotherus odoratus*, in an Urban Stream

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We used radiotelemetry to assess the diet of *Sternotherus odoratus* in a small, frequently disturbed urban stream in which the invasive Asiatic Clam, *Corbicula fluminea*, has attained high densities. Turtles foraged in small, well-defined home ranges within which we sampled the substrate for potential food items. We compared *S. odoratus* diet, which we determine by analyzing fecal samples, to prey availability in the creek. The diet was similar to that found in previous dietary studies of *S. odoratus* except that clams were eaten much more frequently, and the diet compared favorably to prey availability in the creek. The most important prey in both the fecal samples and substrate samples was *C. fluminea*. We suggest the diet of *S. odoratus* has shifted toward molluscivory as the result of a probable 40-yr presence of *C. fluminea* in Gin Creek. Preliminary evidence suggests that changes in head morphology have accompanied the dietary shift. Ab ID: 133

B26. Cytokine gene expression in the ceca of turkey poultts infected with *Eimeria adenoeides*, measured by quantitative PCR

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Chemokine, and cytokine profiles were investigated in 20 d old turkey poultts following an oral infection with 12.5×10^3 oocysts of *E. adenoeides*, a protozoan parasite of the genus *Eimeria* that develops in the ceca. Local immune activities were characterized by observing the extent of leukocyte infiltration in the ceca by histology, measuring subsets of the lymphocyte population by immunohistochemistry, and determining the relative expression of cytokines by real-time RT-PCR. Inflammation, assessed by scoring the extent of cellular infiltration of leukocytes in sections of ceca, was significantly higher in infected poultts compared to uninfected poultts on d 4, 7, 9 and 11 following infection. The percent area occupied by CD4+ and CD8+ cells in the ceca was significantly greater on d 9 and 11 for CD4+ cells and d 11 for CD8+ cells in infected poultts compared to uninfected controls. The relative expression of the chemokine CXCLi2 and the cytokines IL1 β , IFN γ , IL13 and IL10 was investigated in tissue samples taken from the ceca. Increased expression of CXCLi2 occurred on

d 4 and d 7. Increased expression of IL10 and IFN γ occurred on d 4, and IL1 β and IL13 on d 7 post-infection. The increased leukocyte infiltration in the ceca, alterations in the lymphocyte subpopulations, and changes in expression of chemokines and cytokines are an indication of the cell mediated immune mechanisms occurring in the host as a result of exposure to *E. adenoeides*. Ab ID: 141

B27. Determining the Mechanism of Mitochondrial Fission/Fusion in Dictyostelium discoideum

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Mitochondria, the power house of the cell, create energy in the form of ATP. These organelles are very dynamic and are constantly undergoing fission (splitting) and fusion - events which maintain the tubular, highly branched network of mitochondria found in yeast and mammalian cells. Mitochondrial dynamics have been studied in many cells types, and, thus far, all the mitochondria studied have presented this tubular, highly branched structure. Interestingly, as we describe here, our model system, Dictyostelium discoideum, has spherical mitochondria which do indeed carry out the processes of fission and fusion. It is our goal to determine the mechanism of mitochondrial fission in these cells in an effort to understand the fission machinery found in all organisms. We have begun to analyze proteins associated with the mitochondria to determine if they play a role in fission. Thus far, we have analyzed MidA, CluA, and have preliminary data on DymA and DymB. We have concluded that both fission and fusion events are significantly decreased in strains not expressing MidA or CluA. We hypothesize, based on other functional data, that the decrease in these processes in cells lacking MidA is probably an indirect effect. While in cells lacking CluA, we predict this decrease is the result of Clu's role as a fission/fusion linker protein or of a lack of interaction with the cytoskeleton. Additional studies are underway to distinguish between these two possibilities. By analyzing mitochondrial dynamics in D. discoideum cells, we will further our understanding of the mechanism regulating fission in this organism. Ultimately, we hope to gain insight into mitochondrial dynamics of all eukaryotes, as well as increase our understanding of mitochondrial evolution. Ab ID: 143

B28. Retrospective Epidemiologic Analysis of Influenza Pandemics in Arkansas

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This study analyzes influenza deaths in Arkansas during the pandemics of: 1918 (aka Spanish flu), 1957, 1968, and 2009 (H1N1, aka Swine flu). Death certificate and U.S. census data were gathered and analyzed for statistical differences in mortalities based on sex, age, and geographic regions of Arkansas for each pandemic. The geographic regions were defined by the five Public Health Units classified by the Arkansas Department of Health. Regional mortalities were also analyzed across the pandemics to investigate how the different influenza A viruses affected each individual region. It was hypothesized that males presented higher mortalities than females and the more rural regions exhibited higher mortalities than the urbanized regions. Historically, young and elderly populations presented higher mortalities for the pandemics, with the exceptions of the two H1N1 viruses. It was hypothesized that these H1N1 pandemics presented higher mortalities in the young adult and middle-age groups in Arkansas. Chi-square analyses for each pandemic showed only the 1918 pandemic had statistical differences between male and female mortalities ($p < 0.005$). All pandemics showed statistical differences in mortalities across age groups. Analyses across the geographic regions found statistical differences in mortalities for all pandemics except 1968 ($p > 0.5$). Data showed the more urban regions sustained higher mortalities than the rural regions. Across the century, the four pandemics resulted in decreased mortalities throughout the state. Regional mortality rates offer a suggestion as to which areas to focus increased public health efforts during future influenza outbreaks in Arkansas. With this knowledge, health professionals may be able to distribute response resources efficiently to reduce mortality rates. Ab ID: 144

B29. The Analysis of Cataract and/or Myopathy Causing Missense Mutation, R120G in human α B-crystallin

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In our lab, we study a small heat shock protein, α -crystallin. The α B-crystallin, a polypeptide of 20 kDa subunit of α -crystallin, is a major water soluble protein in the vertebrate lens. Unlike the α A-subunit, α B-crystallin is ubiquitously expressed in nonocular tissue with high abundance in the skeleton and cardiac muscle, which implicates that it may participate in other cellular functions beyond providing optical transparency. Consistently, mutations in α B encoding gene causes many disorders including congenital cataract and/or myopathy phenotype. Up to date, total of nine missense mutations in α B-crystallins have been identified. The most well-known is the mutation of Arginine-120 to Glycine (R120G) in α B-crystallin, which is associated with cataracts and desmin-related myopathy (DRM), a disorder of the skeletal muscle. To explain how mutations in α B-crystallin lead to the development of cataract/myopathy, the differences in the oligomeric size, secondary and tertiary structure, surface hydrophobicity, and chaperone function have been investigated in R120G as compared to the wild type α B-crystallin. Understanding the pathophysiology of hereditary cataracts can yield insight into the mechanisms of cataractogenesis. Ab ID: 150

B30. Bacteriostatic Activity of a Novel Silver-Containing Hydrogel

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Harding University Department of Biology¹, Harding University College of Pharmacy²

A novel silver-containing hydrogel was formulated at Harding University College of Pharmacy that appears to have broad bacteriostatic and bactericidal properties. In vitro antimicrobial susceptibility testing was performed with a diverse group of microorganisms representing gram negative rods/bacilli (GNR), gram positive rods/bacilli (GPR), gram positive cocci (GPC), and yeast. Using a standard microtube method to determine minimal inhibitory concentrations (MICs), we determined the following MICs (ug/mL \pm SD; N): *Acinetobacter baumannii* / GNR (0.3 \pm 0.2, 6), *Bacillus spp* / GPR (0.3 \pm 0.2, 6), *Candida albicans* / yeast (0.1 \pm 0.1, 33), *Enterococcus faecalis* / GPC (1.0 \pm 0.7, 6), *Escherichia coli* / GNR (0.3 \pm 0.1, 6), *Pseudomonas aeruginosa* / GNR (0.8 \pm 1.2, 16), *Staphylococcus aureus* (not methicillin resistant) / GPC (0.3 \pm 0.2, 28) *Staphylococcus aureus* (methicillin resistant/MRSA) / GPC (0.3 \pm 0.2, 34), *Staphylococcus epidermidis* / GPC (0.2 \pm 0.1, 6), *Streptococcus pyogenes* / GPC (0.1 \pm 0.0, 3). These data suggest this novel silver-containing hydrogel is a broad-spectrum antimicrobial agent that may have clinical utility. Further studies are underway to determine its kill time kinetics, and potential toxicity to mammalian cells. Ab ID: 153

B31. Effects of Exercise on Cognition in Young Adults

Hunter L Robinson, Mariah Small

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Cardiovascular health benefits of exercise are widely recognized. More recent studies demonstrate that exercise can improve cognitive functions, including spatial memory, in older adults and school age children. Benefits of exercise to young adults are not as well documented. This study evaluates effects of exercise on young adult memory, as evidenced by impact on grade-point averages (GPA), short-term memory, and perceived benefits of exercise. The goal of this study is to evaluate effects of exercise on college-age students and compare our findings with previous studies involving individuals from other age groups. Ab ID: 166

B32. Anomalous Highly Polished Chert Pebbles from Peccary Cave, Newton County, Arkansas

Diana A. Fletcher Stanley, Leo C. Davis, Kenneth M Ball

Southern Arkansas University, Magnolia, AR

Near the close of three summers' excavation of Peccary Cave sinkhole (natural entrance), highly polished angular chert pebbles were discovered in the lowest levels. This note examines the physical characteristics and postulates an origin for these anomalous layers. These layers are approximately twice as deep as Level 18 which has been C-14 dated at 4,300 +/- 70 years old, although we cannot prove that rate of deposition remained constant. Ab ID: 154

B33. Arkansas Crop Residues for Solid Biofuel Development in the Region

Shyam Thapa, Robert Engelken, Kevin Humphrey, Joshua Vangilder, Maqsood Ali Mughal, M. Jason Newell, David McNew, Frederick Felizco, John Hall, Elizabeth Hundley
Arkansas State University, Jonesboro, AR

The sustained harvest of crop residues in Arkansas could potentially bring opportunities for the development of various value-added products in the region. Our ongoing research on "solid biofuel" is aimed at determining optimal constituents and material properties in pelletization, for example, moisture content, particle size, and binders and their proportions, keeping other process variables constant. Previously, the evaluation of good candidates for binders was made by performing hardness tests. However, several additional mechanical tests are underway which, in turn, will supplement our evaluation process. We are planning on also investigating preservatives and encapsulants in order to protect biomass pellets from molds, bacterial decomposition, insects, vermin, and water. Although mechanical tests are important for transportation, handling, and storage, our primary objective is to compare the energy density or heating value of pellets made with various combinations of materials, and conduct studies of their emissions and ashes. We hope to see agricultural wastes in Arkansas turn into useful products for thermal applications, which should ultimately help bring energy security and economic development to the region. This work is supported, in part, by National Science Foundation Grant EPS-1003970 and a graduate student research grant through the ASU Judd Hill Foundation. Ab ID: 173

B34. How distinct are the geographically isolated coastal populations of ponderosa pines in the Willamette Valley of Oregon and Fort Lewis, Washington?

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Incomplete lineage sorting and the potential for inter-specific hybridization in the genus *Pinus* make it challenging to determine recent biogeography and perhaps even to delimit some species. We studied isolated natural stands of ponderosa pines in the Willamette Valley of Oregon and on the Fort Lewis military base near the Puget Sound in Washington. Several researchers have reported that one or both of these pine populations have unique characteristics such as the timing of spring growth, wood density, and biochemistry. These populations are currently classified as *P. ponderosa* var. *pacifica*, but are geographically distant from other var. *pacifica* from coastal California. In addition they grow in a very different climate than the nearer populations of ponderosa in eastern Oregon and eastern Washington (*P. ponderosa* var. *ponderosa*, North Plateau Race). We wish to assess if the populations from the Willamette Valley and Fort Lewis are more closely related to each other than any other variety or if they fit within one of the two varieties. We sampled 10 populations from the Willamette Valley, the Puget Sound, var. *pacifica* in California, and the North Plateau Race from eastern Washington, western Idaho, and central Oregon. We analyzed climate variables and employed microsatellites from the chloroplast and nuclear genomes to investigate the puzzling lineage of these populations. Climate modeling suggests that a plant species restricted to the Fort Lewis location is not very likely to be found in the Willamette Valley, and in the converse test, the Willamette Valley has a very different climate from Fort Lewis. Considering chloroplast data from the eight most genetically related populations provides evidence that Fort Lewis and Willamette Valley populations are very distinct from each other. Similarly, Fort Lewis is distant from the Willamette Valley based on nuclear data. This study provides preliminary genetic and ecological evidence that both populations have been isolated long enough to have

accumulated biologically meaningful differences. If this is supported by morphological evaluations currently under way, then a revised classification reflecting each of these as a variety of may be warranted. Ab ID: 176

B35. The use of an inducible glucose oxidase gene in tobacco to as a model for oxidative stress research

Nathan Reyna, Dexter Barksdale, Meg Coffman
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We have begun to demonstrate the viability of using transgenic tobacco (*Nicotiana tabacum*) plants with an estradiol inducible (XVE) expression of a glucose oxidase (GOX) as a model system for oxidative stress research. The XVE:GOX plants are an ideal system is highly inducible and tightly controlled by specific inducers not produced by plants. When expressed, the GOX protein catalyzes the breakdown of glucose in the plant cell; a byproduct of this process is the generation of H₂O₂ and subsequently oxidative stress. Further we have shown a potential increase in relative apoptotic-like programmed cell death (AL-PCD) levels after H₂O₂ production. Glutathione Reductase (GR) activity increased as a result of H₂O₂ production in our system however; Western blot analysis showed no increase in GR expression levels. We are currently working enzymatic assays for other oxidative stress related enzymes and are using QRT-PCR to measure changes in gene expression genes associated with oxidative stress induced AL-PCD. The effects of GOX expression on leaf physiology will be determined using a chlorophyll fluorescence monitoring system (JR-PAM). Our project seeks to establish the viability of using plants as a model system to study PCD in animals. This system is ideal for the undergraduate research lab. Current results will be reported. Ab ID: 177

Biology Poster Presentation Abstracts

B-1. Status, dispersal, and breeding biology of the exotic Eurasian Collared-dove (*Streptopelia decaocto*) in Arkansas

John M. Fielder, Ragupathy Kannan, Douglas A. James
University of Arkansas, Fort Smith AR

The exotic Eurasian Collared-dove (*Streptopelia decaocto*) was first sighted at Harrison, Arkansas on 25 June 1989. Since this initial sighting the species has grown in numbers and is now present in 42 counties across the state. In the spring and summer of 2009 and 2010, 20 nests were observed in the urban areas of Fort Smith (Sebastian County). Fifteen of the 20 nests (75%) were located on human-made structures of which 13 (65%) were on an electrical substation and two (10%) were on utility poles. The remaining 5 nests (25%) were in trees. Mean nest height was 7.62 m (n=20 nests), and the mean width of the nest site was 40 cm (n = 6 nests). Three focal nests were chosen for intense observation. Nest building lasted 1 to 3 days (mean = 2 days); incubation period was 15 days; and fledging occurred 17-18 days after hatching (n = 3 nests). Ab ID: 51

B-2. Establishing baseline data in the subwatersheds of the Strawberry River, AR, prior to implementation of agricultural best management practices

Teresa R Brueggen, Jennifer L Bouldin
Arkansas State University, Jonesboro, AR

Benthic macroinvertebrates assessments are valuable tools when attempting to determine the success of agricultural best management practices (BMPs) as they indicate alterations in physical, chemical, or biological factors. It is necessary to assess an aquatic system prior to implementation to establish a baseline for

comparison to data collected post-BMP implementation. The purpose of this study was to obtain pre-BMP land use and macroinvertebrate population data in order to establish a baseline for three subwatersheds, Little Strawberry (LS), Greasy Creek (GC), and Sandy Creek (SC) of the Strawberry River Watershed, located in north central Arkansas. Spring data for the three subwatersheds was collected in 1995, 1999, 2002, 2003 and 2009. The measures calculated include: taxa richness, Hilsenhoff Biotic Index (HBI) and Ephemeroptera, Plecoptera and Trichoptera (EPT) score, % dominant taxa, and % Diptera. Varying measures indicate overall stable water quality in the LS subwatershed. Results for GC subwatershed vary with some indicating a stable habitat while increasing % dominant taxa and Diptera indicate a decreasing trend in overall quality. All measures in the SC subwatershed indicate decreasing water quality on a temporal basis. This study indicates the importance of continued data collection in an effort to monitor changes in aquatic systems. Ab ID: 109

B-3. Southern Arkansas University Biodiversity Collection and Database

Katherine S Dockter, Shawn E Krosnick
Southern Arkansas University, Magnolia AR

Voucher specimens are the only reliable manner by which to determine the identity of species included in biological studies. They also provide a wealth of information regarding the historical ecology, diversity, and economic changes that have occurred in a region over time. The voucher specimens that comprise the Southern Arkansas University Biodiversity Collection are a valuable asset to current and future researchers working in Arkansas. This collection is comprised of plants, vertebrates (including amphibians, fish, reptiles, and mammals), and invertebrates (including insects, flatworms, and crayfish). The Biodiversity Collection Database is the result of two years of continuous work by several individuals, including both SAU undergraduates and Biology Department faculty. In the process, all specimens in the collection have been fully curated including cleaning, repair to the fullest extent possible, tagging, resealing, and databasing. All collections have been databased in full with the exception of the mammals, which are currently in progress and are expected to be completed by May, 2012. At present, there are more than 3,300 specimens in the Biodiversity Collection Database. The majority of the specimens were collected locally in Columbia County, Arkansas, although the collection contains specimens from 31 states. Over 150 individual collectors have contributed to the collection since the first specimen was collected in 1901. The most prolific collectors represented in the Biodiversity Collection are H. W. Robison and L. A. Logan. The intent of this work was to improve ease of location of individual specimens and to ensure that the collection is accessible to future students and researchers. The database will be available for searching upon request, and will be fully searchable online within the next two years. Ab ID: 86

B-4. Central nests are more successful and preferred for reuse than peripheral nests in cliff swallow colonies

John Thames, Douglas Leasure, Binh Cortes, Ragupathy Kannan, Steward Huang, Douglas James
University of Arkansas, Fort Smith AR

We observed four colonies of Cliff Swallows (*Petrochelidon pyrrhonota*) in western Arkansas in 2008 to quantify nesting success and nest site preferences. The inner 50% of each colony was designated central and the outer 50% as peripheral. Central nests were significantly more likely to be reused and enhanced than peripheral nests. This finding was reinforced by the fact that nest masses were significantly greater in central than in peripheral nests. Nesting success and clutch sizes were significantly greater in central than in peripheral nests. These results suggest that Cliff Swallows prefer central nests to peripheral nests and that those that occupy central nests enjoy better clutch size and nesting success. Ab ID: 93

B-5. An updated protocol for human leukocyte culture and karyotype preparation for use in biological education

Shawn Krosnick, Tyler Chafin, Subir Shakya
Southern Arkansas University, Magnolia, AR

Karyotyping is a valuable tool in both the laboratory and clinical setting. It can be used in studies of genetic heredity, and in the diagnosis of diseases relating to chromosomal abnormalities. In the classroom, students can barely utilize this technique; largely because of out-dated protocols available to the biological educator. The primary objective of this project was to update the procedure and provide, using the latest cytological techniques, a simple and affordable method to view karyotypes using the chromosomes available in the nucleus of lymphocytes. To create the karyotype for analysis, human leukocytes are obtained from just a few drops of blood. The cells are then induced to divide by mitosis, and then frozen at metaphase. They are then lysed to provide the spread of chromosomes. Even though it is the same basic approach that has been used for years, this is a more utilizable method thus making this technique more accessible for the average education laboratory. It just uses a few drops of blood hence is quite efficient and quick. As a result of this project, educational laboratories will have access to a method in which even a few drops of blood can produce a literal picture of the each individual student's genome in its entirety. Although resultant concentration of chromosomal spreads produced was lower than in "older" macroculture methods, this protocol still yields karyotypes in a high enough frequency to be valuable in the classroom setting. However, for applications requiring a higher yield, a larger scale method using venous blood has also been updated. Ab ID: 95

B-6. Differential Use of Femoral Glands Based on Foraging Strategy in Lizards

Gregory J Robinson, Stanley E Trauth
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We examined the femoral glands, a row of epidermal holocrine glands on the ventral surface of the hindleg in many lizard species, using basic histological techniques and scanning electron microscopy. Study species are sympatric, and include the Six-lined (Prairie) Racerunner, *Aspidozelis sexlineata viridis* (Teiidae), and the Northern Fence Lizard, *Sceloporus undulatus hyacinthinus* (Phrynosomatidae). Femoral gland secretions are known to contain alcohols, steroids, and carboxylic acids, as well as numerous other volatile compounds, and are used to convey information about body condition and social standing for breeding purposes and territory delineation in sit-and-wait predators such as *S. undulatus*. In active foragers such as *A. sexlineata*, no territory is established or defended, and we expect secretion composition and/ or gland structure to be different if the secretions are utilized for other purposes. Further examination will include differential histological staining techniques, transmission electron microscopy, and possibly GC/MS examination of the secretion compounds. Based on previous studies, closely-related organisms from different climate types may be examined to rule out differences based on family.

B-7. Efficacy of Chemical vs. Biological Treatment Protocols for the Removal of Phosphorus from Municipal Wastewater Effluent

Emily Hitzfelder, Anna Willis, Timothy Wakefield
John Brown University, Siloam Springs, AR

The Siloam Springs Wastewater Treatment Plant in northwest Arkansas expels treated waste water into Sager Creek. Prior to 2009 its output of phosphorous was unregulated. New limits were established by the EPA and the plant was ordered to comply by December 2009. A chemical treatment protocol to remove phosphorus was initiated in November of 2009. Construction of additional facilities to remove phosphorus through biological filters also began that same year. The biological filters went on-line in June of 2011. Utilizing water chemistry testing as well as analysis of benthic stream macroinvertebrates to produce a Family Level Biotic Index (FBI) and a Diversity Index (SDI) the health of Sager Creek was compared for the years 2009-2012. These numbers were analyzed to determine the efficacy of the treatment protocols. Ab ID: 102

B-8. Reliability of Student Bioassessments of Flint Creek

Hannah Constantin, Gibbs Kuguru, Rachel Watson, Timothy Wakefield

John Brown University, Siloam Springs, AR

In any well-conceived experiment, the number of variables that could potentially affect the results should be carefully controlled. This level of control is difficult to attain in field experiments where environmental factors are impossible to regulate. During the past three years, field research on Flint Creek has been conducted utilizing six different teams of undergraduate researchers. Although environmental variables have changed seasonally, other variables, such as changes in riparian vegetation, removal of gravel, effects of livestock usage, etc., have been negligible due to the location of the study site, (i.e. private property with minimal usage). Therefore, biological assessments of the creek should be relatively stable over the length of the study period. Should statistically significant findings emerge, it could be reflective of inconsistency in the collection protocol of student researchers. Through data analysis, we have found that student samplings are a reliable source for data collection in assessing the health of the stream. Ab ID: 104

B-9. Searching for Beetles (Coleoptera: Scarabaeidae and Histeridae) Associated with the Dung of Native Arkansas Mammals

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University of Arkansas–Monticello, Monticello, AR

Histeridae) associates of native Arkansas mammals is poorly known. Most of the known records of dung associated beetles in Arkansas have been collected from UV, flight-intercept, or domesticated dung baited traps. We opportunistically searched and collected beetles in situ from the dung or nests of native mammalian species. Preliminary work suggests that most beetles found in situ are mainly generalists that are expected to occur. We found one species of Histeridae, *Onthophilus nodatus* LeConte, that is a new state record. Ab ID: 105

B-10. HPLC Analysis of Nectar Samples Collected from *Passiflora herbertiana*: Implications for Feeding Preferences of Australian Passerine Birds

Samson G King, Shawn Krosnick, Tim Schroeder
Southern Arkansas University, Magnolia, AR

Nectarivorous bird species are known to be essential pollinators for many species of flowering plants throughout tropical regions of the Americas, Africa, and Australia. One such species of plant dependent on bird pollination is the Australian Native Passionfruit, *Passiflora herbertiana*. Found throughout much of Northeastern Australia, this species possesses several floral traits in line with bird-pollination syndromes: the flower remains open and erect for several days, produces large amounts of dilute sugars, produces no scent, and are brightly colored, starting out yellow and turning bright pink with age. In an attempt to better understand pollination syndromes in bird species that visit *P. herbertiana*, nectar samples were obtained from the nectaries of 17 flowers of varying ages from a population of three large individual vines in Queensland, Australia, during the summer of 2011. Field observations of pollinators at the same location were also made that confirmed the association of birds (Lewin's Honeyeater and Eastern Spinebill) with *P. herbertiana*. The nectar samples were then analyzed by High Performance Liquid Chromatography (HPLC) to give a clearer picture of relative sugar concentrations of sucrose, glucose, and fructose. Resultant data obtained from 16 sample runs indicate the presence of no detectable amounts of either hexose sugar, with sucrose being the sole sugar identified in the samples. A seventeenth sample produced equivalent levels of sucrose, glucose, and fructose. This outlier may be due to degradation of sucrose to glucose and fructose by a potential bacterial infection or other environmental agent. The results of this study raise several new questions. Honeyeaters are passerine birds that are not expected to have a strong preference for sucrose-rich nectar; this stands in contrast with New World hummingbirds, which do prefer sucrose-rich nectar. The fact that *P. herbertiana* produces only sucrose given it is visited by honeyeaters is interesting. Sucrose production in *P. herbertiana* could be indicative of the close evolutionary history it shares with New World hummingbird-pollinated species of *Passiflora* endemic to the Caribbean. Alternatively, species of passerine birds may benefit from a diet

consisting largely of sucrose, even if it is not a requirement. It is also possible that the presence of sucrose-rich nectar is coincidental with regard to the pollinators associated with this species. Further examination of these hypotheses is considered here, along with implications for future studies on *P. herbertiana* and its relatives. Ab ID: 114

B-11. Using forward-looking infrared imagery to estimate white-tailed deer populations on a military installation

Danielle M Techentin, Emily S Boyd, Wesley E Sparks, Robert E Kissell, Jr.

University of Arkansas at Monticello, School of Forest Resources; Department of Defense, Pine Bluff Arsenal, White Hall, AR

Military installations, like Pine Bluff Arsenal (PBA), present unique challenges to natural resource managers for managing wildlife populations. White-tailed deer (*Odocoileus virginianus*) populations are often closed because high fences surround much of the property. It is important to have population estimates to establish a baseline from which sustainable harvest rates can be developed. We used Forward-Looking Infrared (FLIR) technology and distance sampling to estimate the size of the deer population on PBA. We estimated the density of white-tailed deer to be 0.182 deer/ha (1 deer/13.7 acres, CV = 0.099) with a mean cluster size of 3.4 deer. Our density estimate was near the natural resource manager's target density of 1 deer/15 acres. Ab ID: 120

B-12. Turtle Usage of Urban Ditches in an Expanding Northeastern Arkansas City

Jonathan S Elston, John J Kelly, Stan E Trauth

Arkansas State University, Jonesboro, AR

Human expansion has contributed to the reduction of wildlife biodiversity across the globe. Turtles are just one of many taxonomic groups that have experienced increased decline in the last few decades from anthropogenic expansion. Turtles have been able to persist in habitats heavily modified by humans; yet, little is known about the ecology of these urban populations. The present investigation focused on urban ditch characteristics associated with high turtle abundance and richness. From May to August of 2011, 199 turtles of six different species were captured in four ditch systems in Jonesboro, Craighead County, AR. We used double-throated hoop traps with 5 cm trap mesh. We found a 14% recapture rate. Four additional ditch systems will be added to the 2012 season, resulting in a total of eight ditch systems. Following completion of the 2012 season, an analysis of ditch length, ditch width, buffer zone width, number of turtles, and number of turtle species will be conducted. Ab ID: 163

B-13. History and current status of Egyptian Goose (*Alopochen aegyptiacus*) in northwestern Arkansas

Kimberly G Smith, Douglas A James

University of Arkansas, Fayetteville, AR

The Egyptian Goose first appeared in northwestern Arkansas in spring of 1988 at the fish hatchery in Centeron in Benton County. The origin of these birds is unknown, but they were probably locally released feral birds. During the 1990s, the population grew, with the largest concentration of 40-50 birds associated with a pig farm in Hiwasse. Since 2000, there have been scattered breeding records in Benton County and small numbers of birds wintering at the fish hatchery, with very few records from Washington County. Currently the largest concentration of about 35 birds is associated with a drive-through zoo in Gentry. The Egyptian Goose population meets most of the American Birding Association's criteria for an established population, except that they still may be dependent on human support. Ab ID: 165

B-14. Lambing season ecology of bighorn sheep in the Bighorn Canyon National Recreation Area

Faye Stephens, Robert Kissell, Emily Boyd
University of Arkansas at Monticello

The bighorn sheep (*Ovis canadensis*) population in the Bighorn Canyon National Recreation Area is thought to have recently declined due to reduced survival of lambs. Understanding causes of mortality and other factors that shape bighorn sheep populations is crucial to effective management. Mortality of lambs during summer may occur due to predation, disease, poor nutrition, or falling. Surveys were conducted to determine lamb production, mortality, and possible causes of mortality. During lambing season, ewes with lambs typically inhabit the canyon for escape terrain. For this reason, surveys were conducted by boat on the Bighorn River, which flows through the canyon, in addition to survey by foot. Though results are preliminary, we estimated approximately 52 adult and juvenile ewes that produced at least 13 lambs. The lamb:100 ewe ratio increased in early summer, as expected. We did not observe any mortality of lambs. We documented one mortality of a yearling ewe only. We did not observe any coughing in lambs, which would indicate presence of lungworm, a cause of mortality in lambs. This field season was unusual in that there was a record amount of precipitation during the winter and spring, causing an increase in forage. This allowed ewes to utilize the superior escape terrain of the canyon until the last two weeks of the survey. Ab ID: 137

B-15. Buffalo Bill and the Wild Horses of Wyoming: Genetics Traced to English Royal Family Horses

Rachel Fowler, Gretchen Saam, Claude Baker
Southern Arkansas University, Magnolia AR

The McCullough Peaks Herd Management Area, located 12 to 27 miles east of Cody, WY (70 mi east of Yellowstone Park), encompasses 109,814 acres of land, including the McCullough Peaks Wilderness Study Area. The climate is typical of a cold desert with annual precipitation averaging five to nine inches. The beautiful wild horses living in this cold desert climate show a wide diversity of coat colors (bay, brown, black, sorrel, chestnut, white, buckskin, gray, palomino, and blue, red and strawberry roans) and patterns such as piebald and skewbald. The animals tend to be moderate to large-sized and are in very good condition. Despite their marginal habitat conditions, the horses have adapted well and have a higher reproductive rate than any other herd. Buffalo Bill Cody's journals suggested genetic mixing of his horses with wild mustangs. When Buffalo Bill's Wild West Show was inactive, he would pasture his royal bloodline horses in an unfenced area allowing them to roam all of the Peaks area. When he corralled his horses for the Wild West Show, he would end up with an extra horse or two and would probably lose a horse or two as well. To verify that genetic mixing took place, DNA testing was conducted in the summer of 2011 between 10 of the McCullough Peak horses and 8 from the British Royal horses, which are of the same bloodline of the horses Queen Victoria gave Buffalo Bill. DNA findings confirmed that two wild stallions from McCullough Peaks, are descendants of Buffalo Bill's royal show herd that he pastured along these peaks. Four of eight mares were also positive matches. Ab ID: 145

B-16. Bacterial Transformation and Protein Purification of a Mutant GFP Fusion Gene

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Green fluorescent protein (GFP), first discovered in the jellyfish *Aequorea victoria*, can be used as a research tool to locate and track proteins and structures within a cell without introducing toxins into the cell or killing it. GFP is commonly fused to a protein that resides within an organelle or cell being studied. This can provide insight as to how neurons function, migration of cells during embryonic development, and cytoskeletal dynamics. The gene expressing GFP can be inserted into a variety of organisms such as *E. coli*, *Drosophila*, mice, and others. In this research, the plasmid pGREEN, which contains a GFP gene, a promoter to encourage expression of the gene, and a gene for ampicillin resistance, was introduced into *E. coli* cells. Most of the bacteria successfully took up the plasmid as the cells growing in colonies on LB/Amp agar plates showed

strong fluorescence under UV light. These cells were then placed in liquid cultures, which enabled them to express the GFP protein in large quantities. The cells were lysed and the lysate from the cells that contained the foreign protein were then isolated and purified using hydrophobic interaction chromatography. This purified lysate was then analyzed using SDS-PAGE protein gel electrophoresis, which enabled the GFP to be visualized on a gel and prevent the protein structure from being damaged. The size of the purified protein was checked and also compared to the unpurified lysate. Although no formal hypothesis was tested, practice was obtained in bacterial transformation with pGREEN, synthesis of GFP from the plasmid, isolation and purification of GFP, and visualization of the protein on a gel. Ab ID: 146

B-17. Expression of FtsZ Orthologs to Identify Interacting Protein

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The powerhouses of the cell, mitochondria, are extremely dynamic. Imaging of these organelles in yeast and mammalian cells demonstrates that the steady state tubular structure undergoes numerous fission and fusion events. The balance of these events ensures that the mitochondria can exchange vital components, as well as remain distributed throughout the cell. Mitochondrial dynamics have been studied in many cell types, and thus far all the mitochondria studied have this tubular, highly branched structure. Interestingly, *Dictyostelium discoideum* has spherical mitochondria. These spherical mitochondria do undergo fission and fusion. Our goal is to identify the mechanism of fission in these cells. *D. discoideum* cells encode two FtsZ proteins, FszA and FszB. FtsZ is a tubulin homolog found in prokaryotes and is responsible for cytokinesis. As mitochondria evolved from bacteria, it is logical that *D. discoideum* two FtsZ proteins may be involved in mitochondrial fission. Thus we are creating expression constructs of both FszA and FszB in an effort to 1) purify the proteins for structural studies and 2) identify interacting partners. Here we describe our progress. Ultimately, we hope to gain insight into the mitochondrial dynamics of all eukaryotes, as well as increase our understanding of mitochondrial evolution. Ab ID: 147

B-18. An approach to identify histone post-translational modifications that regulate meiotic recombination

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Homologous recombination during meiosis increases genetic diversity and is required for accurate chromosome segregation. Hotspot sequences regulate the frequency and position of meiotic recombination throughout the genome, but their mechanisms are poorly understood. Current evidence suggests recombination at hotspots involves histone post-translational modifications (PTMs). The specific histone PTMs at hotspots, their dynamic regulation throughout meiosis, and their role in recombination remain to be determined. Our goal is to identify, systematically and comprehensively, the dynamic regulation of histone PTMs at hotspots throughout meiosis. Here we describe an approach to isolate histones at meiotic recombination hotspots in the fission yeast *Schizosaccharomyces pombe*. We report the construction of minichromosomes containing eight lac operator (LacO) DNA sequences. Our minichromosomes contain either a hotspot DNA sequence or a matching negative control. We expressed a Lac repressor fusion protein (LacI-GFP) and purified it to near homogeneity. We found that this LacI-GFP fusion protein binds with high affinity and specificity to minichromosomes with LacO DNA sites. Using fission yeast, we can induce synchronized meiosis in large cultures harboring either the hotspot minichromosome or control minichromosome. In the future, we will use affinity-capture to purify minichromosomes from meiotic cultures and will use high resolution liquid chromatography tandem mass spectrometry (LC-MS/MS) to identify hotspot-specific histone PTMs. Ab ID: 148

B-19. Measurements of Melanocytes in a Pigmented Northern Blindfish, *Amblyopsis spelaea*, and Comparisons with Southern, Northern, and Ozark Blindfish

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In the literature, the northern blindfish, *Amblyopsis spelaea* is often described as follows: a true cavernicole or cave dweller, adults eyeless and without visible pigment, pigment present in embryos disappears even in a lighted environment, and visible pigmented melanophores in adults are few in number or absent. Discovery of a pigmented northern blindfish led to the study of available histological material of the pigmented specimen, a normal non-pigmented specimen, and study of *Amblyopsis rosae*, the Ozark blindfish, and the southern blindfish, *Typhlichthys subterraneus*. Presumptive melanin and melanocytes were found in all unpigmented cavefishes examined—northern blindfish, southern blindfish and Ozark blindfish. The pigmented northern blindfish melanin was a continuous strip located along the lower portion of the dermis. These melanocytes were roughly 7 times longer and 2 times wider than those located in a normal northern blindfish. Normal northern blindfish had reduced, but readily visible pigment cells in the dermis. Ozark blindfish pigment was observed near the bottom of the dermis with lesser amounts along the top of the dermis. Southern blindfish pigment distribution was similar to the Ozark blindfish. In the species description of the Alabama blindfish, Cooper and Kuehne (1974) noted that reticulate melanophores are obvious in preserved specimens. Three of the four extant species of North American cavernicolous blindfishes that we examined had readily discernible pigment. Literature often suggests these fish have little or no pigment. This notion should be revised to state that blind *Amblyopsis* cavefishes have much reduced pigmented melanocytes found near the bottom of the dermis (*stratum compactum*) with lesser amounts in other areas of the dermis. Ab ID: 149

B-20. Histologic Features of the Spring Cavefish, *Forbesichthys agassizii*: Melanocytes, Eye and Other Interesting Material.

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The Spring Cavefish (*Forbesichthys agassizii*) is one of six species in the family *Amblyopsidae* and only member of the genus *Forbesichthys*. Although several studies have been done on this species, very little information is available on the histological features of this species. We used available material from the collection of Claude Baker to elucidate and measure melanocytes, to study the eye and to study an elaborate internal lateral line system. Photomicrographs of our findings are presented in a poster format. Ab ID: 152

B-21. Curation of Southern Arkansas University's Herbarium Collections: Rediscovering the Botanical Wealth

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The Southern Arkansas University Herbarium dates back to the 1960's and is an important part of the larger SAU Biodiversity Collections. SAU's herbarium is a collection of local plant species collected from the southern Arkansas region and other nearby areas. At the current time, the herbarium collection contains over 3000 specimens. Since January 2012, a project has been underway to curate and repair the herbarium specimens. Working about three hours a week on this project, many new specimens were added to the collection along with extensive repair of older, damaged specimens. At the rate of current production there will be around 125 specimens either repaired or newly curated for this semester. Many of the older specimens were in poor condition, having been originally mounted on non-archival paper, and had been damaged by insects. Acid-free, archival mounting materials were used in both repairs and for newly mounted specimens. The older specimens were prepared by cutting out both the specimen and the herbarium label, and reattaching it to acid free mounting paper. In addition, an SAU Herbarium Database number was attached to the specimen. The new specimens added to the herbarium were collected by SAU students enrolled in Botany 2083/2081 laboratory. These specimens were mounted by gluing the pressed and dried plants to the archival paper and adding additional support, like sewing to secure large specimens to the sheet, or adding library grade book binding

tape to hold down large stems. This effort, put forth by SAU undergraduate student workers, will be continued until the entire collection has been repaired and brought up to modern curatorial standards. With contributions from the SAU Botany course, undergraduate workers, and Biology Department faculty, the collection will continue to grow with added attention towards the collection and preservation of local species. Ab ID: 156

B-22. History and current status of Egyptian Goose (*Alopochen aegyptiacus*) in northwestern Arkansas

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The Egyptian Goose first appeared in northwestern Arkansas in spring of 1988 at the fish hatchery in Centeron in Benton County. The origin of these birds is unknown, but they were probably locally released feral birds. During the 1990s, the population grew, with the largest concentration of 40-50 birds associated with a pig farm in Hiwasee. Since 2000, there have been scattered breeding records in Benton County and small numbers of birds wintering at the fish hatchery, with very few records from Washington County. Currently the largest concentration of about 35 birds is associated with a drive-through zoo in Gentry. The Egyptian Goose population meets most of the American Birding Association's criteria for an established population, except that they still may be dependent on human support. Ab ID: 91

B-23. Literature Review: Treatment options of the Human Papilloma Virus

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Papillomaviruses (HPVs) are a major cause of human disease and are responsible for approximately half a million cases of cervical cancer each year. The protein function of the virus is mediated largely by protein-protein interactions. The two main proteins linked to the cause of cervical cancer are E6 and E7. HPV uses both proteins to interact with and inhibit several key proteins such as p53, Bak and c-myc from carrying out their functions. High numbers of cases of cervical cancer have led to the development of vaccines Gardasil and Cervarix, which have the potential to eliminate up to 70% of invasive cervical cancers. However, this method of treatment only works for those who have not yet been exposed to the virus. Therefore, the main basis of this literature survey was to try and look for other ways of treating those who have already been exposed. What are other options currently available? This review focuses on recent research articles that examine the interaction of E6 and E7 with the key proteins in the body. All the articles reached the same conclusion that the most effective way to stop the spread of the virus would be to inhibit E6 and E7 from interacting with these proteins. Two methods were suggested as the most likely to be effective in combating this virus. First, inhibition of viral transcription of the virus could prevent spread of the disease. This could be done by introducing small molecules that inhibit the viral protein. This inhibition would then reactivate p53, the tumor suppressor gene. This method is highly useful because these compounds, which are low toxicity, could be used as the prototypes of new anti-cancer drugs. Another method that has been shown to be very effective would be the use of peptide aptamers. These are peptide molecules that bind to specific target molecules. Binding specifically to the E6 would result in the apoptotic elimination in HPV positive cancer cells. The use of this method could therefore lead to the development of therapeutic strategies for the treatment of HPV associated cancers. From the collection of this data it can be concluded that successful treatment of HPV is indeed possible. If implemented, these methods of treatment could help lower the number of HPV cases worldwide, and possibly be used in the treatment of certain types of cancer. Ab ID: 164

B-24. Diet of Radiotracked Musk Turtles, *Sternotherus odoratus*, in an Urban Stream

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We used radiotelemetry to assess the diet of *Sternotherus odoratus* in a small, frequently disturbed urban stream in which the invasive Asiatic Clam, *Corbicula fluminea*, has attained high densities. Turtles foraged in small, well-defined home ranges within which we sampled the substrate for potential food items. We compared *S. odoratus* diet, which we determine by analyzing fecal samples, to prey availability in the creek. The diet was similar to that found in previous dietary studies of *S. odoratus* except that clams were eaten much more frequently, and the diet compared favorably to prey availability in the creek. The most important prey in both the fecal samples and substrate samples was *C. fluminea*. We suggest the diet of *S. odoratus* has shifted toward molluscivory as the result of a probable 40-yr presence of *C. fluminea* in Gin Creek. Preliminary evidence suggests that changes in head morphology have accompanied the dietary shift. Ab ID: 133

B-25. The Analysis of Cataract and/or Myopathy Causing Missense Mutation, R120G in human α B-crystallin

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In our lab, we study a small heat shock protein, α -crystallin. The α B-crystallin, a polypeptide of 20 kDa subunit of α -crystallin, is a major water soluble protein in the vertebrate lens. Unlike the α A-subunit, α B-crystallin is ubiquitously expressed in nonocular tissue with high abundance in the skeleton and cardiac muscle, which implicates that it may participate in other cellular functions beyond providing optical transparency. Consistently, mutations in α B encoding gene causes many disorders including congenital cataract and/or myopathy phenotype. Up to date, total of nine missense mutations in α B-crystallins have been identified. The most well-known is the mutation of Arginine-120 to Glycine (R120G) in α B-crystallin, which is associated with cataracts and desmin-related myopathy (DRM), a disorder of the skeletal muscle. To explain how mutations in α B-crystallin lead to the development of cataract/myopathy, the differences in the oligomeric size, secondary and tertiary structure, surface hydrophobicity, and chaperone function have been investigated in R120G as compared to the wild type α B-crystallin. Understanding the pathophysiology of hereditary cataracts can yield insight into the mechanisms of cataractogenesis. Ab ID: 150

B-26. Bacteriostatic Activity of a Novel Silver-Containing Hydrogel

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A novel silver-containing hydrogel was formulated at Harding University College of Pharmacy that appears to have broad bacteriostatic and bactericidal properties. In vitro antimicrobial susceptibility testing was performed with a diverse group of microorganisms representing gram negative rods/bacilli (GNR), gram positive rods/bacilli (GPR), gram positive cocci (GPC), and yeast. Using a standard microtube method to determine minimal inhibitory concentrations (MICs), we determined the following MICs (ug/mL \pm SD; N): *Acinetobacter baumannii* / GNR (0.3 \pm 0.2, 6), *Bacillus spp* / GPR (0.3 \pm 0.2, 6), *Candida albicans* / yeast (0.1 \pm 0.1, 33), *Enterococcus faecalis* / GPC (1.0 \pm 0.7, 6), *Escherichia coli* / GNR (0.3 \pm 0.1, 6), *Pseudomonas aeruginosa* / GNR (0.8 \pm 1.2, 16), *Staphylococcus aureus* (not methicillin resistant) / GPC (0.3 \pm 0.2, 28) *Staphylococcus aureus* (methicillin resistant/MRSA) / GPC (0.3 \pm 0.2, 34), *Staphylococcus epidermidis* / GPC (0.2 \pm 0.1, 6), *Streptococcus pyogenes* / GPC (0.1 \pm 0.0, 3). These data suggest this novel silver-containing hydrogel is a broad-spectrum antimicrobial agent that may have clinical utility. Further studies are underway to determine its kill time kinetics, and potential toxicity to mammalian cells. Ab ID: 153

B-27. Mathematical Modeling of Cotton Leaf Photosynthesis

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Understanding photosynthesis is a vital part of agriculture, and mathematical models of photosynthesis are used to make predictions about the impacts of various growing conditions on plant productivity. This is

especially important for the state of Arkansas, which relies heavily on its agricultural sector. Although there have been substantial research efforts on photosynthesis, there is still relatively little quantitative information regarding the impact of the different stages of leaf development on the photosynthetic response of single leaves to temperature. Modeling has already been established for field data; however, we are currently trying to determine if we can repeat what we have seen in the field in the environmental growth chambers at the University of Central Arkansas. The project goals are to model cotton leaf photosynthesis using STELLA (Systems Thinking in an Experiential Learning Lab with Animation) modeling software to show the effect of growth temperature and stage of leaf expansion on photosynthesis rates. The STELLA simulations will then be checked and re-checked against real data obtained from plants grown under environmental growth chamber conditions, greenhouse, and field conditions. The models will be modified as appropriate to account for this new data based on the statistical analysis of how well the data is fitted to the equations used in the model. Ab ID: 80

B-28. Tigers on a Phage Hunt

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Ouachita Baptist University was selected in 2011 by the Howard Hughes Medical Institute's Science Education Alliance to join the PHAGES program, Phage Hunters Advancing Genomics and Evolutionary Science. Through this program, twenty-five OBU freshmen biology students each worked in academic year 2011-2012 to isolate and characterize a unique mycobacteriophage. Mycobacteriophages are viruses that infect mycobacteria. While some mycobacteria, such as *Mycobacterium tuberculosis*, are pathogenic, others, including our host bacterium *M. smegmatis*, are saprophytic. To find mycobacteriophages that would infect *M. smegmatis*, the OBU PHAGES students sampled from humus-rich sites such as flowerbeds, and mixed these samples with *M. smegmatis*. The mycobacteriophages found were isolated and repeatedly subcultured to obtain pure phage populations. The students worked independently to each isolate and subculture a phage, developing laboratory skills, gaining confidence in themselves, and learning about science. The goals of this PHAGES program are, first, to show an inquiry model for undergraduate science education, and, second, to collect and characterize as many mycobacteriophages as possible. The mycobacteriophages isolated through this program will be used to progress understanding of mycobacteriophage diversity and evolution. Here, two current OBU PHAGES students present their work. Ab ID: 175

B-29. The use of an inducible glucose oxidase gene in tobacco to as a model for oxidative stress research

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We have begun to demonstrate the viability of using transgenic tobacco (*Nicotiana tabacum*) plants with an estradiol inducible (XVE) expression of a glucose oxidase (GOX) as a model system for oxidative stress research. The XVE:GOX plants are an ideal system is highly inducible and tightly controlled by specific inducers not produced by plants. When expressed, the GOX protein catalyzes the breakdown of glucose in the plant cell; a byproduct of this process is the generation of H₂O₂ and subsequently oxidative stress. Further we have shown a potential increase in relative apoptotic-like programmed cell death (AL-PCD) levels after H₂O₂ production. Glutathione Reductase (GR) activity increased as a result of H₂O₂ production in our system however; Western blot analysis showed no increase in GR expression levels. We are currently working enzymatic assays for other oxidative stress related enzymes and are using QRT-PCR to measure changes in gene expression genes associated with oxidative stress induced AL-PCD. The effects of GOX expression on leaf physiology will be determined using a chlorophyll fluorescence monitoring system (JR-PAM). Our project seeks to establish the viability of using plants as a model system to study PCD in animals. This system is ideal for the undergraduate research lab. Current results will be reported. Ab ID: 177

B-30. Habitat use of Rocky Mountain bighorn sheep at Bighorn Canyon National Recreation Area

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Understanding the habitat use behavior of a species is a vital factor in the successful management of that species. The population of Rocky Mountain bighorn sheep (*Ovis canadensis*) at Bighorn Canyon National Recreation Area is a reintroduced population whose size has dwindled in recent years. By understanding the habitat use patterns of bighorns, management can perhaps increase the quantity of this ideal habitat, and reduce disturbance from visitors to these areas. We examined species habitat relationships using logistic regression. Habitat characteristics that were found to be most important to bighorn sheep were the vector ruggedness measure ($p < 0.05$) and distance to water ($p < 0.05$). Habitat aspect and slope were also measured, but were not found to have an independent and significant effect. While ruggedness is not easily managed, distance to water can be influenced by management practices. Additional habitat analyses of bighorns at Bighorn Canyon National Recreation Area will lead to an even better understanding of their habitat use. Ab ID: 174