

TRANSACTIONS of the ILLINOIS STATE ACADEMY OF SCIENCE

Supplement to Volume 102



**101st Annual Meeting
April 17-18, 2009**

Southern Illinois University Edwardsville

**Illinois State Academy of Science
Founded 1907
Affiliated with the Illinois State Museum, Springfield**

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ISAS 101st ANNUAL MEETING
Southern Illinois University Edwardsville
April 17-18, 2009

SCHEDULE OVERVIEW

Friday April 17 - Morris University Center (MUC) Conference Center (building 5 on map, 1st and 2nd floor)

11:00 AM - Registration Opens, MUC Conference Center

11:00 AM - Posters may be put up in the MUC Meridian Ballroom (to remain up all day)

12:00 – 2:00 PM - ISAS Council Meeting, University Club, MUC

2:30 - 5:00 PM - Poster Session, MUC Meridian Ballroom

4:00 - 7:00 PM - Reception, MUC Meridian Ballroom

Saturday April 18 - Morris University Center (MUC) Conference Center (building 5 on map, 2nd floor)

8:00 AM – 2:30 PM - Registration Opens, MUC Conference Center

8:00 AM – 10:00 AM – Continental Breakfast (coffee, tea, muffins)

8:50 AM - Sessions call to order, MUC Conference Center

9:00 – 10:45 AM - Oral Sessions, MUC Conference Center

11:00 – Noon – Keynote Speaker, MUC Conference Center

Noon – 12:45 PM – Buffet Lunch, MUC Conference Center

12:45 – 1:00 PM – 101st ISAS Business Meeting

1:00 – 4:30 PM - Oral Sessions, MUC Conference Center

4:30 PM – 101st Annual ISAS Meeting Adjourned

ISAS 101st Annual Meeting Contacts (2009 ISAS Vice-Presidents)

Dr. William Retzlaff, Department of Biological Sciences, Box 1651 SIUE, Edwardsville, IL 62026, 618-650-2728, wretzla@siue.edu

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Participants with special needs are requested to inform the Vice-President of the meeting as early as possible in order that their requirements can be adequately taken into consideration. Contact one of us above and we will be glad to assist you.

KEYNOTE ADDRESS
11:00 am to Noon
Morris University Center Conference Center



Living with Great Rivers: Birth of Civilizations, Contemporary Disasters, and New Approaches.

Dr. Richard E. Sparks

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National Great Rivers Research and Education Center
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Richard E. Sparks, University of Illinois at Urbana-Champaign
To obtain a version suitable for print publication, contact necks@uiuc.edu, 217-333-9430
rsparks.jpg

What makes a river “great”? Certainly the rivers where civilization began, such as the Nile, the Indus, the Tigris, and the Euphrates, qualify as “great” in human terms and warrant some explication of the link between these rivers and the rise of agriculture, writing, complex societies, and monumental architecture. These rivers were characterized by seasonal floods which inundated floodplains, thereby renewing the fertility of the soil and enabling people to practice agriculture and stay in one place for hundreds to thousands of years. Elsewhere, people had to move on when the fertility of the soil was exhausted. Although early civilizations capitalized on predictable seasonal floods by harvesting natural resources and later practicing a flood-adapted form of agriculture, they were also subject to occasional great floods and droughts that disrupted food production and destroyed lives and property.

Now the situation at first appears to be quite different. Virtually all the large rivers in the tropic and temperate parts of the world are regulated by dams and many of the floodplains and deltas are leveed and developed, not just for dryland agriculture, but also for industrial and municipal uses. Despite these technological achievements, severe problems have developed, including: recent damaging floods around the world (including two events in 2008 in the Upper Mississippi River Basin); expansion of hypoxic zones at river mouths; subsidence and erosion of river deltas; and decline or loss of many species, including commercially valuable fishes and charismatic species, such as the Yangtze river dolphin.

The new National Great Rivers Research and Education Center, founded by the University of Illinois, the Illinois Natural History Survey, and Lewis & Clark Community College, is partnering with other colleges and universities, government agencies, businesses, and non-governmental organizations to develop new, collaborative approaches to sustain ecological services of great rivers and help people live safely and well with these fascinating and dynamic ecosystems.

The address will be open to the public - doors will open to the public at 10:30 AM.

ISAS Registration guarantees front section viewing of Keynote Address.

ISAS 101st ANNUAL MEETING
Southern Illinois University Edwardsville
April 17-18, 2009

EVENT LOCATIONS

All events take place in the Morris University Center (MUC) (building 5 on map, 2nd floor)

Friday April 17

- 10:00 AM** - Registration Opens, Meridian Ballroom
- 10:00 AM** - Posters may be put up in the Meridian Ballroom (to remain up all day)
- 12:00 – 2:00 PM** - ISAS Council Meeting, University Club
- 2:30 - 5:00 PM** - Poster Session, Meridian Ballroom
- 4:00 - 7:00 PM** - Reception, Meridian Ballroom (wine/beer and hors d'oeuvres)

Saturday April 18

- 8:00 AM – 2:30 PM** - Registration Opens, Conference Center
- 8:00 AM – 10:00 AM** – Continental Breakfast (coffee, tea, muffins), Conference Center
- 8:50 AM** - Sessions call to order, MUC Conference Center
- 9:00 – 10:45 AM** - Oral Sessions, MUC Conference Center

<u>Division</u>	<u>Room</u>
Botany	Oak/Redbud
Cell, Mol. & Dev.	Hackberry
Chemistry	Hickory
Computer Sc	Missouri
Env. Sc.	Mississippi
Health Sc.	Illinois
Microbiology	Illinois
Sc. Math & Tech. Ed.	Missouri
Zoology	Maple/Dogwood

- 11:00 – Noon** – Keynote Speaker, Meridian Ballroom
- Noon – 12:45 PM** – Lunch, Meridian Ballroom
- 12:45 – 1:00 PM** – 101st ISAS Business Meeting, Meridian Ballroom
- 1:00 – 4:30 PM** - Oral Sessions, MUC Conference Center
- 4:00 PM** – 101st Annual ISAS Meeting Adjourned

POSTER PRESENTATIONS

Division: Anthropology and Archaeology

1. A study of foraging behavior and diet of *C. capucinus* (white-faced capuchin monkey) in a tropical forest in Costa Rica

Berner, Jamie E; Zawasky, Amy R and Rehg, Jennifer A. Southern Illinois University Edwardsville, Edwardsville, IL.

Cebus capucinus (white-faced capuchin) is a medium-sized, frugivorous-insectivorous monkey found throughout much of Central and South America. *C. capucinus* is found in diverse forested environments providing an excellent case study for understanding the relationship between habitat variability and behavior. *C. capucinus* is widely studied in tropical wet and dry forests of various successional stages with varying foraging techniques and diet by habitat based on resource availability. Research also indicates variation in diet and foraging techniques may be due to learned traditions developed in adolescence. Carara National Park (CNP), a rare transitional forest on the Pacific coast of Costa Rica, exhibits characteristics of wet and dry forests. Multiple forest successional stages offer opportunities to study capuchin behavior in a novel mix of environments. Behavioral data were collected on *C. capucinus* at CNP, during July/August 2008: walking trails daily and observing at least two groups of *C. capucinus*. Data were recorded on foraging/feeding behavior, age, sex, group size, and canopy/support use by focal animal sampling. For all age classes, insect foraging techniques differed between primary and secondary forests; digging through leaves (80.9%) and in bark (100%), respectively. Adults were seen foraging for food more than juveniles. Juveniles never entered the upper canopy for any activity, which may relate to evading tree crowns more exposed to aerial predators. Foraging behaviors observed at CNP are similar to those reported in studies of *C. capucinus* in dry forests.

2. Inspiring pride and saving the past: an archaeological survey of the Belleville-Mascoutah Area

Cooper, Angela S. Southern Illinois University Edwardsville, Edwardsville, IL.

This project addresses the need for more archaeological research in the uplands east of Cahokia in the vicinity of Belleville and Mascoutah. Most research about the Cahokians has been studied at Cahokia Mounds or surrounding areas. Although there is evidence of prehistoric Native Americans in the uplands, such as Emerald Mound in Lebanon and the Richland Complex east of Cahokia, there has been very little documentation of artifact collections or surveys in the vicinity of Belleville and Mascoutah. Archaeologists hypothesize that the people in the uplands grew maize for the Cahokia metropolis (Alt 2002; Pauketat 2003; Woods and Holley 2000). Many of the excavated sites and documented collections in the uplands support this hypothesis. This research demonstrates how I documented prehistoric Native American artifact collections owned by Belleville and Mascoutah farmers, and how I surveyed the land where the artifacts were found. The collections contain hoes, points, axes, celts and other miscellaneous artifacts. Some of the artifacts are broken, reused, or resharpened. These collections contain points from the Paleoindian to the Mississippian. This range of periods shows the appealing nature of the uplands. I hope to inspire curiosity and interest among current residents and among academic archaeologists to investigate why some Cahokians

and other prehistoric people lived in those areas. I hope to encourage collectors to have their collections documented to preserve the history of these areas. If nothing is done to preserve this history, it will be lost as a result of the increasing commercial and residential development in the area. Furthermore, as family farms disappear, their artifact collections will be sold off and all information they contain will be lost. By documenting this research, this history is preserved and adds to the information about Cahokians and other prehistoric peoples.

Division: Botany

3. Forest structure of a fire suppressed glade habitat in St. Charles County, Missouri.

Harms, Patrick; Schneider, Kathy and Mettler-Cherry, Paige. Lindenwood University, St. Charles, MO.

Lindenwood University owns ~2000 acres of Missouri bluff habitat associated with the Daniel Boone Home in Defiance, Missouri, a historic site on the national register. A biological assessment of the property in 2008 revealed a bluff site with characteristics typical of a glade; rocky outcrops, south to southwest facing steep slope and a thin, rocky soil base over limestone bedrock. We observed species indicative of glades (i.e. *Opuntia*), but the area was clearly dominated by *Juniperus virginiana* (red cedar) a common fire intolerant invader of glade habitats where fire has been suppressed. To assess the site prior to restoration, 3 transects were established that encompassed the elevation and aspect gradients of the bluff. Each tree on the transects that was <5cm dbh was identified and cored with a Swedish increment borer. The cores were returned to the lab, lightly sanded with fine grit sand paper and individual growth rings counted to determine age of the individual trees. The site was dominated by *J. virginiana*, with trees ranging in age from seedlings to >100 years, indicating that fire suppression goes back to at least the late 19th century. Cedar dominance decreased with increasing elevation while species diversity increased with elevation. Presence of seedlings and mature trees indicates continued dominance by fire intolerant species until fire is reintroduced to the site, allowing native glade flora to re-establish.

4. Blooming time differences in northeastern *Dodecatheon* likely evolved before independent changes in ploidy.

Bell, Jordan¹; Oberle, Brad²; and Esselman, Elizabeth. ¹Southern Illinois University Edwardsville, Edwardsville, IL, ²Washington University, St Louis, MO.

Dodecatheon are showy spring ephemerals that grow in diverse habitats across North America. They have confounded taxonomists with polyploidy, hybridization and convergent adaptation. Recent work in the southeastern United States discovered variation in ploidy among populations of widespread *D. meadia* and possible hybridization with the rare diploid *D. frenchii*. This study focuses on the relationship between *D. meadia* and *D. amethystinum* in the northeastern United States. *D. amethystinum* grows on calcareous river bluffs disjunctly between the upper Midwest and eastern Pennsylvania. A single unvouchered chromosome count from the Midwest indicates that *D. amethystinum* is tetraploid. Phenological work indicates that *D. amethystinum* blooms one to two weeks earlier than *D. meadia*. In this study we had three goals: 1) we evaluated support for a single ploidy level for *D. amethystinum* in both regions where it occurs, 2) we compared the ploidy levels

of *D. amethystinum* to nearby populations of *D. meadia* and 3) we used these data to evaluate support for three alternative hypotheses for the evolution of reproductive divergence between species. Pollen diameter, which is correlated to ploidy in *Dodecatheon*, varies among populations of *D. amethystinum* in both regions where it occurs, and it does not differ consistently from nearby populations of *D. meadia*. These patterns suggest that phenological differences preceded changes in ploidy, rather than evolving in response to selection against hybridization or as a transgressive consequence of polyploidy itself.

5. Genetic structure of the single remaining *Trillium flexipes* (liliaceae) population on the SIUE campus.

Bragg, Rachel; Minchin, Peter; Eder, Susan and Esselman, Elizabeth. Southern Illinois University Edwardsville, Edwardsville, IL.

Trillium flexipes is a native spring ephemeral widely distributed in the eastern half of the United States. In Illinois the species is often found in high quality deciduous wooded areas. Although common in other areas of the state it is rare and limited to one population on the SIUE campus. Habitat loss, fragmentation and the introduction of invasive species have posed major threats to this and other native wood land plants on campus. The purpose of this study was to map and examine ISSR marker diversity in the remaining *T. flexipes* population to predict the likeliness it will survive into the future. We found that that this population had fewer unique bands and higher levels of similarity than another common widespread *Trillium* species on campus, *T. recurvatum*. There was no correlation between geographic distance and genetic similarity in the *T. flexipes* population. Our results suggest that the current population is only a remnant of a larger population that once existed on the site. Efforts for conservation should include habitat protection and removal of invasive species to ensure the future survival and growth of the population.

6. Does the Hellinger transformation make PCA a viable ordination method for community data?

Rennie, Lauren and Minchin, Peter R. Southern Illinois University Edwardsville, Edwardsville, IL.

Principal Components Analysis (PCA) was one of the earliest ordination methods used in analyzing community data. It fell out of favor when studies using simulated community data showed that the linear model of PCA leads to curvilinear distortion, a phenomenon known as the "horseshoe effect". The distortion increases with the beta diversity of the data. Recently, it has been suggested that the use of a data adjustment, the Hellinger transformation, makes PCA a viable method for community ordination. We simulated community data over a range of beta diversities, with 20 replicate models of each type, ordinated the data using PCA with and without the Hellinger transformation and assessed performance by rotating the ordinations to best fit with the simulated ecological configuration using Procrustes analysis. For comparison, PCA was also performed with other common standardizations and the data were also ordinated using non-metric multidimensional scaling (NMDS) with the Bray-Curtis dissimilarity index, currently considered to be the most robust method for community ordination. Preliminary results show that the Hellinger transformation improves the performance of PCA. At low beta diversities, PCA with Hellinger achieves equivalent performance to NMDS on unstandardized data. NMDS outperforms PCA with Hellinger at higher beta diversities. NMDS applied to data standardized by species maximum (SMAX) consistently outperforms PCA at all beta diversities, irrespective of the data standardization employed.

7. Calyx anatomy of Maxillariinae (Orchidaceae).

Leathers, Jessica and Carlswald, Barbara. Eastern Illinois University, Charleston, IL.

As traditionally circumscribed, *Maxillaria* is a large orchid genus found throughout the American tropics and subtropics. Recent molecular phylogenetic analyses show that *Maxillaria sensulato* is polyphyletic, and core Maxillariinae have been redefined to include 17 monophyletic genera. The focus of our study was to find anatomical features within the calyx that could be used to diagnose the newly defined clades of Maxillariinae currently based on molecular data. Transverse sections from sepals of 13 genera were made at 90-120 μm using a sliding microtome, stained with iron-alum haematoxylin and safranin, and mounted on microscope slides. In transverse section, all sepals of *Maxillaria sensu stricto* contain scattered, homogeneous fiber bundles. Fiber bundles are absent in eight of the thirteen genera, but present in *Heterotaxis*, *Maxillariella*, *Nitidobulbon*, and *Rhetinantha*. Fiber bundles of *Rhetinantha* are heterogeneous and restricted to the ad- and/or abaxial surfaces; in *Nitidobulbon* they are abaxial if present; and in *Heterotaxis* and *Maxillariella* they are scarce or absent. Other distinct anatomical features found in Maxillariinae are scattered, sclerified idioblasts and mucilage-containing ground tissue. Sclerified idioblasts are present in *Heterotaxis*, *Maxillaria*, *Nitidobulbon*, and *Rhetinantha*. *Camaridium*, *Christensonella*, *Trigonidium*, and *Maxillaria* possess ground tissue with large amounts of mucilage. From these three anatomical features, mucilage and idioblasts seem to be the most useful in diagnosing most of the genera of Maxillariinae. In addition, *Maxillaria* is the only genus with all three characteristics.

8. Effects of white-tailed deer (*Odocoileus virginianus*) and flooding on the early growth and survival of bottomland hardwood tree species: a Master's research proposal.

McGuire, Ben M. and Minchin, Peter R. Southern Illinois University Edwardsville, Edwardsville, IL.

Bottomland hardwood forests (BLH) have been drastically reduced in area since European settlement. In BLH restorations, it is necessary to establish large-seeded tree species as seedlings, in order to overcome dispersal limitation. Restoration success can be limited by poor growth and survival, with flooding stress and damage by white-tailed deer being principal causes. I will examine the joint effects of hydrology and deer damage on the early growth and survival of BLH species using a combination of observational and experimental studies at the Two Rivers National Wildlife Refuge (TRNWR), Illinois. In fall 2009, I will re-measure diameters and heights of trees in 56 plots established in 2006 on a restoration site in TRNWR. Three-year growth and survival by species will be modeled using relative elevation and observations of white-tailed deer damage made in 2006. In summer 2009 I will set up a field experiment to test growth and survival over two growing seasons of *Carya illinoensis*, *Quercus bicolor*, *Q. lyrata*, *Q. macrocarpa* and *Q. palustris* in relation to deer damage and flooding stress. Seedlings will be planted in replicated plots at three elevations along the hydrologic gradient. Three types of plot will be set up: (1) surrounded by deer fencing with deer guards on each seedling to exclude deer damage; (2) deer guards on each seedling but no deer fencing; (3) no deer guards or deer fencing. Results will increase our understanding of the factors limiting natural regeneration of these species and should assist in planning and execution of future restorations.

9. Quantitative assessment of edge effects in oak-hickory forest fragments in southwestern Illinois.

French, Zachary L. and Minchin, Peter R. Southern Illinois University Edwardsville, Edwardsville, IL.

Edge effects are one way in which habitat fragmentation can negatively affect biodiversity. A zone of edge influence (ZEI) occurs inwards from the outer boundary of a patch of habitat. The environment of the ZEI differs from the patch interior and species may be unable to utilize the ZEI. Our objective was to quantify the ZEI of oak-hickory forest fragments in southwestern Illinois and test the hypothesis that the ZEI of a more mature forest on SIUE campus (Sweet William Woods) is narrower than that of a younger forest that is part of Bohm Woods, a State Nature Reserve. Five transects were randomly established on a south-facing edge in each forest, beginning at the edge and extending 100 m into the forest. Air temperature, relative humidity, and soil temperature were measured at marked points along each transect on three days during summer 2008. Light was characterized by analyzing vertical fish-eye photos taken at the same points in July 2008. Variation in community composition along the transects was assessed using Bray-Curtis dissimilarity calculated from dominance data for trees, stem counts for shrubs and saplings, and cover for the ground-layer. Trends in both abiotic factors and community composition were examined using exponential models, with the width of the ZEI for defined as the distance from edge at which the predicted value was within 5% of the modeled value for the forest interior. Preliminary results support the hypothesis: Sweet William Woods has a narrower ZEI for air temperature, soil temperature, relative humidity, and woody species composition.

10. Influence of liquid hickory smoke seasoning on seed germination of twenty prairie plant species.

Daugherty, Brad M; Ervin, Stefanie L; Sandra P; Coutant, Nancy E and Coons, Janice M. Eastern Illinois University, Charleston, IL.

One management technique often used for prairies is fire. Studies from African and Australian grasslands and from Californian chaparral report that seeds of some species require smoke exposure to germinate. The purpose of this study was to determine if liquid hickory smoke seasoning would promote seed germination of prairie species. Nine genera with 2 species each (*Echinacea* had 4 species) were selected including *Astragalus canadensis*, *A. crassicaarpus*, *Bouteloua curtispindula*, *B. hirsuta*, *Ceanothus americanus*, *C. herbaceus*, *Coreopsis lanceolata*, *C. palmata*, *Echinacea pallida*, *E. atrorubens*, *E. purpurea*, *E. simulata*, *Lespedeza capitata*, *L. virginica*, *Liatris punctata*, *L. aspera*, *Oligoneuron rigidum*, *O. riddellii*, *Pycnanthemum pilosum* and *P. virginianum*. Every other species on this list (except *L. punctata*) was reported to respond positively to smoke with increased germination. Five concentrations (control, 1:1000, 1:500, 1:100, 1:10) of liquid hickory smoke were used. Seeds were placed on filter paper moistened with test solution in petri dishes using three replications (10 seeds each) for each treatment. *Ceanothus americanus*, *Echinacea atrorubens*, *E. pallida*, *E. simulata* and *Pycnanthemum pilosum* had significantly higher germination percentages with smoke compared to controls. For these species, 1:500 was one of the best concentrations, with some of these species responding equally well to 1:1000 or 1:100. The 1:10 concentration consistently inhibited germination. Further investigation is needed to understand the role of smoke in prairie management using burns.

11. Reconstruction of an oak/hickory forest history by aging stumps and standing trees.

Campo, Adam and Brugam, Richard B. Southern Illinois University Edwardsville, Edwardsville, IL.

Understanding the history of oak-hickory forests of Southern Illinois is important for landscape management. Tree ring counts were taken to reconstruct a history of a *Quercus alba* and *Carya ovata* dominated site in southern Monroe County. The study site is located in the Northern Ozark Division of Schwegman's (1973) map of the natural divisions of Illinois. The local terrain is karst with many loess-covered sinkholes. Stand size is approximately 14.16 hectares. Tree ring counts were taken from stumps of logged trees. The oldest trees were *Quercus alba*, *Quercus rubra* with *Quercus velutina* establishing itself more recently. The oldest individuals of *Q. alba* were located down slope in sinkholes where losses due to logging are less likely. A major pulse of reproduction occurred in the early 1900's. This is believed to be due to the result of colonization of an abandoned pasture. Future methods will include taking core samples from standing trees to determine rates of establishment in more recent times. The use of tree ring counts and tree locations allows us to reconstruct the history of particular stands relating it to previous land management.

12. Efficacy of glyphosate injection to control *Ailanthus altissima* (Simaroubaceae)

Choudhury, Jessica and Schulz, Kurt E. Southern Illinois University Edwardsville, Edwardsville, IL.

Invasive trees are often felled and the stumps are treated with herbicide. This is both expensive and time consuming. In many situations the tools and skilled personnel necessary are not available. In more remote areas an alternative to tree felling is to inject herbicides directly into the trunk, and let trees die on the stump. This is preferable because it is cheaper, faster, and creates a more natural pattern of tree mortality (e.g., creates standing snags, prevents logging damage, etc.). This study examined the effectiveness of glyphosate injection using an EZject™ Lance (Arbor Systems, Omaha, NE) on established *Ailanthus altissima* trees 2-40 cm dbh in a disturbed hardwood forest on the Southern Illinois University Edwardsville Campus. In early July 2008, we injected 288 stems of an *Ailanthus* population of > 352 stems. 64 specimens were left untreated as controls. Qualitative assessment in early October returned 39% killed, 48% showing decline, 5% indeterminate, and 8% unaffected. Evaluation of untreated specimens returned 2% dead, 19% showing decline, 13% indeterminate and 67% thriving. Decline in untreated individuals may be the result of clonal connections. The effectiveness of this method, combined with ease of application and near absence of potential residual or unintentional damage to non-target organisms, suggests its potential value for invasives control and land management.

13. Field trial of a physiologically based strategy to kill invasive honeysuckles (*Lonicera* spp., Caprifoliaceae).

Choudhury, Jessica and Schulz, Kurt E. Southern Illinois University Edwardsville, Edwardsville, IL.

Invasive species management frequently relies upon chemical control, although this approach can contaminate the environment and harm non-target species. Control methods which simultaneously minimize chemical use and labor are cheaper and benefit the environment. Asiatic shrub honeysuckles (*Lonicera* spp.) are persistent invaders of Midwestern forests. The most widely recommended control method is to paint freshly cut stems with 20% glyphosate, which is both

expensive and time consuming. This study tests a recently published alternative control method, in which the established plants are cut to ground level immediately after leaf expansion in spring, and then the regrowth is sprayed with glyphosate ca. 60 days later. Cutting in late spring after energy stores are depleted and before new stores can be accumulated reduces the plant's ability to recover. Returning to the plants when regrowth appears allows an applicator to apply minimal amounts of glyphosate in lower concentrations over a lesser area while fully eradicating the specimens. We conducted studies on the grounds of the Gardens at SIUE, where a large number of Amur honeysuckle shrubs had been cut to ground level at leaf out in early spring. Secondary treatments of glyphosate spraying with or without recutting were applied to 143 individuals growing under an open canopy. Shrubs were then evaluated in late October 2008. 81% of the treated individuals died after treatment. This compares favorably with published values for both this new technique and applications of concentrate to cut stems.

14. Seed dispersal of invasive Amur honeysuckle (*Lonicera maackii*, Caprifoliaceae) and autumn olive (*Elaeagnus umbellata*, Elaeagnaceae).

Hall, Melissa and Schulz, Kurt E. Southern Illinois University Edwardsville, Edwardsville, IL.

Lonicera maackii and *Elaeagnus umbellata* are non-native invasive shrubs that threaten native communities in southern Illinois. These two species compete with natives in the forest edge, although *Lonicera* colonizes the interior as well. Native species are preferred by wildlife because they provide better nesting habitat, structure, and food resources than these exotic species. The purpose of this study was to compare patterns of fruit removal between species, the effects of fruit position (upper vs. lower branches), and for *Lonicera*, differences in fruit disappearance rates between forest edge and interior habitats. We examined fruit disappearance rates at 6 sampling sites by counting the number of fruits on marked branches at ca. weekly intervals from ripening in mid-September to final disappearance in January (108 days total). Overall, *Elaeagnus* fruits had a higher disappearance rate than *Lonicera*, suggesting *Elaeagnus* is preferred by frugivorous birds. *Lonicera* shrubs exhibited two different patterns of disappearance. In some instances there was a steep initial loss followed by a plateau before more fruits were lost. In other cases there was a steady rate of fruit loss. Edge *Lonicera* showed higher fruit loss rates than interior plants. Both species had higher rates of fruit loss on branches that were lower versus branches that were higher in the shrub. Preference for low hanging fruit suggests concealment from predators may be important.

15. Changes in flowering stem density and diversity of prairie forbs as influenced by deer browsing and burning.

Anderson, Roger C¹; Corbett, Erica A² and Anderson, Rebecca M¹. ¹Illinois State University, Normal, IL, ²Southeastern Oklahoma State University, Durant, OK.

We examined forb flowering stem density and diversity in plots protected from deer browsing since 1992 or remained unprotected. Plots were burned twice during our 4-year study of flowering. The study site is located adjacent to Goose Lake Prairie State Park in Grundy County, 70 km southwest of Chicago. Plots were established in a 33 x 48 m area that had high forb diversity, 100 species recorded. Forb stems with flower buds, flowers, or fruits were counted in six belt transects (2 m x 16m) in both plots in late-June or July in 1998, 1999, 2000, and 2001. Pretreatment sampling in 1992 indicated that forb similarity was 81% between protected and unprotected plots. However, by 2001, similarity between protected and unprotected plots was reduced to 37.9% by selective deer

browsing and varied differences in forb tolerance to browsing. Diversity of flowering stems based on the Shannon Index (H') was always significantly lower ($P < 0.001$) on the unprotected plot ($H' = 1.29-1.70$) than the protected plot ($H' = 1.92-2.26$). Species richness was higher on the protected plot than the unprotected plot. Flowering stem counts were higher on the protected plot than the unprotected plot. However, the counts for the two plots were nearly the same in years when plots were burned due to large increases in flowering stems of *Silphium integrifolium* and *Parthenium integrifolium* following burning, especially on the unprotected plot, where flowering stem density for the two species combined was (mean \pm se) 5272 ± 664 and 884 ± 80 in burn and non-burn years, respectively.

16. A threatened existence: a tale of the Illinois hill prairie larkspur.

Eyler, Elizabeth A and Koontz, Jason A. Augustana College, Rock Island, IL.

Delphinium carolinianum is a rare flowering plant in Illinois. Currently restricted to three non-contiguous counties, this species is potentially threatened. Populations encountered during surveys of hill prairies were marked using GPS. To determine variation in genetic relatedness among different populations of this larkspur, leaf samples were collected. DNA was extracted from the samples, and analyses of genetic variation were performed to assess levels and patterns of diversity in the Illinois populations. At one of our study sites, Bald Bluff, located in Henderson County, heavy grazing is occurring. In addition to the detrimental presence of cattle, invasive cedars encroach upon the hill-prairie boundaries. Though subjected to cattle for many years, several key prairie species are present on the hill prairie. With cedar removal and cattle exclusion, this hill prairie may be restored and added to the IL Natural Areas Inventory. A solar-powered electric fence was installed on the perimeter of the hill prairie to prevent cattle grazing the area around the larkspurs. An initial survey was taken, to be followed by subsequent surveys over the next two years to monitor the effectiveness of cattle exclusion on this hill prairie's restoration.

17. Increased *in vitro* germination of *Schoenoplectus hallii* (Cyperaceae) in response to ethylene

Jedlicka, Joseph R and Barry, Kelly J. Southern Illinois University Edwardsville, Edwardsville, IL.

Hall's Bullrush, *Schoenoplectus hallii*, is a transient wetland sedge that is found throughout a number of Midwestern United States. This wetland species exhibits very low germination rates when propagated through *in vitro* tissue culture techniques. Plant growth regulators are supplied to the growth medium for *in vitro* techniques mainly to induce rooting and shooting of explants; however, ethylene is a plant growth regulator that is seldom used during tissue culture because it commonly stimulates senescence and death of plants. On the other hand, ethylene has been found to release the seed dormancy period of some plant species, including *S. hallii*. The objective of this study is to determine if the addition of ethephon, an ethylene producing compound, increases the germination rates of *S. hallii* seeds or affects the viability of the seeds. To determine if the *S. hallii* plantlets are negatively impacted by the supplemented ethephon, the *in vitro* seedlings were transplanted and acclimated to greenhouse environmental conditions. Developing an effective protocol for germinating *S. hallii* more efficiently through the addition of an ethylene plant growth regulator may allow for more widespread growth of this uncommon plant.

18. Root development on auxin-treated stem cuttings of eight native plant species from Illinois. Gillespie, Sarah E; Fox, Melissa S; Coons, Janice M and Coutant, Nancy E. Eastern Illinois University, Charleston, IL.

Many exotic cultivated perennial plant species are propagated vegetatively to maintain desirable traits and to reproduce plants quickly. Reports on the use of vegetative techniques to propagate Illinois native plants are limited. The purpose of this research was to investigate if auxins would promote root growth on stem cuttings of eight Illinois native forbs. Bontone® Rooting Powder was tested on stem cuttings of *Dalea purpurea*, *Liatris pycnostachya*, *Lilium michiganense*, *Lobelia cardinalis*, *Mimulus ringens*, and *Rudbeckia subtomentosa*. Dip 'n Grow Root Inducing Concentrate (5, 10 or 20%) was tested on *Amorpha canescens* and *Ceanothus americanus*. Each treatment group included nine cuttings. Individual cuttings were placed in a 4 x 4 x 6 cm cell filled with moistened vermiculite. Cells were placed in a growth chamber at 25°C with 38 $\mu\text{mol}/\text{m}^2/\text{sec}$ light. *D. purpurea*, *L. michiganense*, and *R. subtomentosa* exhibited no callus or root growth. Cuttings treated with Bontone® had significantly more root growth than the controls for *L. pycnostachya* and *M. ringens* after 3 weeks and for *L. cardinalis* after 6 weeks. For *A. canescens*, cuttings treated with 5% Dip 'n Grow had significantly more callus growth than other concentrations after 6 weeks. Cuttings of *C. americanus* treated with Dip 'n Grow had some callus development, but no significant differences between concentrations. In four of eight species, auxin promoted callus and root development.

19. Molecular detection of arbuscular mycorrhizal fungal associations with *Trillium recurvatum*.

Anderson, Tawnya; Basso, Douglas K; Fowler, Thomas J and Barry, Kelly J. Southern Illinois University Edwardsville, Edwardsville, IL.

Arbuscular mycorrhizal fungi (AMF) form a symbiotic relationship with many plants through the formation of fungal-plant root structures called mycorrhizae. Fungal spores found in the soil grow within the host plant cell wall in order to feed on fixed carbon produced by the plant. In return, the fungus transfers mineral nutrients to the plant. The general importance of fungal associations with plants should not be overlooked during ecosystem restoration and horticultural applications. Trilliums are slow growing native perennial herbs found in healthy, relatively undisturbed woodlands. While *T. recurvatum* is common in this region, several other trilliums are rare. Consequently, *T. recurvatum* is being used as a model species for the analysis of AMF fungal associations in natural populations. We used AMF-specific primers to investigate the AMF association with *T. recurvatum* in two different natural environments, a continuously moist streamside location and a drier hilltop location. Roots were collected from trilliums growing in both locations and total DNA was extracted from pooled root samples. DNA was also extracted from soil adjacent to hilltop trilliums and from hilltop trillium rhizomes. PCR amplification indicates that AMF are associated with trilliums at both locations but in greater abundance at the drier location. No PCR amplification was detected from soil DNA or trillium rhizome tissue.

20. Do invasive Asiatic honeysuckles (*Lonicera* spp., Caprifoliaceae) invade from the forest edge?

Harroun, David; Schulz, Kurt E and Choudhury, Jessica. Southern Illinois University Edwardsville, Edwardsville, IL.

The colonization pattern of invasive *Lonicera maackii* was examined in a successional forest stand on the Southern Illinois University Edwardsville Campus. We were interested in determining whether the forest edge might act as a seed source for shrubs established within the forest, resulting in a pattern of declining shrub age and abundance proceeding from the edge. A pilot study was conducted to determine if the age of *L. maackii* could be quickly and accurately estimated from ring counts of the largest diameter stem or canopy diameter. Stem sections of randomly selected shrubs were taken and ages were determined from ring counts in the shrub base and the four largest stems. The age of the largest diameter stem is a stronger predictor of age than is shrub canopy diameter. To evaluate colonization patterns, studies were conducted in the south facing forest edge of a mixed hardwood stand. Over 700 stem samples were taken from 25 m² plots situated at 5 intervals (5-45 m) along 8 transects from forest edge to forest interior. We did not observe any evidence from age, size, or abundance data that suggested dispersal from the forest edge. To develop an alternative explanation for the results, hemispherical canopy photographs were taken at the geographic center of each sample plot. Canopy openness ranged 7.8-13.0%, and revealed no apparent gradient from edge to interior. There was no correlation between canopy openness and seedling density. We conclude *Lonicera* invasion is largely driven by seed dispersal from broadly ranging birds.

21. Impacts of preferential herbivory on tree species composition and seedling abundance in an Illinois closed-canopy forest site.

Slater, Mitchell, A and Anderson, Roger, C. Illinois State University, Normal, IL.

The suite of tree species present in closed-canopy forests is largely determined by tree species' shade tolerance characteristics, site conditions, and response to herbivory. The latter is particularly important in Illinois' forests having high deer densities during winter months. Repeated sampling of woody species in permanent plots at one such closed-canopy, mesic forest site (Funks Grove, Illinois) was conducted to assess the frequency of deer browsing and changes in species composition between 2003 and 2008. The tree stratum is dominated by the shade-tolerant *Acer sacharrum*; however, *Asimina triloba* and *Fraxinus* sp. (Ash) were the only species that showed an increase in seedling abundance. Both species exhibited lower levels of herbivory than expected if deer had no browse preference. The largest increase in seedlings between the two sampling periods occurred for *A. triloba*, which possesses powerful defensive chemical compounds that largely prevent damage from herbivores. These results suggest that the composition of forest community tree species is chiefly being shaped by intense browsing at this site. Furthermore, the effects of high *A. triloba* density on forest regeneration are not clearly understood and may substantially reduce species richness over time.

22. Biomass production in an abandoned agricultural field in Rock Island County, Illinois.

Andrade, Bruno M. and Dziadyk, Bohdan. Augustana College, Rock Island, IL.

In November 2007, a final corn crop was harvested on a one half hectare agricultural plot contiguous with the Beling Ecological Preserve, a wetland field station owned and managed by Augustana College. The 40 ha preserve is located on the north shore of the Rock River in Rock Island County, northwest Illinois. Because the old field will be allowed to undergo secondary succession, we decided to take advantage of the opportunity to analyze floristic and biomass changes in 2008 and later. Three permanent study sites (15m x 20m) were established at varying distances from the surrounding forest to permit assessment of the rate of species introductions. Above ground net

primary production was estimated by the harvest method with six randomly chosen, quarter meter square quadrats clipped in each site at approximately two week intervals from early June to mid September. Site locations (from the forest edge) and the peak standing crop biomass (g/m^2) at each are: Site I - 1m, 258 (the wettest site); Site II - 20m, 345; and Site III - 40m, 515 (the driest site). All three sites attained maximum biomass in late August during the wettest year on record (130cm by mid November). Important taxa contributing to biomass production were species of *Persicaria*, *Scutellaria* and *Penthorum sedoides* in site I, *Ammannia coccinea* and *Cyperus strigosus* in site II and *Amaranthus hybridus*, *Xanthium strumarium* and *Setaria faberi* at site III. Seedlings of *Acer saccharinum*, the dominant tree of the adjacent forest, were present at all sites but experienced significant mortality in sites I and II because of heavy flooding in June.

Division: Cell, Molecular and Developmental Biology

23. Expression patterns of pheromone receptor-like genes from the mushroom fungus

***Schizophyllum commune* (Schizophyllaceae)**

Springer, Kate M; Cerentano, Kari J; Fowler, Thomas J. Southern Illinois University Edwardsville, Edwardsville, IL

A search of the *Schizophyllum commune* genome sequence identified four putative genes with extensive predicted amino acid similarity to mating-pheromone receptor genes located in the characterized B mating type locus (B-MAT). At least three of these genes are closely physically linked to B-MAT. Thus, these genes might represent pheromone receptors that were unrecognized by earlier work. However, all four genes are present in a sterile mutant strain. It has been shown that this sterile strain has intact pheromone signaling components except for active mating pheromones and receptors; which suggest that any receptor specified from these newly identified genes does not act independently as a mating-pheromone receptor. A search of *S. commune* Expressed Sequence Tag (EST) databases indicated that at least three of the putative genes are expressed as mRNA. Unmated and mated tissue was collected at several time points to determine when these putative genes are expressed, and whether any correlation to the mating process can be determined. Total RNA was extracted and probed for three of the putative genes. mRNA was detected by two of the gene probes at several time points, and in both mated and unmated tissues, while a third probe did not detect any message in these tissues. Thus, it is still conceivable that these receptor-like genes have a role in mating or sexual development of *S. commune*.

24. Differential gene expression of pheromones and receptors involving dikaryons and Dik-mutants of *Schizophyllum commune* (Schizophyllaceae)

Haswell, Riah L; Fowler, Thomas J. Southern Illinois University Edwardsville, Edwardsville, IL.

Schizophyllum commune is a wood rotting fungus that has three distinct phases in its life cycle: haploid, diploid, and dikaryotic. During the haploid phase the fungus is referred to as a homokaryon and contains one haploid nucleus per cell. Two compatible homokaryons mate to form a dikaryon which has cells containing the two unique nuclei. Diploidy lasts only one cell cycle. With an estimated 20,000 sexes based on incompatibility factors at two distinct loci, *S. commune* has been a model organism for studying the evolution of sex. These loci, A and B, both have subloci, α and β , which behave redundantly to determine whether two haploid nuclei are compatible and to maintain a

dikaryotic state. The A locus encodes homeodomain proteins and the B locus encodes lipopeptide pheromones and G protein-coupled receptors. If the homokaryons are compatible, then reciprocal nuclear exchange is followed by pairing of the distinct nuclei and synchronous nuclear division every cellular division. *dik-* is a dominant mutation resulting in premature fusion of dikaryotic nuclei. Our goal is to determine whether the expression of mating-type pheromones and receptors is down regulated in the diploid organism as a result of the *dik-* mutation. Crosses between a *dik-* strain and a compatible *dik+* strain yielded progeny with a common genetic background that represented the parental and recombinant mating types for both *dik-* diploids and *dik+* dikaryons. Quantitative PCR was used to detect and compare levels of specific pheromones and receptors in the dikaryons and diploids.

25. A site-directed mutagenesis approach to Mdm20p structure and function in *S. cerevisiae* (order: Saccharomycetales)

Alvarez, Eduardo A; Crawford, Patrick A and Singer, Jason M. Augustana College, Rock Island, IL.

N-terminal acetylation is one of the most common post-translational modifications of eukaryotic proteins. *S. cerevisiae* contains three major N-terminal acetyltransferases (NATs): NatA, NatB, and NatC, each with a catalytic subunit and corresponding auxiliary subunit(s). The highly related proteins that compose the catalytic subunits have been much better characterized than the auxiliary subunits, and their structure & function are better understood. The NatB complex consists of the catalytic subunit Nat3p and the associated subunit Mdm20p. Our research is focused on the Mdm20 protein with the goal of gaining insight into its structure and function. Previous studies have shown that yeast cells carrying a complete deletion of either MDM20 or NAT3 display defects in mitochondrial inheritance and actin organization, and have a reduced-growth plate phenotype. The *mdm20-1* allele results in a truncated protein lacking only the C-terminal 50aa (out of 796aa), yet renders the Mdm20 protein completely non-functional. We attempted to further dissect this critical region using site-directed mutagenesis. Four stop codons were introduced at roughly ten codon intervals through the 3' coding sequence, corresponding to aa 755-790. We have verified one synthetic mutation by sequencing and are currently sequencing the remaining three. We are also testing the function of the new mutant alleles using plate growth assays. The results of these experiments will be presented. Further experiments should provide additional insight into Mdm20p and the other auxiliary subunits of NATs.

26. Apoptosis induction in human leukemia cells, HL60 , by UVB irradiation

Gniadek, Jamie; Ruecker, Mckenzie; Wade, Michael C and Wanda, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL

Apoptosis is the genetic process of programmed cell death in eukaryotic cells. Exposure to UVB radiation induces apoptosis in eukaryotic cells. Many changes in the orientation, type, and concentration of membrane components occur during apoptotic cell death. In order to identify and quantify some of these changes HL60 cells were irradiated with UVB light for various times and at a range of distances from the radiation source. Cell viability of treated and untreated cells was determined by trypan blue dye exclusion. Cell death was also correlated with caspase 3 activity. These findings, along with our previous data, were used to derive a hypothetical model for death receptor clustering, one of the many membrane changes in apoptotic cells.

27. The role of serotonin in the digestive tract of the earthworm *Lumbricus terrestris*

Neal, Michael and Krajniak, Kevin. Southern Illinois University Edwardsville, Edwardsville, IL.

Our lab has been investigating the effects of neurotransmitters on the motility of the isolated crop-gizzard from the earthworm, *Lumbricus terrestris*. We found that serotonin causes inhibitory effects on the spontaneously contracting crop-gizzard. Since many segments of gut have not been explored, we decided to examine the effects of serotonin on the isolated pharynx, esophagus, and intestine. The organ of choice was removed from the animal and placed in a tissue bath. Contractions were recorded using a force transducer. The tissue was exposed to increasing concentrations of serotonin and the resulting changes in contractions were used to create log-concentration response curves. So far we have determined that serotonin modulates the crop gizzard and also causes a decrease in contraction amplitude and frequency of the esophagus. Threshold concentrations for contraction frequency and amplitude of the esophagus range from 0.1 to 1 pM and 10 to 100 nM respectively. Currently we are investigating the role of serotonin in controlling the motility of the pharynx and intestine.

28. Gravitropism in roots and inflorescence stems of the gravity persistent signal 4 (gps4)

***Arabidopsis thaliana* mutant.**

Bargiel, Agnes¹; Winter, Mallory¹; Wyatt, Sarah² and ¹Luesse, Darron R. ¹Southern Illinois University Edwardsville, Edwardsville, IL, ²Ohio University, Athens, OH.

Gravitropism, which can be simply described as bending in response to gravity, serves a crucial function in plant survival. Gravity sensing and proper response assures that the plants growth organs are oriented towards the gravity field and that the growth proceeds in the proper direction. In order to better understand the signal transduction pathway required for gravitropism, a mutant screen was conducted to identify lines of *Arabidopsis thaliana* that showed an aberrant response to gravity after a 4° C cold treatment. One mutant discovered in this screen, gravity persistent signal 4 (gps4) shows no gravity response in its inflorescence stem after the cold treatment. Use of an adaptor-ligation protocol revealed that gps4 contains a Transfer-DNA insertion in a gene previously identified to be involved in the gravity signaling pathway. Sequence analysis revealed that like GPS4 is a J-Domain-containing protein that could be involved in regulating hsp70. This research focuses on the gps4 mutant, which exhibits a reduced gravitropism response when compared to wild-type Arabidopsis. The research presented here is focused on characterization of gravitropism in roots and inflorescence stems of gps4 mutant and comparing the results with the wild type. The measurements involve both room temperature and cold treatment conditions, which will allow for more insight in the nature of the gps4 defect.

29. Analysis of transcription factor promoter binding in rat hepatoma/fibroblast hybrids

Angle, Jordan C. Eastern Illinois University, Charleston, IL.

The cellular mechanisms that dictate sweeping changes in gene expression during mammalian development are mostly unknown. To determine mechanisms directing tissue-specific gene expression, we have used rat hepatoma/fibroblast hybrids, which show a complete lack of both hepatoma-specific and fibroblast-specific gene expression. The mechanisms of repression present in the hybrids have been shown to act at the level of transcription. By utilizing the chromatin immunoprecipitation (ChIP) assay, the ability of transcription factors to bind the promoter region of

tissue-specific genes can be analyzed in vivo. Previous data has suggested gene silencing may simply be due to the loss of essential transcription factors in the hybrid cells, although a direct test of this idea failed to result in rescue of hepatic gene expression. Here, we use the ChIP assay to determine whether silenced genes are inactivated due to failure of transcription factors to bind or due to other mechanisms. Results suggest that forced expression of hepatic transcription factors in the cell hybrids or in fibroblasts results in binding to promoters of liver-specific genes, suggesting that the block to gene transcription occurs through mechanisms other than a failure of liver-specific transcription factors to interact with promoters.

30. Basic characterization of gravity persistent signal 5 (gps5), a hyper-gravitropic mutant in *Arabidopsis thaliana*

Kinser, Joshua D¹; Huynh, Ha T¹, Wyatt, Sarah E² and Luesse, Darron R¹. ¹Southern Illinois University Edwardsville, Edwardsville, IL, ²Ohio University, Athens, OH.

A plant's ability to sense gravity is critical to its ability to survive, providing them the ability to direct growth, avoid predation, and to compete with surrounding plants for sunlight. It impacts how a plant grows from its earliest stages to seed production. The goal of this study is to better understand the molecular signals involved in the gravitropic response by attempting to better characterize the gravitropic persistent signal 5 (gps5) mutant in *Arabidopsis thaliana*. The gps5 mutant was identified as part of a mutant screen for plants that showed altered response to a 90° reorientation at 4° C. This particular mutant displayed enhanced gravitropism in the inflorescence stem. Identification of the location of a Transfer-DNA (T-DNA) in gps5 indicates that the mutation is in a member of a gene family that could function as an E3 ubiquitin ligase. This work endeavors to better characterize the gps5 mutant, with observations made on gravity response in root, hypocotyls, and inflorescence stem of *Arabidopsis thaliana* under cold treatment conditions as well as room temperature. We will also report progress on identification of other alleles of the gps5 mutant.

31. Gravitropism in the *Arabidopsis thaliana* mutant gravity persistent signal 4 (gps4).

Winter, Mallory¹; Bargiel, Agnes¹; Wyatt, Sarah E² and Luesse, Darron R¹. ¹Southern Illinois University Edwardsville, Edwardsville, IL, ²Ohio University, Athens, OH.

Gravity plays a crucial role in the physical patterning of *Arabidopsis thaliana* and other plants. When presented with a change in the direction of gravity, plants alter their growth patterns. This response is known as gravitropism. Gravitropism is a 3-step pathway by which gravity is sensed, signal transduction occurs, and the result is differential growth (bending) toward or away from gravity. The effects of gravity on the shoots and hypocotyls are studied in the laboratory by reorienting a plant 90° with respect to gravity. The mutant gravity persistent signal 4 (gps4) is a "no response" mutant isolated in a screen for *Arabidopsis* lines that display altered tropisms after a 90° reorientation at 4°C. Molecular analysis indicated that there is a Transfer-DNA inserted in the gene ARG1-Like 2 (ARL2). This report focuses on the basic characterization of the gps4 mutant. We have measured gravitropic bending in gps4, arg1, and wild-type seedling hypocotyls with and without a 4°C pre-treatment. Our results will provide insight on gps4 and its role in signal transduction of gravitropism.

32. Characterization of acute ethanol exposure on LPS-induced signaling pathways in RAW 264.7 macrophages.

Darrow, Michele C and Kirkley, Janet. Knox College, Galesburg, IL

Innate immunity is an essential defense system in the body. Cells promoting inflammation participate in a complex system of communication and response designed to protect the body from bacterial infection. Ethanol has been shown to affect this immune response by altering macrophage response to lipopolysaccharide (LPS) from Gram-negative bacteria. The mechanisms by which ethanol exerts its effect are not entirely understood. The purpose of this study was to characterize further these mechanisms by determining the effects of acute ethanol exposure on selected LPS-stimulated signaling pathways in RAW 264.7 cells and on specific products of the inflammatory response. The pathways studied included the MAP kinases p38 and JNK. The effect of ethanol on the expression of COX-2 and inducible nitric oxide synthase (iNOS) was also investigated. Addition of ethanol simultaneously with LPS to cell cultures resulted in a decrease in the phosphorylation of JNK and p38. Ethanol was also found to decrease LPS-induced expression of iNOS in a dose-dependent fashion, although it did not appear to affect COX-2 expression in a similar manner. These results indicate that ethanol may exert a negative effect on the innate immune response by decreasing macrophage response to LPS through an impairment in signal transduction and a decrease in expression of at least some inflammatory mediators.

33. The cholinergic receptor transduction system in the earthworm (*Lumbricus terrestris*) gizzard

Meredith, Alan M and Krajniak, Kevin G. Southern Illinois University Edwardsville, Edwardsville, IL.

In the earthworm, *Lumbricus terrestris*, acetylcholine stimulates the contraction rate of the crop-gizzard and causes a biphasic change in amplitude with an increase at low concentrations and a decrease at high concentrations. Since many cholinergic receptors are linked to the production of second messengers we decided to see if known inhibitors of transduction pathways could alter the mechanical responses of isolated gizzard rings to acetylcholine stimulation. When exposed to the adenylyl cyclase inhibitor, MDL-12,330A, the rate of contraction after an acetylcholine application was markedly decreased. Even after all of the inhibitor was washed away, the subsequent application of acetylcholine did not result in a contraction amplitude as high as the initial 1 μ M application of acetylcholine. These results suggest that an adenylyl cyclase pathway might be responsible for acetylcholine induced responses. To confirm our theory, we treated the gizzard with an adenylyl cyclase agonist 8-Br-cAMP, which should behave similarly to acetylcholine. However we found that 8-Br-cAMP application did not produce results similar to the application of acetylcholine. 8-Br-cAMP caused an increase in contraction rate at low concentrations, and decreased at higher concentrations. We are now testing the effects of a protein kinase A blocker, H-89, to determine its effects if any on this pathway. We also plan to use phorbol esters in order to block some interference that may affect our data.

34. The alimentary canal of the earthworm *Lumbricus terrestris* and the systematic effects of neurochemicals

Klohr, Renee C and Krajniak, Kevin. Southern Illinois University Edwardsville, Edwardsville, IL.

The effects of acetylcholine and FMRFamide on the isolated organs of the alimentary canal were examined in this study. Each dissected alimentary organ was attached to a transducer and suspended in a tissue bath of worm saline. Applications of these drugs in a series of increasing concentrations were administered and the percent change in amplitude and rate were calculated from the measurements recorded. No reproducible data was obtained when either acetylcholine or FMRFamide was applied to the isolated pharynx. Acetylcholine causes a biphasic response when applied to the esophagus, excitatory in amplitude at 0.01 to 0.1 nM, inhibitory at 1 to 10 nM, followed by excitatory at 100 nM before becoming inhibitory again. An excitatory change in rate was seen at 100 to 1000 nM. An excitatory response for both amplitude and rate was observed in response to acetylcholine on the crop and gizzard with a threshold of 10 nM. Acetylcholine applied to the intestine showed an overall inhibitory effect. FMRFamide treatment on the esophagus induced an excitatory response in amplitude at 0.01 to 1 nM and amplitude decrease at 10 to 1000 nM. An excitatory response in rate at 100 nM was observed in the esophagus. FMRFamide applied to the crop or gizzard, individually, elicited a concentration dependant excitatory reaction in rate and amplitude at 1 to 10000 nM. The rate of contractions in the intestines were unaffected by FMRFamide, but an inhibitory effect in amplitude at .01 to 1000 nM was observed.

Division: Chemistry

35. Microcontact printing of thiols on silver and AFM characterization

Jewell, Sherryl M and Voss, Eric J. Southern Illinois University Edwardsville, Edwardsville, IL.

Soft lithography by microcontact printing is a modern technique for easily making detailed patterns on a substrate. This project involves the preparation of a poly(dimethylsiloxane) (PDMS) stamp that is used to print an alkanethiol pattern on a silver-coated piece of glass. The alkanethiol molecules form a self-assembled monolayer (SAM) on the surface, and protect the silver where they have been deposited. The unprotected silver can be chemically etched away, allowing one to see the stamped pattern, or the silver can be left in place. Research so far has focused on optimizing conditions for depositing silver on the glass, preparing the PDMS stamp, and consistently stamping the thiol onto the surface. We are currently interested in using Atomic Force Microscopy (AFM) to characterize the patterns on the surface. A future goal is to use this method to make nanoscale patterns and characterize them by AFM.

36. Solution-phase parallel synthesis of N-benzenesulfonyl derivatives of heterocycles

Pagliero, Romina J¹; Mazzieri, Maria R¹ and Nieto, Marcelo J². ¹Universidad Nacional de Cordoba, Cordoba, Cordoba, Argentina, ²Southern Illinois University Edwardsville, Edwardsville, IL.

Small molecule combinatorial chemistry has been used in the last ten years to dramatically accelerate the development of biologically interesting scaffolds in drug discovery process. Some of the advantages of solution-phase parallel synthesis (SPPS) include the capability of easy monitoring the reaction and success and the favorable kinetics of homogeneous conditions that decrease the

reaction time. As part of an ongoing drug discovery project we are interested in the design and synthesis of small N-benzenesulfonyl-heterocyclic libraries. Because of their broad-spectrum biological activities, the heterocycles have been extensively used in drug design. We selected eight nitrogenated heterocycles that are common moieties in known biologically active molecules. On the other hand, the benzenesulfonyl (BS) moiety is a substituent frequently present in molecules with biological activity. Not only is the p-aminobenzonesulfonyl moiety a known PABA antagonist with antibacterial and antileprotic activity, but the BS group has demonstrated interesting biological binding properties. The initial library of small molecules generated more than 100 compounds. The methodology used for the SPPS led to pure compounds in a shorter time compared with the classical synthesis. Finally, the characterization and quality control was also performed by high-throughput methodology (LCMS). The characterization was completed by NMR, IR, m.p. for representative compounds. The overall yield for the synthesis of this library was over 80% with an overall purity (by mass spectrometry) of over 90%.

37. Characterization of the calcium binding domain of NADPH Oxidase 5 (NOX5)

Chen, Liu Qi and Wei, Chin-Chuan. Southern Illinois University Edwardsville, Edwardsville, IL.

Superoxide generated by non-phagocyte NADPH oxidases (NOXs), such as NOX5, is of growing importance for vascular physiology and pathology. NOX5 enzyme consists of a transmembrane heme domain that is linked to a flavoprotein domain that contains FAD and binds NADPH. It appears to be regulated by self-contained Ca^{2+} binding domains (CaBD), which contains four EF-hands motifs. Previously we demonstrated that this calcium binding gates the heme reduction in NOX5, possibly through the CaBD-flavoprotein interaction. To better understand its structure and function, here we characterized the metal binding properties of the recombinant CaBD by fluorescent spectroscopy. Our data revealed that CaBD binds to Ca^{2+} , Mg^{2+} , terbium (Tb^{3+}) in the range of μM to mM . The data are further supported by the studies using the site-directed labeled CaBD. The rate of calcium association was too fast to be determined by a stopped-flow device, but the dissociation rate constant was determined to be 5 s^{-1} at 20°C . The ANS titration and Stern-Volmer plots suggested that there was a significant conformational change upon the metal bindings. Interestingly, the spectra of circular dichroism indicated otherwise no change on the context of its secondary structure. However, this conformational change can be observed using the Surface Plasmon Resonance with the CaBD immobilized in the sensor chip. Because our data and other studies suggest there are two different types of calcium bindings in CaBD, currently we are performing the similar studies using N- and C-terminal halves of CaBD (aa 1-78 and 79-184)

38. Osmium(VIII) catalyzed kinetics of indigo carmine oxidation by chloramine-B in basic medium

Mosarla, Narendar R; Puram, Swetha; Cholkar, Kishore; and Gowda, Netkal M. Western Illinois University, Macomb, IL.

Indigotindisulfonate sodium or indigo carmine (IC) finds applications in chemistry as a redox indicator and in biology as a microscopic stain. It is also clinically used in kidney function tests. Manganese(III) acts as a mild one-electron oxidant in acid solutions. Chloramine-B (CAB) like chloramine-T acts as a mild, two-electron oxidant in solutions. IC-CAB kinetic studies have not been reported in the literature. Therefore, it is of importance to study the kinetics of oxidation of IC in order to understand the mechanism. In this project, we report some kinetic data involving the

CAB oxidation mechanism of IC catalyzed by Os(VIII) in basic medium. The oxidation of IC by CAB has been spectrophotometrically monitored at $\lambda_{\max} = 610$ nm. The experimental rate law for the reaction, under the pseudo-first-order conditions of $[IC] \ll [CAB]$, is as follows: $\text{rate} = k [IC] [OH^-]^x [Os(VIII)]^y$, where x and y are fractional orders. Additionally, the reduction product of CAB (benzenesulfonamide), the ionic strength, and the dielectric constant of the reaction medium have negligible effect on the rate. Based on the effect of temperature, activation parameters have been evaluated using Arrhenius and Eyring plots. A mechanism consistent with the observed kinetic and activation data has been proposed for the reaction and a rate law consistent with the experimental data has been derived.

39. Template synthesis and AFM characterization of nickel nanowires

Thomas, Joel D and Voss, Eric J. Southern Illinois University Edwardsville, Edwardsville, IL.

Wires of nanoscale dimension have been made by the template synthesis method in which metal is electrochemically deposited into the pores of an alumina membrane. The membrane template is chemically dissolved away to liberate the nanowires. The diameter of the wires is fixed by the size of the pores in the template, and the length of the wires is determined by the deposition time. This project involves the synthesis of nickel nanowires with 200 nm diameter and lengths between 10 and 40 μm . Previous researchers have characterized these nanowires by optical microscopy, powder X-ray diffraction (PXRD), and scanning electron microscopy (SEM). In addition to these techniques, we have also employed tapping-mode Atomic Force Microscopy (AFM) to characterize the nanowires on a mica surface. Future goals are to synthesize nickel nanowires of smaller diameter and length, and to study their electrical and optical properties.

40. Chemical and thermal stability of the calcium binding domain of NADPH Oxidase 5

Levek, Kelli A; Williams, Tiffany and Wei, Chin Chuan. Southern Illinois University Edwardsville, Edwardsville, IL.

Superoxide generated by NADPH oxidases (NOXs) plays an essential role in promoting cell growth and, therefore, disease development. NOX5 consists of a transmembrane heme domain, a flavoprotein domain, and a calcium binding domain (CaBD) that contains four calcium binding sites. The superoxide-generating activity of NOX5 is controlled by the calcium flux, possibly through the interaction of CaBD with the flavoprotein domain within NOX5 enzyme. In our laboratory, we have observed a conformational change associated with metal bindings (Ca^{2+} , Tb^{2+} , and Mg^{2+}) using fluorescence spectroscopy, but not on the content of the secondary structure using circular dichroism (CD). Because the conformational change on CaBD upon calcium binding appears to be important for the interaction with the flavoprotein domain, here we aim to study the chemical and thermal stabilities of CaBD using fluorescent spectroscopy and differential scanning calorimetry (DSC). Our preliminary data indicated that thermal stabilities of CaBD are different in the absence and presence of Ca^{2+} and indicated there is one intermediate during the CaBD's unfolding using intrinsic tryptophan fluorescence. We will repeat similar experiments using cys107 labeled IAEDANS CaBD and using guanodine hydrochloride as denaturant. Similarly, DSC will be used to monitor their folding and unfolding properties. We will also perform these studies using half domains of CaBD (N-CaBD and C-CaBD). In combining the data gathered from this study, a discussion on the stability caused by metals that is related to their structures will be given.

41. Synthesis and AFM characterization of block copolymers

Rensing, Derek T and Voss, Eric J. Southern Illinois University Edwardsville, Edwardsville, IL.

Block copolymers consist of alternating large areas composed of two or more different monomer units, leading to complex architectures. A polymer chain block is first grown while maintaining an active end, then a second monomer is added to grow a second block. The structure of the resulting copolymer is controlled by choice of the monomers, their relative molar ratio, and other reaction conditions. In this project, several block copolymers were synthesized by Ring Opening Metathesis Polymerization (ROMP) using a ruthenium carbene catalyst. A 7-oxanorbornene derivative was synthesized in a two-step process and was then polymerized for 24 h. A second monomer, cyclooctene, was added and the polymerization was continued for 48 h. The resulting copolymer was spin-cast onto a mica substrate and was characterized by tapping-mode Atomic Force Microscopy (AFM). The coated polymer is relatively flat, yet blocks are easily identified by changes in the tapping phase. When the 7-oxanorbornene derivative and the cyclooctene are polymerized simultaneously, the resulting polymer shows no blocks. In addition to varying the mole ratios of monomers and studying the effect on block size and shape, we are developing this experiment for an upper-level inorganic chemistry laboratory.

42. Fluorescence characterization of N and C-terminal halves domain of calcium binding domain of NADPH OXidase 5

Motl, Nicole A and Wei, Chin-Chuan. Southern Illinois University Edwardsville, Edwardsville, IL.

Superoxide generated by NADPH oxidases (NOXs) is essential for the operation of normal biological functions, such as promotion of cell growth and division. Abnormal levels of superoxide generated by NOX5 have been connected to diseases such as gastroesophageal reflux disease (GERD) and cancer. NOX5 consists of a transmembrane heme domain, a flavoprotein domain, and a calcium binding domain (CaBD) that contains four calcium binding sites. The superoxide-generating activity of NOX5 appears to be regulated by calcium flux, possibly through the interaction of CaBD with the flavoprotein domain within NOX5 enzyme. In our laboratory, we have shown that there are two types of calcium binding in CaBD, one with relatively tight binding and another with relatively weak binding. To further elucidate its calcium binding, we expressed and purified the recombinant N-half CaBD (N-CaBD, a.a. 1-78) and characterized it using fluorescence spectrometry. Our preliminary data indicates that N-CaBD has a weaker binding to calcium with very fast association and dissociation rates that can not be detected in a stopped-flow device. N-CaBD also binds to other metals such as Mg^{2+} and Tb^{3+} , and appears to be functionally independent to C-terminal half (C-CaBD). We also determined the conformational change of N-CaBD upon metal bindings with ANS titration and Stern-Volmer fluorescent quenching. Currently we are constructing plasmid for C-CaBD and will perform purification and characterization in the same manner.

Division: Earth Science

43. Post-acquisition processing for ground-penetrating radar surveys in cemeteries

Batir, Joseph F and Henson, Jr., Harvey. Southern Illinois University Carbondale, Carbondale, IL.

Ground-Penetrating Radar (GPR) data were acquired at an early nineteenth century cemetery in Jackson County, Illinois in an attempt to help locate unmarked graves. The Sensors and Software, Inc. Noggin Plus 250 MHz and 500 MHz antennae systems were used to collect the GPR data. There were many sources of digital noise at this site, including old growth trees, grave markers, and cast iron fences. It was essential to increase the signal to noise ratio in order to identify subtle grave signatures in the GPR data. An iterative approach to digital processing was utilized to test the benefits of numerous post-acquisition processing techniques and various parameters on improving overall data quality and interpretation. The processing sequence is presented and discussed step by step and displayed along with GPR digital results. A comparison of processing techniques and results for the 250 MHz and 500 MHz data will be presented. Although unique to this case study, outcomes provide a framework for similar (noisy) GPR data collected by researchers at other project sites.

44. Nomenclature of the Triassic Metoposauridae (Amphibia, Temnospondyli)

Ruez, Jr., Dennis R. University of Illinois at Springfield, Springfield, IL.

Metoposaurs are widespread, occurring on four continents, and are particularly abundant in west Texas. These large amphibians were variously assigned to species within *Anaschisma*, *Apachesaurus*, *Arganasaurus*, *Borborophagus*, *Buettneria*, *Calamops*, *Dictyocephalus*, *Dutuitosaurus*, *Eupelor*, *Kalamoiketos*, *Koskinonodon*, *Metopias*, and *Metoposaurus*; species level identification is more tenuous. Because there is considerable debate as to the nomenclature and systematics of the group, I performed a phylogenetic analysis of metoposaur species type specimens. The results conflict with recently proposed relationships and previously proposed synonymies of metoposaur taxa. A conservative taxonomic approach is suggested here because of the overall morphological similarity, the incongruence of paleogeography and phylogenetic hypotheses, and the paucity of synapomorphic characters. I recommend using *Metoposaurus* for all species of metoposaurs until additional characters are found and variation within taxa is clarified.

Division: Environmental Science

45. The effectiveness of a forested buffer on water quality of Friends Creek in Macon County, Illinois

Fritzgerald, Adam S; Imel, Chelsey J; Scholl, Eric A and Horn, David J. Millikin University, Decatur, IL.

Numerous studies have found that the use of forested buffer zones around streams can improve water quality, decrease erosion, and enhance biodiversity in aquatic ecosystems. With water quality deteriorating in some areas, there is a need to study how buffers can improve stream health. Friends Creek in Macon County, IL is a small waterway that runs through agricultural regions, and a county park that acts as a riparian buffer. We studied the effects of buffers on water quality and their effectiveness in improving water quality downstream. From July to November 2008, we used physical and chemical testing to quantify water quality at five sites in both agricultural and buffered regions. Buffers did not act completely as predicted, but supported our hypotheses that the buffer is effective in reducing stream flow and nitrate levels in the stream. Overall, we found that most factors of stream health in Friends Creek fall within healthy ranges, and that this creek is healthy

compared to other Illinois waterways. For future research, monitoring will continue through the planting season to determine if there are temporal differences in the effectiveness of buffers.

46. A paleolimnological study of two lakes adjacent to Native American Sites on the Illinois River

Wilson, Matthew¹; Brugam, Richard¹; Williams, Phillip¹; Kohn, Luci Ann P¹ and Vogel, Gregory².
¹Southern Illinois University Edwardsville, Edwardsville, IL, ²Center for American Archeology, Kampsville, IL.

This study examines sediment cores from former floodplain lakes at two Native American sites, Moundhouse and Koster. Our goal is to determine Native American impacts on the local environment. Moundhouse was a ceremonial site that was occupied from about 2100-500 BP and is currently located in a corn field along the Illinois River. It was nearly surrounded by an oxbow lake which has been drained for farming. The Koster site was a Native American living site periodically occupied from 8000-500 BP. The study lake is located in the floodplain adjacent to the site. It was drained and is now a bean field. The samples were collected using a Giddings corer. Two cores were collected from the Moundhouse site. Samples were collected about every 10cm for ash weight determinations. Samples were dried and heated in a muffle furnace at 550° C to determine organic matter concentration and 950° C to determine carbonate concentration. Our preliminary data shows decreased organic matter deeper in the cores. Carbonate-rich river sands compose the bottom of each core. There is also a 20 cm plow layer. The study of sediment from former floodplain lakes in the Illinois River Valley should allow us to reconstruct the long-term impact of both Native Americans and Euro-Americans on their environment.

47. Atrazine levels in Friends Creek and Stevens Creek in Macon County, IL: the influence of agriculture, urbanization, and buffer zones

Imel, Chelsey J; Fritzgerald, Adam S; Scholl, Eric A; Horn, David J and Acheson, Ed R. Millikin University, Decatur, IL.

Atrazine is a herbicide with possible negative effects on wildlife, as well as humans. While atrazine levels are recommended to be 3 ppb or less in the water supply, some studies have found greater levels at various times of the year. We monitored the levels of atrazine in Stevens Creek and Friends Creek in Macon County, IL for five weeks from 10-25-08 to 11-15-08 and again in spring 2009. Because Stevens Creek moves through both agricultural and urban settings, and Friends Creek moves through both agricultural areas and a buffer zone, we were able to examine the atrazine levels at three habitats common in central Illinois. We used the Hach's Atrazine Immunoassay Kit in order to test the samples from both creeks for the presence of atrazine, and we analyzed samples with the use of a 8452 A Diode Array Spectrophotometer. As atrazine has been linked to health risks in both animals and humans, it is important to determine the amount of atrazine in local waterways.

48. Scavenging rates differ at windowed compared to windowless sites at Millikin University in Decatur, Illinois

Rawlings, Cynthia M and Horn, David J. Millikin University, Decatur, IL.

The number of bird-window collisions is estimated to be between 100 million-1 billion per year. One reason for the wide estimate in the number of collisions is scavengers finding carcasses before

they are found. We examined whether bird-window collisions influence foraging pattern by comparing scavenging rates at windowed sites compared to windowless walls. The study was conducted at Millikin University in Decatur, Illinois from Fall 2007 to Fall 2008. Six, 40-day trials were conducted in which 20 grams of chicken breast was placed at 16 sites (8 windowed and 8 windowless sites), and the status of the chicken was monitored every 12 hours. Scavenging rates were faster at windowed sites 0 m from windows compared to windowed sites 10 m from windows and locations 0 and 10 m from windowless walls. Scavenging rates also varied by season with faster rates in the spring and summer months compared to the fall and winter. While scavenging rates are faster at windowed sites 0 m from windows, seasonal scavenging patterns do not correspond with the seasonal distribution of bird-window collisions. Thus, faster scavenging rates in the spring and summer are most likely a result of an increase in the number and kinds of scavengers present.

49. Urban sprawl and farmland loss: the farmer perspective

Atkinson, Seth David. Southern Illinois University Edwardsville, Edwardsville, IL.

Illinois, one of the United States' leading agricultural producers, is experiencing continual farm loss at the rural-urban interface. It is my contention that sprawling development is the leading cause of farmland conversion in metropolitan fringe areas. Highly ranked among states most threatened with farmland loss to development, Illinois is an ideal platform for analysis of the phenomenon. The current literature on the subject focuses the majority of its attention on areas such as land valuation and policy assessment and prescription. This is not my intent. Rather, my research will provide insight into the perceptions of Illinois families and individuals that have encountered the direst of effects, complete loss of the capacity to farm. This will be achieved by conducting semistandardized interviews aimed at extracting the farmer's account of the process and causal factors of farm loss. My target area is comprised of five widely dispersed Illinois counties experiencing high loss of prime farmland in the metropolitan periphery. While I perceive sprawl to be the leading causal factor, I hypothesize that the average farmer will not see the same correlation, perhaps attributing the result to reasons such as agribusiness or subsidy allocation. This study will accommodate the voice of the farmer who has lost her land and communicate it as a means of better understanding sprawl as an intricately progressive rather than singular event.

50. Dollars and sense: evaluating environmental justice in IL through the distribution of brownfield funds and Tax Incremental Financing

Gates, Christen M. Southern Illinois University Edwardsville, Edwardsville, IL.

Government incentives like brownfield remediation grants and loans provide financial and managerial support to promote land revitalization while Tax Incremental Financing (TIF) attempt to spur growth and development by appropriating taxes to pay for economic development plans. It is my proposal to analyze these incentive programs by examining the distribution of Brownfield remediation funds and TIF Districts in Illinois (IL). Data for this analysis will be compiled through an investigation of the EPA's brownfield remediation grants and loans as well as TIF districts in IL. Calculations will be measured and mapped through the use of Geographical Information Systems and Statistical Package for Social Sciences. Their distribution will be classified in three areas: geographical, metropolitan, and political. Each assessment will identify with its respective variables such as geographical position (e.g. longitude and latitude), population characteristics (e.g. density, industrial concentration, median income), and geopolitical alignment (e.g. legislative districts). I

hypothesize that TIF and publicly funded brownfield remediation will be most concentrated in northeastern IL and TIF districts and brownfields will be most concentrated in the following legislative districts: Cook, DuPage, De Kalb and Will. From this investigation I hope to fully comprehend the present circumstances these governmental systems have laid out. In turn, once the distribution of these government programs have been recognized an evaluation of concentrating State resources can take place.

51. The effects of agriculture and urbanization on water quality of Stevens Creek in Macon County, Illinois.

Scholl, EA; Imel, C. J; Fitzgerald, AS and Horn, DJ. Millikin University. Decatur, IL.

Agricultural practices such as fertilization can place nutrients into a nearby water system. Urbanization can lead to high levels of nutrients from sewage and lawn fertilizer, and runoff from impervious surfaces. Stevens Creek is 29 km long and flows through central Illinois, beginning in an area of heavy agriculture, and flowing through the urbanized portion of Decatur. We measured physical and chemical characteristics at five locations from October 2007 to March 2009. The first two sites are located in heavy agriculture, the third at the transition into urbanization, the fourth in the city of Decatur, and the fifth before it empties into the Sangamon River. We tested nitrogen, alkalinity, orthophosphorus, and dissolved oxygen levels, as well as stream flow, turbidity, and temperature. By using physical and chemical testing, we can gain a better understanding of whether agriculture and urban areas are playing a role in the health of Stevens Creek, and be able to offer recommendations on how to improve the overall quality of the creek.

Division: Health Sciences

52. Telithromycin enhances some murine immune responses

Purlee, S Janel; Azenga, Brenda M; Hartman, Jason V; Gooch, Melanie; Khazaeli, Sadegh and Kitz, Dennis J. Southern Illinois University Edwardsville, Edwardsville, IL.

Telithromycin (aka Ketek) is a relatively new, semi-synthetic member of the macrolide antibiotic class. This drug may cause liver damage, but despite this ongoing debate regarding therapeutic safety, Ketek is widely used to treat drug-resistant intracellular respiratory bacterial pathogens. Ketek is concentrated by phagocytic cells, and in our experience this correlates with enhanced immune responses by the host. Among the murine cells examined, macrophage cidal activity was significantly enhanced by Ketek, while neutrophil cidal activity was depressed. In vivo exposure of PEC (macrophages) to Ketek also enhanced in vitro killing of yeasts. Ketek significantly enhanced DTH (T cells and macrophages) response in mice to the chemical dinitrofluorobenzene (DNFB) Sigma at a total ip dosage of 4.0 mg. Organ clearance of candidal yeasts administered intravenously was not different in drug-treated or control mice. These results suggest that Ketek mediated enhancement of macrophages and T cells help explain the drug's efficacy in patient therapy. This work was supported in part by the Max Baer Heart Fund, Fraternal Order of Eagles and the NSF-funded Illinois LS-AMP Research Scholar's Program.

53. Azole antifungal molecules can influence murine immune response

McDaniel, Darrin D; Nelson, Darah J; Adkins, Eric R; Ocegüera, Ashlee N; Khazaeli, Sadegh and Kitz, Dennis J. Southern Illinois University Edwardsville, Edwardsville, IL.

Amphotericin B Squibb has been the gold standard for antifungal therapy for many years and is well known for its effects on host T and B cell response. Continuing this line of research, we have looked at the ability of imidazole class antifungal molecules: Fluconazole, Voriconazole and Posiconazole; to influence murine immune response. These azoles act on enzymes inhibiting the sterol pathway leading from lanosterol to ergosterol in the fungal membrane. Using a contact sensitizing chemical dinitrofluorobenzene (DNFB) Sigma in an assay described by Phanuphak (J Immunol 112:115,1974) the effects of DNFB on DTH were determined. Fluconazole enhanced DTH response to DNFB at dosages of 1.0 to 6.0 mg. The optimal fluconazole dosages and sensitizing time frame for drug exposure relative to DTH response were determined. Fluconazole also was found to reverse the host tolerance response in mice to DNFB elicited by iv administration of DNBSO₃Kodak. Voriconazole was also found to enhance DTH response to DNFB, and recently obtained Posaconazole is currently being tested for its effects of DTH. This work was supported in part by the Max Baer Heart Fund, Fraternal Order of Eagles, and the NSF-funded Illinois LS-AMP Research Scholar's Program.

54. Some murine immune responses can be modulated by glycopeptide antibiotics

Adkins, Eric R; Nelson, Darah J; Hendree, Shannon N; Meyers, Samantha; Khazaeli, Sadegh and Kitz, Dennis J. Southern Illinois University Edwardsville, Edwardsville, IL.

Vancomycin, Dalbavancin and Targocid are all glycopeptide class antibiotics often used to treat serious bacterial infections. These drugs act on peptidoglycan synthesis, membrane permeability and RNA synthesis, and are used to treat drug-resistant *Staphylococcus aureus*, enterococci, *Clostridium difficile* as well as serious infections of the heart and bloodstream. Neutrophils and macrophages were thioglycolate elicited from the peritoneal cavities of AKR/J mice. The glycopeptides displayed a mixed effect on phagocytic cell activity for candidal yeasts, with Dalbavancin significantly boosting macrophage killing. A contact sensitizing assay (J Immunol 112:115,1974) developed by Phanuphak, Claman and associates was used to determine glycopeptide drug effect on DTH; both vancomycin and dalbavancin significantly boosted DTH response. Organ clearance assays were done by iv challenge of mice with *Candida lusitanae*, groups with and without drug given ip. Mice were sacrificed 3-4 days later by group to determine CFU of yeasts present in organs of control and drug-treated mice. These glycopeptide drugs are the hosts' last defense against serious bacterial infection, and drug-mediated immune enhancement may contribute to their successful antimicrobial therapy. This work was supported in part by the Max Baer Heart Fund, Fraternal Order of Eagles, and the NSF-funded Illinois LS-AMP Research Scholar's Program.

55. The effect of atrazine on learning and memory in young Sprague-Dawley rats

Beeson, Kathleen A and Penick, Esther. Knox College, Galesburg, IL.

The extensive application of the herbicide atrazine (ATR) in the U.S. has led to accumulation in ground, surface, and drinking water. While a variety of consequences of human exposure to ATR are known, its effect on learning and memory in the developing brain is still being investigated. Therefore, for this study, young Sprague-Dawley rats were orally exposed to ATR at 10 mg/kg/day for 1 week after which learning and memory abilities were examined. This was done behaviorally,

using a Morris water maze test, and electrophysiologically using long-term potentiation (LTP) in the CA1 region of the hippocampus. Rats exposed to ATR showed a trend of decreased learning and memory capabilities in the Morris water maze test compared to control rats (Mean seconds/120s \pm SD: Control=59 \pm 11.0, ATR=47 \pm 16.3; $p < 0.11$). The cellular correlate to learning, LTP, was similarly affected. Field recordings of excitatory post-synaptic potentials (fEPSP) expressed less synaptic potentiation in ATR hippocampus slices than slices taken from control rats (Mean fEPSP slope as % baseline \pm SE: Control=171.3 \pm 51.0, ATR=125.3 \pm 12.3). This study may indicate that ingesting atrazine could have a detrimental effect on learning.

Division: Microbiology

56. Prevalence of β -hemolytic *Streptococcus* carriers among undergraduates at Aurora University

Stark, Elizabeth A and Zelman, Mark, E. Aurora University, Aurora, IL.

Strep throat is a bacterial infection found throughout the world. It occurs most frequently among school age children but everyone is susceptible. Infections cause many lost work and school days and may lead to serious complications. The purpose of this study is to determine the prevalence of the bacterium *Streptococcus pyogenes* among undergraduate residents and commuters at Aurora University. Student volunteers age 18 and over were screened for β -hemolytic streptococci. Throat swabs were cultured on blood agar plates. If β -hemolytic bacteria were present, the sample was then run through a rapid strep agglutination test to determine if *S. pyogenes* was the bacteria causing the hemolysis. Preliminary results show that more than half of the students carried *S. pyogenes* in their throats. The relative risk for carrying β -hemolytic streptococci was calculated for commuters, residents, gender, and age.

57. Anaerobic growth potentials of *Xenorhabdus nematophila*

Schuette, Alexandra C and Daniel, Steven L. Eastern Illinois University, Charleston, IL.

Xenorhabdus nematophila is a gut symbiont of the entomopathogenic (insect-killing) nematode *Steinernema carpocapsae*. The life cycle of *X. nematophila* is unique because this bacterium is involved in nematode symbiosis as well as in insect pathogenesis (kills insects which allow the nematode to complete its own life cycle in the insect). One factor which might contribute to the survival of this bacterium in these different habitats is its ability to respire or ferment. However, little is known about the anaerobic (fermentative) capabilities of this bacterium. The goal of this project was to determine the anaerobic growth potentials of *X. nematophila*. *X. nematophila* was maintained in aerobic Luria-Bertani (LB; supplemented with 20 mM glucose and 0.1% pyruvate; pH 7.0) broth at 25°C. When transferred from aerobic LB broth to anaerobic LB broth (aerobic LB broth prepared under argon), significant growth was observed, and the final pH of anaerobic LB cultures approximated 5.6. Supplementation of anaerobic LB broth with fumarate or nitrate did not enhance growth, and growth did not occur in anaerobic brain heart infusion (BHI; supplemented with yeast extract and glucose) broth or in an anaerobic undefined medium (UM; yeast extract, glucose, pyruvate, minerals). Aerobic BHI and UM were growth supportive. Studies are currently underway to resolve the anaerobic metabolic potentials of this bacterium by identifying the end products of fermentation.

58. Evaluation of purine and indoline scaffolds containing n-benzenesulfonyl moieties on microbial growth

Mercado, Reesa; McCracken, Vance J and Nieto, Marcelo. Southern Illinois University Edwardsville, Edwardsville, IL.

Bacterial resistance to antimicrobial drugs has become a serious concern to public health, necessitating a search for novel antimicrobial compounds. Compounds with heterocyclic structures, such as purine and indolines, have been found to frequently possess antimicrobial activity. In this study organic synthesis was used to attach benzenesulfonamide groups to purine and indoline scaffolds to produce compounds to be tested for antimicrobial activity. Minimum inhibitory concentrations (MIC) of these compounds for Gram-negative (*Escherichia coli*; ATCC 25922 and *Pseudomonas aeruginosa*; ATCC 27853) and Gram-positive (*Staphylococcus aureus*; ATCC 25923 and *Enterococcus faecalis*; ATCC 29212) bacteria were determined using microbroth dilution methods. A two-fold serial dilution was performed for all test compounds, obtaining concentrations ranging from 128 mg/L to 0.125 mg/L. Bacteria were also tested against a standard antibiotic, tetracycline. Test compounds inhibited microbial growth only at the highest concentration of 128 mg/L. These results were indistinguishable from results of a dilution series of the compound used to resuspend the compounds (DMSO). Tetracycline had the expected MIC according to published values for each bacterium. Though these compounds did not exhibit antimicrobial activity, information from these studies will assist in the design of additional test compounds.

59. Evaluation of potential antimicrobial effects of benenesulfonyl-containing heterocyclic compounds

Williams, Josh; McCracken, Vance J and Nieto, Marcelo. Southern Illinois University Edwardsville,Edwardsville,IL.

For decades microorganisms have become increasingly resistant to existing antimicrobial drugs; development of novel antimicrobial therapies is therefore of great importance. The experiments performed in this study were part of an ongoing drug discovery project to synthesize and evaluate small N-benzenesulfonyl-heterocyclic libraries, which due to their broad-spectrum biological activities are widely used in drug design. Additionally, the benzenesulfonyl moiety is a substituent frequently present in compounds with antimicrobial activity. We therefore used organic synthesis to attach benzenesulfonamide groups to indoline, methylindoline, and indole scaffolds to produce compounds that were tested for antimicrobial activity against Gram-positive (*Staphylococcus aureus*; ATCC 25923 and *Enterococcus faecalis*; ATCC 29212) and Gram-negative (*Escherichia coli*; ATCC 25922 and *Pseudomonas aeruginosa*; ATCC 27853) bacteria. Following suspension of the drugs in DMSO, antimicrobial activity was assessed using microbroth dilution assays by performing a two-fold serial dilution series with a starting concentration of 128 mg/L for each compound. A dilution series of tetracycline produced the expected MIC according to published values for each strain of bacteria. However, test compounds did not possess significant antimicrobial activity, as microbial growth for all bacterial strains tested was inhibited only at the highest concentration of the dilution series. Future studies will utilize information gained from these studies for the design and synthesis of additional test compounds.

60. Comparison of a wildtype (MG1655) and a mutant (WRL2) strain of *E. coli* for growth in a rich medium.

Weekly, Heather; McCommas, Steven. Southern Illinois University Edwardsville, Edwardsville, IL.

Colon cancer is the second-leading cause of cancer deaths in the U.S. Epidemiological studies strongly suggest a protective role played by dietary fiber, especially soluble fiber. Exactly how this type of carbohydrate lowers cancer risk is still being debated, but our laboratory is interested in the possibility that bacteria in the gut could mutate and be selected for increased ability to utilize fiber for food and energy. This would lower the amount of fiber in the gut and potentially increase the risk of colon cancer. To study this, we are developing a model system using *E. coli*. One task is to isolate mutants and compare them to the wildtype strain from which they were derived. My project entails comparing growth of wildtype and a mutant strain on Luria-Bertani medium, both in single strain cultures and in competition.

61. Competition of a wildtype and a mutant *E. coli* that is more efficient on galactose medium.

Kruse, Joel; Kelley, Melissa and McCommas, Steven. Southern Illinois University Edwardsville, Edwardsville, IL.

In today's world, colorectal cancer is a serious threat to human beings and is one that remains unsolved. There is some evidence that mitogenic lectins in our daily diet bind to sugar moieties on the cell surface receptors in the colon. This mitogenic effect may start these cells on a pathway to becoming cancerous. However, the polysaccharides associated with soluble dietary fiber may reduce the risk of generating colorectal cancer. These polysaccharides from fiber may bind lectins and prevent them from binding epithelial cells. I am exploring the possibility of a mutant bacterium arising that may have a selective advantage over its wild type in binding these soluble fiber polysaccharides more efficiently and drastically decreasing the protective advantages of fiber. I am using a model system with *E. coli*, and experimenting with a mutant CH6 strain containing a single point mutation in the GalR gene. When grown in rich medium, the wild type out competes the mutant. My results show that when the two strains compete for either galactose or maltose as the only carbohydrate, the mutant prevails.

62. Degradation of salicylate, an important plant signaling molecule, by the fungal plant pathogen *Sclerotinia sclerotiorum* (order: Helotiales and family: Sclerotiniaceae)

Penn, Cory D and Daniel, Steven L. Eastern Illinois University, Charleston, IL.

Salicylate is a plant-signaling molecule synthesized by plants in response to a pathogen attack and is involved in activating plant defenses. *Sclerotinia sclerotiorum* is a necrotrophic phytopathogen that infects over 400 species of plants and has the ability to significantly reduce crop yields. A key pathogenic determinant of this fungus is oxalate (toxin) production. The goals of this project were to determine whether salicylate was degraded by *S. sclerotiorum* and the impact of salicylate on biomass formation, oxalate production, and culture acidification. *S. sclerotiorum* D-E7 was grown at 25°C with shaking in an undefined medium (50 ml) containing minerals, 0.1% soytone, 50 mM MES buffer (pH 6.5), 25 mM glucose, and 1 mM salicylate. Glucose, oxalate, and salicylate concentrations were monitored by HPLC. Biomass formation (130 mg), oxalate concentrations (~10 mM), and culture acidification (final culture pH approximated 5) were essentially the same in cultures grown with or without salicylate. Time-course analyses revealed that salicylate, as well as

glucose, was completely degraded after 7 days of incubation and that intermediates were formed during salicylate metabolism. These results indicated that *S. sclerotiorum* degrades salicylate and thus has the potential to overcome plant defenses through the inactivation of important plant signaling molecules.

63. Comparing the nutritional requirements of the bile acid-metabolizing gut bacteria *Clostridium hylemonae* and *Clostridium hiranonis*

Huckaba, J'nai K and Daniel, Steven L. Eastern Illinois University, Charleston, IL.

Clostridium hylemonae and *Clostridium hiranonis* are part of the resident gut microbiota of humans. In the colon, these anaerobic bacteria are actively involved in the conversion of primary bile acids, cholate and chenodeoxycholate, to secondary bile acids, deoxycholate and lithocolate, respectively. Secondary bile acids are toxic and have been associated with an increased risk for colon cancer and gallstone disease in humans. Thus, finding out the nutritional requirements of *C. hylemonae* and *C. hiranonis* would provide needed information on the physiology and metabolism of these bile acid-metabolizing gut bacteria. *C. hylemonae* TN-271 and *C. hiranonis* TO-931 were routinely maintained in an anaerobic BHI broth at 37°C. When transferred to an undefined medium (UM; 0.1% yeast extract, 20 mM glucose, minerals/metals, bicarbonate, 100% CO₂ gas phase, and cysteine [reducing agent]), growth by both organisms was minimal. When UM cultures were transferred to a defined medium (DM; UM without yeast extract) supplemented with a vitamin mix (10 different known vitamins) and an amino acid mix (20 different known amino acids), both organisms displayed much improved growth. This is the first report of *C. hylemonae* and *C. hiranonis* growing under defined culture conditions. Studies are currently underway to determine which individual vitamins and amino acids are required for optimal growth by these important anaerobic gut bacteria.

64. Assessing the preventative effects of dietary fiber against colon cancer: examination of a mutant strain of *E. coli*

Williams, Simone and McCommas, Steven. Southern Illinois University Edwardsville, Edwardsville, IL.

Colon cancer is a common cancer, affecting approximately seven percent of the US population. Although cancer screening is the primary method of reducing a person's risk of colon cancer, other means of prevention have also been recommended such as eating a diet high in fiber. It has been proposed that dietary fiber has protective effects against colon carcinogenesis. However, it is plausible that over a person's lifetime normal colon flora can mutate and compete with wildtype bacteria, digesting dietary fiber more efficiently and consequently diminishing the protective effects of dietary fiber. The objective of our research is to study the occurrence of such a mutation by using a simplified model system of wild-type *Escherichia coli* (MG 1655) and its isogenic mutant KR11. A competition experiment was run to discover how the mutant and wild type would perform in liquid culture. The numbers of each of the strains were determined by the number of red colonies (MG 1655) and white colonies (KR11) on MacConkey lactose plates. My results show that the wildtype strain outcompetes this mutant on this rich medium.

65. *Helicobacter canadensis* induces interleukin-8 secretion in a human intestinal epithelial cell line (HT-29)

Schmidt, Brandi and McCracken, Vance J. Southern Illinois University Edwardsville, Edwardsville, IL.

Wild birds have long been recognized as an important potential reservoir for pathogens, including *Campylobacter* and *Helicobacter* species. Canada geese are frequently infected with different intestinal or enterohepatic *Helicobacter* species, including *H. winghamensis*, *H. brantae*, *H. anseris*, and other unidentified species, some of which may have zoonotic potential. *H. canadensis* is an emerging pathogen originally isolated from humans with gastroenteritis, and subsequently found to be present in different populations of Canada geese. The mechanisms whereby *H. canadensis* induces pathology have not been characterized. Because responses to gastrointestinal pathogens are often initiated by intestinal epithelial cells, we tested the ability of *H. canadensis* to induce secretion of the neutrophil chemokine interleukin-8 (IL-8) by the human colonic epithelial cell line HT-29. Following a 24 h incubation, IL-8 was not detectable by ELISA in the supernatant from HT-29 cells cultured in the absence of *H. canadensis*. Addition of 10 ng/ml of tumor necrosis factor- α (TNF- α), a known inducer of IL-8 secretion, to HT-29 cultures resulted in an IL-8 concentration of 16,570 +/- 2122 pg/ml. Coculture of HT-29 cells with *H. canadensis* (multiplicity of infection of 100) resulted in an IL-8 concentration of 7880 +/- 440 pg/ml; some cytotoxicity was also observed. Additional cell culture and in vivo studies will be necessary to further characterize host responsiveness to *H. canadensis*.

Division: Science, Mathematics and Technology Education

66. SIUC heart GK-12 partnerships for science education

Renzaglia, Karen; Henson, Harvey; Gibson, David; Mumba, Frackson; Sipes, Sedonia and Schuette, Scott. Southern Illinois University Carbondale, Carbondale, IL.

HEART GK-12 at Southern Illinois University Carbondale (SIUC) is an NSF supported fellowship program that links science teachers from local high schools with graduate fellows. Teacher and fellow (resident scientist) teams work together to improve high school science curriculum by planning and delivering learning modules, conducting Action Research (AR) and engaging students in a rich array of scientific experiences. This unique program uses stellar graduate students to help improve science learning while bridging the gap between the university and local schools. Fellows bring original scientific research into the high school classroom and help develop ecological and environmental science curricula as they mentor teachers in the scientific research process. During the first two years of the program graduate fellows have impacted high school science teachers and students while gaining invaluable teaching experience. Teacher-fellow teams currently include graduate researchers from Geology, Plant Biology and Microbiology working with high school teachers in life and physical sciences. Teachers and fellows have enrolled in university graduate courses to learn more about ecology, pedagogy and AR. Reflective teaching practices, such as AR, are being used to better understand and measure the impacts of inquiry-based instruction in the classroom. The dynamic rapport developed

between the university and secondary education has begun to bridge the academic gap and opened the door for long-lasting scientific interaction between SIUC and southern Illinois schools.

Division: Zoology

67. Evaluating mucus production behavior in a freshwater snail using a histological stain

Riseman, Lauren and Brunkow, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

Gastropod molluscs move along a thin mucus film using a single, muscular foot. Such adhesive mucus pedal locomotion is the most energetically costly form of transport in the animal kingdom, and the majority of this cost is due to mucus production itself. We have been developing a technique to study mucus production by single, freshwater snails that uses a common histological staining technique (periodic acid-Schiff's stain) to visualize mucus trails on glass slides. Pixel grayscale values in digital photographs of slides then quantify amount of mucus present along a trail. In the present study, individual snails were allowed to move along a slide, were briefly disturbed, and then allowed to continue moving off the slide. Both pre- and post-disturbance trails were significantly darker on average, and had greater variability in pixel grayscale values, compared to background, indicating that trails were clearly visible. Regions where snails were disturbed were darker than pre-disturbance trails, indicating that snails produced more mucus on a very short time scale when disturbed. Post-disturbance trails were slightly less dark than disturbance regions but not significantly so, suggesting that snails maintained higher levels of mucus production after disturbance until they left the slides. This technique shows great promise in evaluating how snails modulate mucus production in response to environmental cues, and could thus greatly increase our understanding of the ecological energetics of these species in aquatic ecosystems.

68. A comparison of feeding behavior in the Tiger Salamander, *Ambystoma tigrinum* and Northern Leopard Frog, *Rana pipiens*

Jabs, Ashley M and Essner, Richard. Southern Illinois University Edwardsville, Edwardsville, IL.

Many frogs and salamanders acquire food by lunging forward and grasping prey with the mouth. This form of feeding is found throughout frogs and salamanders, and is present among the most basal forms. This raises the possibility of its presence in the common ancestor of both groups. We tested the homology of lunging behavior by examining the kinematics and electromyography of feeding in the Tiger Salamander, *Ambystoma tigrinum*, and Northern Leopard Frog, *Rana pipiens*. We filmed frogs and salamanders using high-speed video (250 fps) combined with electromyography in order to quantify and compare limb movement and muscle activity patterns for a range of trunk and limb muscles during feeding. Our observations indicated that lunging in tiger salamanders was fundamentally different from that in leopard frogs. Tiger salamanders lunged using asymmetrical movement of the hindlimbs, lateral undulation of the trunk, and asynchronous muscle activity patterns. Leopard frogs were characterized by symmetrical movement of the hindlimbs, absence of lateral undulation, and synchronous muscle activity patterns. While our findings do not support the homology of lunging in frogs and salamanders, a range of species from both groups should be examined.

69. The effects of noise pollution on the weight and swimming behavior of goldfish, *Carassius auratus*

Grass, Elizabeth A and Robertson, Marianne. Millikin University, Decatur, IL.

The production of anthropogenic noise is an increasing problem for aquatic wildlife. Researchers are starting to gain interest in the effects these anthropogenic noises are having on aquatic wildlife, specifically fish. Little is known about the physiological and behavioral effects these anthropogenic noises, (or noise pollution) have on fish, but more research is being done on the physiological effects, but not specifically behavior. This research focuses on the effects noise pollution has on the stress of the goldfish, *Carassius auratus*, quantified by the weight of the goldfish, and the effects noise pollution has on the swimming behavior of *C. auratus*. Six trials of 15 minutes each were done on each goldfish, 15 control and 15 experimental. The experimental group was subject to noise while the control was not. Results show that the experimental group did not gain or lose weight throughout the experiment while the control group did gain weight. Results also show that the swimming behavior between the control and experimental groups did not show any significant differences when noise was introduced. These results support my hypothesis that the control group would gain weight because they did not experience any noise pollution that would have stressful effects, while the experimental group did and therefore experienced neither weight gain nor loss. The results did not support my hypothesis that the noise pollution would have a behavioral effect on the goldfish, both experimental and control groups. Therefore anthropogenic noise or noise pollution does have a stress

70. The effects of decreased dissolved oxygen levels on learning in goldfish (*Carassius auratus*).

Savia, Juliana and Robertson, Marianne. Millikin University, Decatur, IL.

Water conditions in many places around the world are decreasing due to pollution, including runoff from farmers' land and air pollutions that gets into the water. One effect of this pollution is a decrease in the dissolved oxygen levels of the water. My objective was to determine whether lowered dissolved oxygen levels, or hypoxia, affects learning in goldfish, and if so, how. This is an important study because, although researchers have studied the physiological effects of hypoxia on fish, the effects of hypoxia on learning have not been looked at. To study this, I created a maze with four doors which the fish could choose to swim through. Both how long it took each fish to swim through the correct door and how many mistakes each fish made was recorded for every trial. Each of the 15 fish in the control group and the experimental group ran ten trials. I had a control group with normal amounts of dissolved oxygen in the water and an experimental group with hypoxic water. I found that, when looking at times alone, fish in both groups failed to learn the maze over time. However, the fish in the experimental group made fewer mistakes as the trials progressed, whereas the control group showed no correlation between trials and mistakes. These results are inconsistent with previous tests because goldfish have learned mazes in the past. The results could be applied to studies of how fish learn and how pollution affects fish.

71. Auditory learning in the common house cricket, *Acheta domesticus* (Insecta: Orthoptera), by classical conditioning through the paired stimuli of electric shock and sound.

Ellis, Mary E, and Robertson, Marianne W. Millikin University, Decatur, IL.

Crickets have a high capacity for learning, and multiple studies have been conducted testing olfactory learning in crickets. However, no research has previously been conducted studying auditory learning and memory in crickets. I exposed 15 *Acheta domesticus* crickets to sound alone for one trial and then to the same sound paired with a simultaneous electric shock for eight more trials. I then exposed crickets to sound alone again in trial ten in order to determine whether crickets could associate this sound with the shock via classical conditioning. A control group of 15 crickets was exposed to sound only for all ten trials. When compared, the data from the tenth trials of the control and experimental groups were not significantly different. Results do not support auditory learning in *A. domesticus* and are not comparable to results of previous studies on olfactory learning. However, differences in olfactory versus auditory learning could result from differences in the receiving and processing of information by the brain and ganglia of *A. domesticus* or from differences in environmental selection pressures.

72. The effects of caffeine on learning in mice: is there a difference between the sexes?

Butts, Jessica LK; Hill, Andrew P and Robertson, Marianne A. Millikin University, Decatur, IL.

We evaluated the effects of caffeine on learning in male and female mice. Twenty mg/kg of caffeine has been shown to increase exploratory behavior in mice. We examined whether increased exploratory behavior leads to increased learning in mice. We measured learning using a Barnes maze and tested mice once a day for ten days. We gave experimental mice 20 mg/kg of caffeine dissolved in water and presented control mice with water only. All four groups (Control males, control females, experimental males and experimental females) did learn to navigate the maze, but the differences in time required for navigation were not significantly different between groups. Therefore, our data do not demonstrate that caffeine positively affects learning, and that this affect differs between the sexes. Studies demonstrate that the age of the subject is critical when evaluating the effects of caffeine on cognitive processes; therefore, further studies of aged mice may be warranted.

73. Operant conditioning via electrical stimulus in millipedes *Orthoporus texicolens* (Diplopoda:Spirostreptida)

Holmes, Morgan L; Robertson, Marianne and Watson, Casey. Millikin University, Decatur, IL.

While learning capability studies are often focused on mammalian species, recent research that concentrates on invertebrate groups has contributed to the development of new models of brain anatomy and function, and has broadened the future of neurophysiological studies. Comprehensive knowledge of vertebrate neurology, as well as neuroevolutionary development both within and between species, requires dedication to the study of invertebrate models, and attention to what they imply about adaptive learning. Our study examined the ability of millipedes, *Orthoporus texicolens*, to learn through operant conditioning. We used the negative reinforcement of electric shock to determine whether millipedes could be conditioned to choose to move towards one side of a testing arena over the other. Forty millipedes were subjected to 15 trials each and we found statistically significant evidence of learning through operant conditioning. The study is the first to support associative learning in any millipede species.

74. Speciation: testing for reproductive isolation within a divergent topminnow species

Einhorn, Joseph L and Duvernell, David D. Southern Illinois University Edwardsville, Edwardsville, IL.

Two species of topminnow fish, *Fundulus olivaceus* and *F. notatus* exist throughout the Mississippi drainage region. These two species typically prefer separate and distinct niches in overlapping environments. However, several contact zones have been found and sampled establishing a sympatric relationship between the two. One of the known contact zones is the Neches River, which runs along the eastern side of Texas. DNA sequences of fish samples collected in the Neches have shown significant and consistent genetic variation from the previously documented species, suggesting that yet another sympatric species of topminnow may exist within the Mississippi drainage. Preliminary mitochondrial testing has shown that Fsp fish do exist within the sampled area in significant numbers. Using DNA sequences, diagnostic molecular markers were developed that are capable of distinguishing between *F. olivaceus*, *F. notatus*, and Fsp. The identified SNPs exist within the mitochondrial gene Cyt B, and the two nuclear genes. Laboratory techniques such as PCR amplification, enzymatic digestion, and gel electrophoresis performed on the nuclear genes mentioned above enable the frequencies of homozygotes and heterozygotes to be determined. Comparing the actual frequencies to expected Hardy-Weinberg frequencies allows the hypothesis of reproductive isolation to be supported or rejected. The presence of numerous heterozygotes would suggest a lack of reproductive isolation between *F. notatus* and Fsp, whereas the presence of numerous homozygotes would suggest that reproductive isolation exists be

75. A multivariate habitat model for neotropical migrant songbirds in southwestern Illinois

Richter, Lane A; Essner, Richard L and Minchin, Peter R. Southern Illinois University Edwardsville, Edwardsville, IL.

The forested bluffs of southwestern Illinois attract large numbers of migrating songbirds due to their prime location near the confluence of the Mississippi, Missouri, and Illinois Rivers. These once extensive oak-hickory forests are now highly fragmented, initially due to agriculture and more recently due to increasing urbanization. As the St. Louis metropolitan area continues its rapid expansion eastward, protection and management of remaining forests is crucial. The 2,660-acre campus of Southern Illinois University Edwardsville (SIUE) and the adjacent 90-acre Bohm Woods Nature Reserve include some of the largest remaining forest tracts in Madison County, Illinois. To assess the conservation status of bird populations in these forests, we conducted 25-meter fixed-distance point count surveys at 130 randomized circular plots from May to August 2008 on the SIUE campus and adjacent Bohm Woods Nature Reserve. All species seen or heard at a plot during a five-minute sampling period were recorded, and individuals found within the 25-meter radius were used in density estimates. Each site was visited three times during the sampling period. In addition, vegetative features were quantified at each plot and used to generate a predictive-habitat model for target bird species. We identified 86 bird species in three forest patches, including neotropical migrants of conservation concern, such as the Wood Thrush (*Hylocichla mustelina*) and Golden-winged Warbler (*Vermivora chrysoptera*) as well as an Illinois endangered species, the Northern Harrier (*Circus cyaneus*).

76. Status of the Chinese mystery snail in southern Illinois

Sharp, Mary A and Brunkow, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

The Chinese mystery snail (*Cipangopaludina chinensis*) was first introduced to the U.S. in San Francisco, around 1892, while being imported for sale in a Chinese market. *C. chinensis* has since been reported across the U.S. in more than 25 states. The U.S. Geological Survey lists *C. chinensis* as an exotic, nonindigenous species, but *C. chinensis* exhibits characteristics similar to other invasive snails and could thus eventually be declared an invasive species. In Illinois, *C. chinensis* has been reported in the Chicago area and southeastern and central Illinois; there have been no documented reports of *C. chinensis* in western or far southern Illinois. The purpose of the present study was to survey and describe the current status of *C. chinensis* along the lower Illinois River in a population discovered by John Tucker of the Illinois Natural History Survey. We also report on the status of two additional potential introduction sites in southern Illinois. Updating the known range of introduction of Chinese mystery snails in Illinois will allow monitoring of population expansion and detailed analysis of effects on native species.

77. Web location and habitat associations of micrathena orb-weavers

Hessler, Sheri N and McCravy, Kenneth W. Western Illinois University, Macomb, IL.

Spiders are important predators in most terrestrial habitats. Forest orb-weavers in the genus *Micrathena* were studied to better understand their web building habits and relationship to habitat disturbance caused by prescribed fire. *Micrathena gracilis* and *Micrathena mitrata* were collected and observed in burned and unburned forest habitats and measurements were taken on their webs, including size of web, distance from the ground and presence of prey items. *M. gracilis* webs were significantly larger and higher than were *M. mitrata* webs. *M. gracilis* prey items were dominated by Diptera, whereas *M. mitrata* prey included substantial numbers of Coleoptera in addition to Diptera. *M. gracilis* were most abundant in the unburned forest but *M. mitrata* were most abundant in the burned forest. These results indicate that while these closely related species of orb-weavers share similar habitats, they each fill a unique ecological niche.

78. Developing a terminal velocity assay technique for measuring hydrodynamic drag in freshwater snails

Karcher, Ellyn and Brunkow, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

Many studies exist which examine hydrodynamic drag acting on the shells of marine snails, whereas studies examining effects of the same force on freshwater snails are lacking. A clearer understanding of how freshwater snails are affected by hydrodynamic drag is timely, however, given their ecological importance in freshwater ecosystems and their declining conservation status. We have been developing a technique to measure drag on freshwater snails that relies on the concept of terminal velocity. Terminal velocity studies have been used to examine drag characteristics of such organisms as fishes, tadpoles and large bivalve molluscs, but applying this approach to measuring drag in small benthic snails has proven challenging. We have measured a significant relationship between drag and shell length for one Ozark stream-dwelling species (*Elimia potosiensis*), showing a strong curvilinear relationship across a wide range of shell lengths. Finding such a relationship for the larger, syntopic *Pleurocera acuta* has proven more difficult due to a trade-off between functional buoyancy and relevant Reynolds numbers. We report on continued improvements to this technique that will yield accurate measurements across a wider range of shell sizes, allowing for determination of the importance of drag in diverse lotic snail communities.

79. Image distance estimation during eye sacchades

Mohainmani, Aurash¹ and Bowen, Samuel². ¹Illinois Institute of Technology, Chicago, IL, ²Chicago State University, Chicago, IL.

Most literature on vision implies that during sacchades (coordinated rapid eye motions) little or no information is gathered by the brain. Ganglion cells and other cells in the layers of the retina have been shown to detect and generate signals on encountering moving contrast boundaries across the retina. We have conducted a long and detailed literature search on such cells and their motion sensing capabilities. We present arguments that these cells could thus distinguish moving images on the retina during sacchades and by simple geometry could determine which images in each eye represent objects at the same distance, which, therefore, area likely to be the same object. This property could give the visual system another means of identifying the same objects in the two different images of the eyes.

80. Evolution of pelvis morphology in canids.

Kotouch, Ashley; Dunker, Jacob and Kohn, Luci Ann P. Southern Illinois University Edwardsville, Edwardsville, IL.

Pelvis form is influenced by reproductive and locomotor factors, as well as genetic factors. This study examines skeletal dimensions of the pelvis in canids: grey fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*) and coyote (*Canis laterans*). While sharing similarities in habitat, and litter size, these canids differ in locomotor styles, with the grey fox retaining an ability to climb trees, an ability not shared by the red fox and coyote. We expect to observe dimensional differences in pelvis form associated with these locomotor differences, once the data are adjusted for differences in their overall body size. The three-dimensional location of 14 landmarks was recorded in 10 grey foxes, 10 red foxes and 26 coyotes, and these landmarks were used to define 8 lengths representing dimensions of the ilium, ischium and pubis. Data were adjusted for differences in overall size by dividing each individual's dimensions by the geometric mean of their dimensions. Species differences were analyzed by analysis of variance and principal component analysis. Significant differences in form throughout the pelvis were observed in these taxa, however differences between taxa do not appear to be primarily due to locomotor differences. Natural selection is acting on a mosaic of traits in the evolution of the canid pelvis.

81. Copulation duration with regard to age in the Caribbean fruit fly, *Anastrepha suspensa* (Diptera: Tephritidae)

Mott, Emily E; Seehofer, Lara B; Dust, Holly J; Fritz, Gary N and Fritz, Ann H. Eastern Illinois University, Charleston, IL.

In terms of economic damage to agricultural crops, the most important Dipteran family is the Tephritidae. Upon emergence, males and females in the tephritid fly, *Anastrepha suspensa*, undergo a reproductive teneral period where these flies are refractory to copulation. Generally copulation assays with tephritids utilize a predetermined time-period when flies show a readiness to copulate; much variation in copulation readiness, however, is evidenced. We examined age as a factor in the copulation duration of colony-reared virgin *A. suspensa* flies. Male and female flies were separated 24 hours post-emergence. Virgin males and females at 10, 11, 12, and 14 days post-emergence were allowed to copulate and the duration of copulation was timed. The average duration of copulation

ranged from 14.67-19.33 minutes. Flies eleven days post-emergence copulated the longest (19.33 minutes) while flies 12-days post-emergence copulated for the least longest (14.67 minutes).

82. Morphometric analysis of the canid scapulae in red and gray foxes and coyotes (*Vulpes vulpes*, *Urocyon cinereoargenteus* and *Canis latrans*, Family Canidae).

Sydow, Mariellen and Kohn, Luci Ann P. Southern Illinois University Edwardsville, Edwardsville, IL.

The scapula is significant in quadrupedal locomotion, reflecting movement and forces on the shoulder girdle and upper limb. Examination of scapula form in three Canids, the red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*) and coyote (*Canis laterans*), allows us to examine the influence of function and evolution on scapular morphology. These three taxa inhabit similar areas such as prairies, forests, farmlands, and scrublands and their range encompasses most of the United States. They share similar diets, but differ slightly in methods of hunting and capture. The gray fox is distinguished from the red fox and coyote by its relatively longer body and shorter limbs, and its ancillary arboreal locomotion. This study examines scapula morphology in 25 red foxes, 22 gray foxes and 40 coyotes, testing for locomotor differences between the taxa. Three-dimensional coordinates of fifteen scapular landmarks were recorded and converted to linear distances that reflect functional regions of the scapula. Species differences in these functional areas were tested by analysis of variance, and a Mantel test was used to assess if there is a similar pattern of correlations among traits within each species. Significant differences between species were present, representing both differences in scapula function and evolutionary history. These results provide insight into the selection pressures associated with the evolution of these three closely related taxa.

83. Diversity and vertical distribution of robber flies (Diptera: Asilidae) at Post Wildlife Sanctuary

Kartawich, Laura M and McCravy, Kenneth W. Western Illinois University, Macomb, IL.

Robber flies (Diptera: Asilidae) constitute a large family of insects with roughly 1,000 North American species and over 7,000 species worldwide. They are predatory insects that are often associated with specific habitats, and are growing in importance as a group of special conservation concerns. Diversity and vertical distribution of forest robber flies were studied at Western Illinois University's Post Wildlife Sanctuary from late May to mid October 2008 using malaise traps. Traps were located at understory level and at 3.5 m elevation above ground level. Overall, robber flies were significantly more abundant in the lower traps, but there was a significant month X elevation interaction, with greater numbers of robber flies captured than expected in the upper traps in July. Robber fly diversity and species composition were similar in lower and upper traps. These results indicate that robber flies are present and active at substantial distances above ground level, and that vertical abundance/activity may vary temporally.

ORAL PRESENTATIONS

Division: Botany

9:15 1. Reproductive potential, fruit, and seed quality of *Lonicera maackii* (Caprifoliaceae) in sun and shade habitats

Choudhury, Jessica and Schulz, Kurt E. Southern Illinois University Edwardsville, Edwardsville, IL.

Lonicera maackii is a highly invasive Asiatic shrub honeysuckle that exhibits exceptional phenotypic plasticity in response to the light environment. It readily colonizes fields, forest edges and the forest interior. Honeysuckle produces bird dispersed fruits that remain available for longer periods than fruits of native competitors. This study examined the difference in reproductive potential and seedling growth of shrubs growing in high and low light and environments on the Southern Illinois University Edwardsville Campus. 85 shrubs were selected at random from a naturally established population. We found that individuals grown in sun or shade produce equal numbers of flowers per leaf node, as well as equal numbers of nodes per annual branch growth increment. This suggests that the reproductive potential of sun- and shade-grown plants is equivalent. However, sun plants have higher rates of fruit set than shade plants, and individual the fruits born on sun plants are greater in size and mass (wet or dry) than those from shade plants. Sun plants also produce a greater number of seeds per fruit and these seeds are greater in mass than those produced by shade plants. Seeds sun or shade origin were germinated and seedlings measured for height. Germination rates and initial seedling heights were equivalent for both sun and shade parents. All else being equal, these findings suggest that plants growing and reproducing in high light environments dominate the pool of colonizing seeds, yet sun plants do not have an advantage in terms of seed quality.

9:30 2. Effects of proposed river regulation on riparian vegetation of the Marmaton River Basin, Missouri

Mettler-Cherry, Paige A¹; Heimann, David² and Ely, Joseph³. ¹Lindenwood University, St. Charles, MO, ²US Geological Survey, Lees Summit, MO, ³University of Central Missouri, Warrensburg, MO.

The Marmaton River Basin straddles the state line between eastern Kansas and western Missouri. Proposed impoundments by the US Army Corps of Engineers on the Kansas portion of the river will modify the characteristics of flooding in the associated riparian habitat in the Missouri portion of the river, causing concern for conservation of Missouri riparian wetlands associated with the Marmaton. Results of hydrologic modeling indicate that fill events (flooding of wetlands via overbank flow) will be significantly reduced as a result of the additional impoundments in Kansas, resulting in reduced flooding and higher impact on wetlands closer to the state line. To quantify the effects of the modified hydrologic regime on riparian vegetation, we sampled 3 wetlands in the Marmaton River watershed in Vernon County, MO. The sites are spread along the river starting at the state line (site 1, highest impact) to approximately 19 km east (site 3, lowest impact). Woody vegetation was identified, dbh measured and species wetland indicator status determined for individuals in 54, 10m x 10m plots. Each site had sufficiently different hydrology to produce different vegetation structure, but all had several species in common (*Acer saccharinum*, *Fraxinus pennsylvanica*, *Carya* spp.).

Site 1 will have the greatest contraction in area as a result of the modified hydrology as it had the highest proportion of obligate wetland species.

9:45 3. Evaluating exotic species assemblages across a chronosequence of restored floodplain forests

McLane, Craig R; Battaglia, Loretta L; Gibson, David J and Groninger, John W. Southern Illinois University Carbondale, Carbondale, IL.

Exotic plant species pose a great risk to restoration success in post-agricultural bottomlands, but little information exists on their dynamics during succession of actively restored sites. We hypothesized that compositional trends of exotics are similar to those published for natives in other systems, with early peaks of herbaceous richness and declines as woody species establish. We established 16 plots in a 17-year chronosequence (1991-2008) of restored forests, with four mature sites for comparison, within the Cypress Creek NWR, Illinois. Within each plot, we identified all species and quantified canopy openness at three strata (1.5m, 1.25m, and 0.75m), soil texture, total soil C, and total soil N. Trends in exotic assemblages were significantly correlated with canopy openness at all strata (all $p < 0.0001$). Non-linear regressions suggest that richness of herbaceous exotics and herbaceous natives follow trends with stand age that are consistent with a Weibull model ($R^2 = 0.543$, $p = 0.005$; $R^2 = 0.483$, $p = 0.01$). Woody native richness over time conformed to a logistic model ($R^2 = 0.404$, $p = 0.01$). Woody exotics exhibited no discernible relationship with stand age, although they existed in young and old sites. Our results show that herbaceous exotics exhibit successional trends similar to natives and therefore may not pose a lasting threat to restoration projects. Woody exotics can establish early or late in succession, persist into a closed canopy, and may pose a lasting threat. Thus, bottomland restorations are quite vulnerable to exotics even after canopy closure.

10:00 4. Grassland seed banks, management implications and restoration potential

Zylka, Jason¹; Molano-Flores, Brenda² and Whelan, Christopher². ¹Department of Natural Resources and Environmental Sciences, University of Illinois, Champaign-Urbana, IL, ²Illinois Natural History Survey, Champaign, IL.

Conversion from one type of grassland to another by changing the management regime is a common practice in the Midwest. The effect of these conversions on seed bank composition is not fully understood. This study aims to determine the effect of changing management histories on seed bank composition as well as determining if there is any relationship between above ground vegetation and seed bank composition. Of particular interest is determining if there is potential to use seed bank material for restoration efforts. Six different management histories were surveyed for this study: remnant prairie, restored prairie, row crop, old field, historic pasture, and pasture recently converted from row crop at the Midewin National Tallgrass Prairie (Will Co., IL). In 2008, vegetation surveys and soil cores were collected in July and October, respectively, for a total of 30 sites (five sites per management history) and 600 soil cores (20 cores per site). Half of the collected soil cores were then grown in a greenhouse and the seedlings identified to species. The other half, were elutriated for an additional seed soil inventory. Preliminary results indicate that the seed banks vary per management history and there is little correlation between above ground vegetation and the seed bank. These results suggest that although the seed bank may not correlate with the aboveground vegetation, it can provide information about past vegetation and restoration potential of an area.

10:15 5. Comparative *in vitro* micropropagation and vegetative structure of Aeridinae (Orchidaceae)

Klaus, Isaac T and Carlsward, Barbara S. Eastern Illinois University, Charleston, IL.

Aeridinae form one of three subtribes in Vandeeae and represent a diverse group of monopodial, epiphytic orchids found throughout the Old World tropics. There are over 1200 species in the subtribe, including the economically important genus *Phalaenopsis*. While there are many horticulturally popular species within this tribe, the ability to micropropagate Aeridinae has only been extensively studied in *Phalaenopsis* and *Vanda*. In addition, correlations between the success of micropropagation and vegetative structure have not been examined. The goal of our experiments were to determine which vegetative tissues would be best suited for direct somatic embryogenesis or callogenesis; determine what ratio of plant growth regulators (PGR's) is most effective in generating new tissue; and determine any correlations between anatomical features and micropropagation success. To address these questions, we examined the vegetative morphology and anatomy of six species in five genera within Aeridinae: *Ascocentrum*, *Chiloschista*, *Phalaenopsis*, *Sarcochilus*, and *Vanda*. We simultaneously tried to micropropagate these plants *in vitro* from root tips and leaves using New Dogashima Medium with thiadiazol and naphthaleneacetic acid as PGR's. Preliminary results show four of the five genera were able to produce callus from either root or leaf tissues, while ratio tests showed minimal growth differences between treatments. Furthermore, features such as explant extraction location, cuticle thickness, and root epidermal thickness show correlations with micropropagation success. Ultimately, our results should enable horticulturists to better understand which vegetative parts to use in their micropropagation efforts of orchids, an extremely important horticultural plant family.

10:30 6. An update on asymbiotic seed germination and *in vitro* development of the federally endangered Hawaiian endemic, *Platanthera holochila* (Orchidaceae)

Johnson, Lynnaun¹; Zettler, Lawrence W¹ and Perlman, Steve². ¹Illinois College, Jacksonville, IL, ²National Tropical Botanical Garden, Kauai, HI.

The federally endangered terrestrial orchid, *Platanthera holochila* (Hbd.) Krzl. (Orchidaceae), is endemic to the Hawaiian archipelago, and is one of North America's rarest orchids with fewer than 36 individuals thought to remain on three islands (Kauai, Maui, Molokai). Despite its Federal listing, these plants remain vulnerable to feral pigs, exotic plant intrusions, and human activity (e.g., poaching). Since 2002, the Orchid Recovery Program at Illinois College has collaborated with the National Tropical Botanical Garden to cultivate this orchid with and without fungi using a range of media and growing conditions. To date, the most reliable protocol for acquiring advanced, leaf-bearing seedlings consists of sowing seeds on the asymbiotic medium P723 (PhytoTechnology LaboratoriesTM). With this protocol now established, the *in vitro* propagation of this species was attempted on a large scale using all remaining seed in storage. Thirteen seed sources collected from two islands (Kauai, Molokai) spanning four years (2002, 2003, 2005, 2006) were utilized. A total of 24,940 seeds were sown (pooled), of which 23,441 had embryos (94.0% visual viability). Of the 13 seed sources, seeds from only three sources failed to germinate after 351 days. Seed germination percentages were generally low for all sources (<10%), but comparable to previous studies. Of the 23,411 viable seeds sown, 423 leaf-bearing seedlings (1.8%) have been obtained thus far.

Session Break

1:00 7. A one step approach to shoot multiplication, shoot elongation, and rooting of *Schoenoplectus hallii* (Cyperaceae) is cytokinin dependent

Wann, Steve; Kelley, Melissa and Barry, Kelly J. Southern Illinois University, Edwardsville, Edwardsville, IL.

Like most wetland plants, the loss of wetland habitat poses a serious threat to *Schoenoplectus hallii* or Hall's Bullrush. Micropropagation would prove beneficial for the collection and storage of genetic resources for *S. hallii* in addition to providing adequate plant material for the study and development of conservation strategies. Previous in vitro propagation attempts established that shoot proliferation occurred in the presence of the cytokinin N6-benzyladenine (BA) but rooting required a transfer to cytokinin-free medium. BA is a synthetic cytokinin that is commonly used due to its heat and light stability as well as affordability. Since rooting was known to occur in the absence of an exogenous auxin or cytokinin, we hypothesized that an easily degradable cytokinin such as kinetin would 1) induce shoot proliferation and 2) degrade to allow shoot elongation and rooting without a medium change. Hall's bulrush was cultured using BA and kinetin and increased shoot proliferation as well as root production was seen with kinetin. This eliminates a need for a medium change and increases efficiency of micropropagation of Hall's bullrush.

1:15 8. Survival adaptations at different developmental stages for *Physaria ludoviciana* (Brassicaceae), an Illinois endangered species of Mason County

Grant, Marissa J; Coons, Janice M; and Carlsward, Barbara S. Eastern Illinois University, Charleston, IL.

Physaria ludoviciana occurs in sand prairies with low water holding capacity, frequent disturbances and full sunlight, creating a niche where few species establish. An understanding of survival adaptations at all developmental stages is lacking. Our purpose was to investigate survival adaptations of *P. ludoviciana* at various stages including seed, seedling, vegetative and reproductive. Surveys and seed collections of *P. ludoviciana* were at Mason County, IL in 1999-2008. For seeds, production, afterripening, dispersal and longevity in seed banks or storage were studied. Plants at seedling, vegetative, and reproductive stages were surveyed. Growth of seedlings and vegetative plants at 2 light intensities (584 or 174 $\mu\text{mol}/\text{m}^2/\text{s}$) was measured. For reproductive plants, flower initiation at 2 photoperiods (16 or 8 hr light) was studied. Anatomical structures in leaves and stems were evaluated. Seed production was 22-500/plant in different years. Germination rates increased with afterripening. Seeds were in seed banks and remained viable for at least 6.5 years in storage. Plant densities varied. Plants had significantly greater vegetative growth at higher than at lower light intensity. *P. ludoviciana* was a quantitative long day plant. *P. ludoviciana* had adaptations for xeric conditions, including dense leaf trichomes (2.6-2.9 per $74101.7 \mu\text{m}^2$), a long taproot (46 cm), rosette habit and evergreen traits. However it was a C3 plant with no water storage tissues. *P. ludoviciana* had adaptations at every developmental stage to survive in its unique environment.

1:30 9. Population surveys and reproductive ecology of *Synthis bullii* (Plantaginaceae), a rare Illinois species

Chi, Katherine¹ and Molano-Flores, Brenda². ¹University of Illinois Urbana-Champaign, Champaign, IL, ²Illinois Natural History Survey, Champaign, IL.

Kittentails (*Synthis bullii*, Plantaginaceae) is a plant species endemic to the Midwestern United States, found in savannahs, open woods, and gravel/sand prairies. Urbanization and agriculture often limits populations of *S. bullii* to small, highly isolated remnant habitats where landscape factors likely restrict pollinator movement and visitation, which potentially affects the reproductive output of the species. The objectives of this study are: 1) to determine the current status of *S. bullii* populations in Illinois and 2) determine if the reproductive ecology of this species accounts for its rarity. Over 20 populations were visited according to state records of occurrence. From these populations, nine were selected to determine numbers of individuals and to gather information on local habitat conditions and management history. At each population, 20 infructescences were collected to determine fruit and seed set. Results indicate that there are differences in fruit and seed set between sites that differ in disturbance history and light availability. Average fruit size was also larger for sites with higher light availability. Aside from conservation management implications, the results of this study could also demonstrate the serious consequences that habitat fragmentation has on selection of reproductive traits in native plants.

1:45 10. Status assessment of *Schoenoplectus hallii* (Hall's Bulrush) in the United States

McKenzie, Paul¹; Smith, Marian² and Smith, Galen³. ¹US Fish & Wildlife Service, Columbia, MO, ²Southern Illinois University Edwardsville, Edwardsville, IL, ³University of Wisconsin, Whitewater, WI.

Schoenoplectus hallii (A. Gray) S.G. Smith (Cyperaceae) is a small annual sedge that is primarily restricted to wetland habitats in areas characterized by fluctuating water levels. It most often occurs as an emergent species on bare soil as water recedes from transient ponds. *Schoenoplectus hallii* is of conservation concern in every state in which it occurs. In a 2007 study, we conducted an assessment of the status of the species in the United States. We studied the historical and current range of the species, its population status, its ecology and life history and the various threats that potentially affect its survival. We formulated and discussed the conservation efforts that should be employed to stabilize its status in the United States. In addition, we outlined the research areas that remain to be elucidated.

2:00 11. Genetic and environmental aspects of phenotypic plasticity in the invasive Asiatic honeysuckles *Lonicera maackii* and *Lonicera x bella* (Caprifoliaceae)

Schulz, Kurt E; Harroun, David; Delap, Amy R and Kohn, Luci Ann P. Southern Illinois University Edwardsville, Edwardsville, IL.

Lonicera maackii and *Lonicera x bella* aggressively invade Midwestern forests. They appear to exhibit high levels of phenotypic plasticity in response to light. In a previous study we discovered strong genetic and environmental effects on the responses of *L. x bella* to light availability, but few significant gene x environment responses. In this experiment we compared responses of *L. x bella* and *L. maackii* using 8 maternal genotypes of each taxon. We hypothesized stronger genetic responses in the hybrid *L. x bella*. Rates of seed germination were greater in *L. x bella* (72% vs.

55%) but much more variable among maternal genotypes of *L. maackii*. *L. maackii* seedling heights at 40 and 80 days were significantly greater, but RGR did not differ in the 40-80 day period. Half of each population was subsequently grown in 60% shade for 27 days. Height growth did not differ between regimes, which allowed *L. maackii* to retain its height advantage. Shade treatments caused ca. 20% reductions in RGR with *L. maackii* (-15%) being more affected. In *L. x bella* showed maternal and treatment effects for height, but only treatment effects for RGR. Heights of *L. maackii* showed no maternal, treatment or interaction effects at 107 days, but maternal and treatment differences were present for RGR. Despite the hybrid origin of *L. x bella*, we conclude that genetic differences may be more important in *L. maackii*, both in terms of seed germination and growth rate.

2:15 12. Age structure of an understory population of invasive honeysuckle (*Lonicera maackii*, Caprifoliaceae)

Harroun, David; Schulz, Kurt E; and Choudhury, Jessica. Southern Illinois University Edwardsville, Edwardsville, IL.

The age structure and colonization pattern of an invasive Asiatic honeysuckle (*Lonicera maackii*) was examined in a forest stand on the campus of Southern Illinois University at Edwardsville. We were particularly interested in determining whether recruitment of this invader followed a continuous or pulsed pattern. Several studies were undertaken. A pilot study was conducted to ascertain if the age of *L. maackii* could be quickly and accurately estimated from ring counts of the largest diameter stem or from canopy diameter. Stem sections of randomly selected shrubs were taken and ages were determined from the shrub base and the four largest stems. The age of the largest diameter stem is a stronger predictor of age than is shrub canopy diameter. Over 230 stem samples were collected from mapped shrubs (> 0.35 m height threshold) and an additional 120 stem samples were taken from shorter, unmapped shrubs to compare population age and size structure. Based on shrub age data, a pulsed recruitment pattern was shown to exist in our population. Hemispheric canopy photographs were taken at 5 x 5 m grid intervals within the study site to determine whether canopy density influenced ongoing colonization. Although seeding density ranged 0-11 individuals per 25 m² plot, and canopy openness ranged 3.7-13.6%, no relationship was detected. Seed dispersal may be the important constraint on colonization, as opposed to light availability.

2:30 13. Predicting the invasiveness of an alien plant *Triadica sebifera* under future climate change scenarios in southeastern United States

Paudel, Shishir and Battaglia, Loretta L. Southern Illinois University Carbondale, Carbondale, IL.

Climate change may increase the spread of invasive species by altering disturbance regimes. Along the Gulf of Mexico, which experiences sea level rise and intense tropical storms, *Triadica sebifera* has become an aggressive invader and cause negative impact to native plant communities. Tropical storms create canopy gaps and increased salinity through storm surge, which may increase the establishment of invasive species. We predict that *Triadica* spread will increase with shifts in disturbance regimes compared to native species. We model the probability of occurrence of invasive species *Triadica*, and native species (*Baccharis halimifolia*, *Ilex vomitoria*, and *Morella cerifera*) in response to canopy openness and electrical conductivity (EC) of soil water in Grand Bay National Estuarine Research Reserve, USA. Initial data analysis revealed that *Baccharis* occurrence was not related to canopy-openness but did show a significant unimodal relationship with EC ($p = 0.0001$)

and peaked at higher EC levels. *Morella*, *Ilex*, and exotic *Triadica* showed a significant unimodal response to canopy-openness ($p = 0.0009$, 0.0005 , and 0.0006 , respectively) and negative relationships with EC ($p = 0.0126$, 0.0025 , and 0.0187 , respectively). Results suggest that *Triadica*, *Ilex* and *Morella*, may expand their distributions where wind damage occurs but perhaps retreat with saltwater intrusion. In contrast, *Baccharis* may expand into areas with salinity increases. Intense and frequent tropical storms may enhance the spread of *Triadica* in coastal regions as well as drive changes in native species' distributions.

Division: Cell, Molecular and Developmental Biology

9:00 14. EB1 protein regulates actin protrusion and motility in melanoma cells

Cain, Jeanine M and Schober, Joseph M. Southern Illinois University Edwardsville, Edwardsville, IL.

Cell migration is characterized by maintenance of polarity and persistent actin protrusion. End-binding (EB) proteins regulate microtubule function and bind cell polarity signaling molecules. Here we address the role of EB1 protein in cell-matrix interaction and motility in mouse melanoma cells using RNA interference. B16F1 cells were transfected with plasmids encoding both soluble GFP and a short hair-pin sequence specific for EB1 or a two-nucleotide mismatch control, and projected cell area and roundness index were measured. Knock down of EB1 decreased initial rate of cell spreading and caused increased cell roundness index over the whole time course. Kymographic analysis of live cells revealed non-productive protrusion caused by EB1 knock down, while control cells formed opposed retracting and protruding edges. We examined 2-dimensional motility over 24 hours and found cells depleted of EB1 exhibited decreased displacement from origin and overall decreased velocity. We examined the mechanism of defective motility through immunofluorescence localization of fascin, a marker of filopodia, and Arp3, a marker of actin network protrusion. Knock down cells displayed abnormal fascin localization at the basal contact surface, cell periphery and throughout the entire z-axis. Arp3 distribution was decreased at the cell periphery. We conclude EB1 is essential for maintenance of a polarized cell shape and normal motility; furthermore, our studies suggest EB1 may regulate a signaling pathway through fascin and Arp2/3 during melanoma cell metastasis and tissue invasion.

9:15 15. Upregulation of telomerase during regeneration in *Dugesia tigrina* (Turbellaria)

Brady, Megan M and Thorn, Judy M. Knox College, Galesburg, IL.

Telomeres are added to the 3' terminal end of an animal chromosome in stem cells and cancer cells by the ribonucleoprotein enzyme telomerase. Telomerase is composed of two fundamental components, the telomeric template TR (telomerase RNA) and the protein catalytic subunit TERT (telomerase reverse transcriptase), with TERT found in active telomerase. In this study, the freshwater planaria *Dugesia tigrina* was used as a model for observing the upregulation of telomerase during regeneration due to the presence of mitotically active neoblasts distributed throughout the animal. These totipotent, somatic stem cells are required for planarian regeneration, and subsequently must have a mechanism in place for avoiding the end-replication problem when regenerating lost tissues and organs. Using fresh tissue samples from whole and cut (regenerating) planaria, reverse-transcriptase polymerase chain reaction was utilized to attempt TERT amplification

in the *D. tigrina*. Primers used have primarily come from well-conserved areas of the nematode, *Caenorhabditis elegans*, trt-1 gene (the telomerase reverse transcriptase domain) and have been degenerate and non-degenerate in nature. As the *D. tigrina* TERT gene has not yet been located, a telomerase gel-based assay kit will be used to determine telomerase quantity in the animal. Of note, EF-2 primers (taken from a gene involved in protein synthesis) from the *D. japonica* were used as a positive control and successfully amplified in the *D. tigrina*.

9:30 16. Genome wide analysis of gene silencing in mammalian cell hybrids

Hickman, Sharon and Bulla, Gary A. Eastern Illinois University, Charleston, IL.

It has been known for more than four decades that the fusion of mammalian cells of distinct origin creates hybrid cells that result in global loss of tissue-specific gene expression. Despite a great deal of research on this phenomenon, the mechanism of this process remains elusive. Understanding the intricacies of tissue-specific gene expression can lead to the understanding of developmental biology and what governs differential gene expression. Due to recent advancements in microarray technology, it is possible to monitor gene expression of entire genomes in cell fusion experiments. Our strategy is to identify candidate genes that are involved in gene silencing observed in the cell hybrids. We utilized microarray analysis (Rat Genome 230 2.0 array chips from Affymetrix) to observe whole rat genome expression in rat hepatoma cells, rat fibroblast cells, and rat hepatoma x fibroblast hybrid. Results show that a large number of liver-enriched genes are moderately (5-10 fold) to strongly (>10 fold) repressed (194 and 300 genes, respectively) in the cell hybrids. Five genes that code for transcription factors, and whose expression is dramatically affected in the cell hybrids, include Hex1, Hnf3 β , Hnf6 α , Wnt4 and Klf4. These are currently being tested for their ability to rescue tissue-specific gene expression.

9:45 17. Investigation of integrins during pedal lacerate development in *Aiptasia pallida* (Aiptasiidae)

Avery, Tiffany M¹; Fowler, Thomas J¹ and Sawyer, Sara J². ¹Southern Illinois University Edwardsville, Edwardsville, IL, ²Glenville State College, Glenville, WV.

Integrins are cell surface receptors essential in attachment and signaling in cell growth and tissue formation. They have been identified in Cnidarians but their distribution and regulatory properties are not well understood. In this study we investigate the role of integrins during pedal laceration in the sea anemone, *Aiptasia pallida*. Small portions of the pedal disc are shed and reorganize to form a complete anemone in 48-72 hours. We are using pedal laceration as a bioassay to study integrin signaling. Immunocytochemistry of pedal lacerates with an anti-integrin antibody shows patterns of integrin staining centralized as a network between the two primary epithelial layers. Pedal lacerates treated with the PI3K pathway inhibitor LY 294002 (12 μ M) and MAP kinase inhibitor PD98059 (20 μ M) showed inhibited development in 60% of lacerates. When treated with the PI3K pathway activator SC3036 (24 μ M) pedal lacerates showed accelerated development with treated animals maturing 50% faster than untreated controls. Each pharmacological agent also affected the distribution of integrins in the lacerates. Lacerates treated with the MAPK inhibitor showed reduced integrin staining as did lacerates treated with the PI3K inhibitor after 72hrs. Lacerates treated with the PI3K activator had increased integrin staining. These results suggest that both the MAPK and PI3K pathways are used during cellular rearrangements of pedal lacerate development. We are now looking at how disrupting integrin signaling pathways affects the integrin staining in treated adults.

10:00 18. Characterization of nuclear localization of intersectin during *Xenopus laevis* (Anura Pipidae) development

Hadac, Jamie, N. Knox College, Galesburg, IL.

Intersectin (ITSN), a well conserved, multidomain protein, has known functions in endocytosis, exocytosis, and mitogenic processes. ITSN has two isoforms as a result of an alternative splicing event. The short form (ITSN-S) contains two Eps15 homology domains, a coiled-coil domain, and five Src homology 3 domains and is ubiquitously expressed. The long isoform (ITSN-L) also contains a Pleckstrin homology domain, a Dbl homology domain, and a calcium-binding domain and is neural specific. Previous studies determined ITSN shifts from the cytoplasm to the nucleus at stage 8 during *Xenopus laevis* development and later returns to the cytoplasm after stage 20. To better understand this shift in subcellular distribution, we are further characterizing nuclear localization to establish whether localization is isoform specific, which domain is necessary for localization, and elucidate the mechanism that transports ITSN to the nucleus. We have determined from fluorescence microscopy that ITSN-S and ITSN-L show little difference in nuclear localization patterns during development, suggesting that only the domains in ITSN-S are necessary for nuclear localization.

10:15 Business Meeting

Division: Chemistry

9:00 19. Development of an eco- and user-friendly procedure for oxidative cleavage of alkenes
Steele, Keegan; Thottumkara, Prem and Vinod, TK. Western Illinois University, Macomb, IL.

The venerable ozonolysis procedure for oxidative cleavage of alkenes is often limited by practical difficulties and safety concerns. Alternate transition metal based procedures, though effective, suffer from cost and toxicity drawbacks. Development of safe and environmentally friendly procedure(s) for this essential synthetic transformation is thus a desirable research objective. Herein we describe an in situ generation of hydroxy(4-carboxyphenyl)iodonium ion as a convenient reagent for oxidative cleavage of alkenes in aqueous solvent mixtures. Commercially available 4-iodobenzoic acid serves a benign precursor to the active iodonium ion reagent when oxidized in situ with Oxone. The preliminary results obtained clearly reveal the viability of the method and the pertinent deductions from proposed reaction mechanism allows one to estimate the amount of Oxone needed for the complete cleavage of differently substituted alkenes.

9:15 20. Expedient synthesis and solvent dependent oxidation behavior of a water-soluble IBX derivative

Kommareddy, Amitha and Vinod, TK. Western Illinois University, Macomb, IL.

o-Iodoxybenzoic acid, IBX, is a versatile and selective oxidant and has attained the status of a reagent in organic chemistry. We have recently synthesized three water-soluble derivatives of IBX to enhance the utility of the reagent by enabling selective oxidative transformations to be carried out in the most eco-friendly solvent of all, water. Herein we describe the synthesis of one such water-soluble derivative of IBX in two steps from commercially available 2-aminoterephthalic acid. The new reagent soluble in both DMF and water exhibit solvent dependant selectivity in its oxidation

behavior. A variety of alcohols are oxidized using the new reagent in DMF with ease and selectivity identical to that of parent IBX. However, oxidations carried out in water and other aqueous solvent mixtures using the reagent exhibit unique selectivities towards different substrates and provide products different from reactions carried out in DMF. A mechanistic rationale is provided for this solvent dependent behavior of the new reagent.

9:30 21. Easy and wide-ranging vicinal difunctionalization of alkenes

Gottam, Himabindu; Vinod, TK. Western Illinois University, Macomb, IL.

Regio- and stereoselective 1,2-addition to olefinic double bonds resulting in the incorporation of two different vicinal functional groups is a highly sought synthetic manipulation. Cofunctionalization reactions where a halogen and a nucleophile are added to a C=C are extensively studied and products from halohydroxylation, haloalkoxylation, haloacetoxylation, halophosphoryloxylation are valuable synthetic intermediates in pharmaceutical, agrochemical, dyes and specialty chemical industries. A common strategy for the addition of I-Nu across a C=C is the use of iodine and a silver salt followed by the use of a suitable Nu to open up the initially formed iodonium ion intermediate. We present here the use of water-soluble hypervalent iodine reagents and (diacetoxyiodo)benzene, DIB, to produce electrophilic hypoiodite intermediates in reactions for vicinal iodo-functionalization of alkenes. Several examples of regio- and stereoselective introduction of varied functional groups on alkenes will be discussed.

9:45 22. Nucleophilic displacement reactions using quaternary ammonium and phosphonium catalysts

Dehghanipour, Reza; Yasomane, Jagodige P; Sadrerafi, Keivan; Sadrerafi, Peyman; Kitz, Dennis J and Khazaeli, Sadegh. Southern Illinois University Edwardsville, Edwardsville, IL.

Phase transfer catalysis (PTC) facilitates nucleophilic substitution reactions to give enhanced reaction rate and high yield when reactants are in two or more immiscible solvents. So far we have successfully used PTC in the conversion of alkyl bromides into alkyl chlorides and acetates. But the conversion of alkyl bromide into alkyl fluoride was a challenge due to the difficulty in finding a proper solvent for metal fluorides which were used as the nucleophile. Among several solvents selected, tertiary butyl alcohol (t-butanol) was found to be the best solvent for cesium fluoride (CsF). This solvent was used in the conversion of n-hexyl bromide to n-hexyl fluoride and gave high reaction rate and yield. Quaternary ammonium and quaternary phosphonium salts were used as catalysts in the above reaction. Our results indicate that phosphonium catalysts are more effective than ammonium catalysts. We also used hectorite clay as a solid support of the catalysts so that it can easily be separated after the reaction. Clay supported quaternary phosphonium catalysts showed more than 50% reduction in reaction rate when compare to un-supported quaternary phosphonium catalysts. Quaternary ammonium catalysts showed approximately the same reaction rates when it was used as un-supported catalyst and as clay supported catalyst.

10:00 23. Formation of metal colloids in the presence of silane-containing polymers and studies of their catalytic and synthetic abilities

Miller, Josiah D; Campbell, Dean J and Andersh, Brad. Bradley University, Peoria, IL.

Colloidal heterogeneous catalysts are often more effective than larger heterogeneous catalysts because their surface to volume ratio is greater. One of the shortcomings of using colloidal particles as catalysts is that the small particles are often difficult to remove from the product. Encapsulating the colloidal catalysts in polydimethylsiloxane (PDMS) may be a solution to this separation issue. PDMS cross-linked into a solid by hydrosilation reactions often contains unreacted silicon-hydrogen bonds within its polymeric structure. Potassium tetrachloroaurate(III), sodium tetrachloropalladate(II), and palladium(II) acetate can diffuse into the polymer to react with these silicon-hydrogen sites to produce gold or palladium metal colloids embedded within the polymer structure. Our PDMS-confined palladium colloids were used to catalyze the hydrogenation of methyl red and the reduction of other common organic functional groups.

10:15 24. Synthesis and antibiotic testing of 5-Aryl-3-oxo- δ -lactones

Van Hise, Nicholas; Baudo, David; Johnson, Keith A and Andersh, Brad. Bradley University, Peoria, IL.

Treatment of substituted benzaldehydes and acetoacetate esters with potassium carbonate in absolute ethanol or methanol yields 5-aryl-3-oxo- δ -lactones (6-aryl-dihydro-2H-pyran-2,4(3H)-diones) after workup with dilute HCl(aq) instead of the expected Knoevenagel products. This is significant because it provides a simple method for preparing a class of compounds which possess antioxidant, antifungal, and antiviral activity. Because 5-aryl-3-oxo- δ -lactone derivatives possess antifungal and antiviral activity, we set out to determine if they also possess antibiotic activity. From this study, we have found that several 5-aryl-3-oxo- δ -lactone derivatives are active against gram-positive bacteria. Details of our synthetic work as well as results from minimum inhibitory concentration (MIC) determinations will be presented.

10:30 25. Synthesis of highly substituted pyrandiones

Van Hovel, Ryan and Andersh, Brad. Bradley University, Peoria, IL.

We have found that 6-aryl-dihydro-2H-pyran-2,4(3H)-diones are active against gram-positive bacteria, and that they inhibit cyclooxygenase enzymes. In an effort to determine if the stereogenic center in the 6-position is necessary for this activity, we set out to prepare the corresponding 6-aryl-2H-pyran-2,4(3H)-diones. Direct dehydrogenation of 6-aryl-dihydro-2H-pyran-2,4(3H)-diones was unsuccessful using various conditions. We are currently investigating the use of previously published methods for synthesizing these compounds, which involves trapping the dianion of methyl acetoacetate with 1-benzoyl-2-methylaziridine followed by cyclization. Results from this synthetic work will be presented.

1:00 Business Meeting

Division: Computer Science

9:00 26. HTTPA

Remesh, Raaj, R; Binto, George and Valeva, Anna. Western Illinois University, Macomb, IL.

Sensitive information on the Internet is transmitted through Secure socket Layer (SSL). However, SSL introduces latency and processing overhead for key exchange and encryption. While this overhead is justifiable in situations where confidentiality of information is important, it introduces considerable delays in downloading large web contents. In many cases, authenticity is more important than confidentiality. In this work we suggest an alternate protocol, which we call HTTPA, that can assure authenticity of public information and reduce the time to establish a connection. Significant improvement in performance can be achieved in scenarios where web page content is predominantly static and servers are facing requests from multiple clients. This is due to the fact that HTTPA does not require the time consuming handshake. Instead, authenticity is achieved by digitally signing the static content of a web document using a precomputed hash, thus considerably reducing the workload at the server's end. Results from the early stages of a simulation study are encouraging and we hope that we can further quantify the improvement in performance of HTTPA versus HTTPS by the simulation study in the future.

Division: Environmental Science

9:00 27. Comparison of the known history of Cougar Lake to history inferred from the sediment

Williams, Phillip D; Brugam, Richard; Lin, Zhi-Qing and Retzlaff, William. Southern Illinois University, Edwardsville, IL.

Stable isotopes of carbon and nitrogen, phosphorus, diatoms, and lead concentrations were examined in sediment cores from Cougar Lake, a 13 m deep reservoir on the SIUE campus, to reconstruct the history of eutrophication and heavy metal contamination. Phosphorus is a limiting nutrient for lake primary production. Stable isotopes are used as indicators of eutrophic conditions because $\delta^{13}\text{C}$ of phytoplankton increases with eutrophication. High $\delta^{15}\text{N}$ indicates sewage contamination. Diatoms indicate lake changes. We took 3 sediment cores from the lake. Two were from the deep water of the lake and the third was from a shallow former swimming area. Phosphorus concentrations in the open lake do not change throughout the core. Our $\delta^{13}\text{C}$ results in the open water core also show no change. $\delta^{15}\text{N}$ increases from the bottom of the core to the top indicating an increase of sewage contamination over time. Diatom counts from the open water core indicate little change in trophic status of Cougar Lake. However, diatom counts from the shallow water core show a shift from open-water species to diatoms characteristic of macrophyte communities. Lead analysis indicates an overall decrease from the bottom of the core to the top. Our results suggest that trophic status of the lake has not changed. Aquatic macrophytes have increased and heavy metal contamination has decreased.

9:15 28. Consequences of heavy metal exposure in the white-footed mouse (*Peromyscus leucopus*; Order Rodentia)

Kohn, Luci Ann P; Brugam, Richard; Lin, Zhi-Qing; Patil, Shruti; Williams, Phillip and Wilson, Matthew. Southern Illinois University, Edwardsville, IL.

Exposure to lead (Pb) and other heavy metals is a major public health concern, as exposure to high concentrations may have adverse effects on both children and adults. Rodents are ideal model organisms to test for environmental exposure, since they are found virtually everywhere, across an economic spectrum. They may be exposed to contaminants, either on surfaces or in their food. Lead and other contaminants may be incorporated into internal tissues, with these tissues serving as a reservoir for future exposure. The contaminants may be released during normal metabolic processes. This study tests for the presence of heavy metals in the white-footed mice (*Peromyscus leucopus*) in two areas representing low and high levels of lead in the soil. Samples were collected along a public bicycle path near Edwardsville, Illinois. Concentrations of chromium, nickel, copper, zinc, arsenic, selenium, cadmium, and lead incorporated into bone, kidney, liver and muscle were measured in 10 control mice and 12 mice from an area with a high level of heavy metals in the soil. Experimental mice had a significantly level of higher heavy metals incorporated into their organs, and the organs exhibited differential absorption of these contaminants. These results suggest that the bioconcentration of heavy metals may serve as a bioindicator of soil metal contamination.

9:30 29. Ecological census of reef habitats adjacent to Tobacco Caye, Belize C.A.

Moore, Clint S. Knox College, Galesburg, IL.

Six oceanic coral reef habitats, adjacent to the barrier reef bordering Tobacco Caye, Belize, were surveyed for species richness and diversity. Habitats differed in depth, location along the reef, and organization. Surveyed habitats consisted of two spur and groove, both at a depth of 5m. Two patch reefs, one at 5m, the other at 12m and two clump reefs, one at 5m, the other at 12m. Individual organisms were identified and placed into one of thirteen categories (fish, algae, stony corals, echinoderms, etc...). Categories were combined giving a species richness count for each habitat. The shallow clumped reef had the largest species richness (129 species); the lowest richness count (86 species) was in the spur and groove habitat. Diversity of each habitat was calculated using the Simpson Index of Species Diversity which combines evenness and richness of the thirteen categories. The highest diversity was in the spur and groove reefs (DI = 0.9525), while the lowest diversity was in the shallow clumped reef (DI = .8957). In addition, comparisons of dominant coral species in each habitat were made. Within the shallow reef habitats ($\leq 5m$) Blade Fire Coral (*Millepora complanata*), Lettuce Corals (*Agaricia agaricites*), and Pillar Coral (*Dendrogyra cylindrus*) dominated. The deeper reefs ($\geq 6m$) were dominated by bouldering corals (*Montastraea franksi*, *Siderastrea sidereal*, and *Colpophyllia natans*).

9:45 30. Stormwater loss through evapotranspiration from green roof systems

Richter, Lane¹; Retzlaff, Bill¹; Morgan, Susan¹; Jost, Vic²; and Luckett, Kelly³. ¹Southern Illinois University Edwardsville, Edwardsville, IL, ²Jost Greenhouses, Des Peres, MO, ³Green Roof Blocks, Florissant, MO.

Green roof technology is increasingly used to aid in reducing urban storm water runoff. However, when the growth media becomes saturated it loses its ability to retain any further precipitation until

some rainwater has evaporated or been transpired. A growing medium and plant species combination that loses the most water to the atmosphere following saturation will increase the storm water retention of the green roof. Our research includes twenty-four Green Roof Blocks and forty-eight Green Paks, located on the SIUE Engineering Building Green Roof in Edwardsville, Illinois. These modular systems were placed in a completely randomized design with three replicates on May 23, 2006. In this project we have evaluated four growth media types, the contribution of vegetation, and the contribution of a drainage layer to storm water retention and loss back into the atmosphere. Individual green roof systems were weighed for up to a week following saturation events from establishment in 2006 through September 2008. Significant differences were found for storm water loss to the atmosphere from the four growth media types and by drainage layer orientation. Green roof systems containing lava growth media lost (evaporated or transpired) the most storm water to the atmosphere. Our data clearly indicates that design choice impacts storm water retention and water loss through evaporation and transpiration by green roof systems.

10:00 31. Characterization of Selenium's effects on rabbitfoot grass microbial communities
Karna, Ranju; McCracken, Vance J and Zhi-Qing, Lin. Southern Illinois University Edwardsville, Edwardsville, IL.

Selenium (Se) is an essential trace element for animals and humans, but at higher doses Se is toxic. Se contamination of soils occurs in one-third of hazardous waste sites identified by the Environmental Protection Agency's National Priority List. Microbial volatilization is one method of phytoremediation for Se removal from contaminated sites. This method is based on interaction among plants and microbes in the rhizosphere, where an inorganic form of Se, such as selenite and selenate, is metabolized to a harmless organic form of Se, i.e. dimethyl selenide (DMSe), and released to the atmosphere. Analysis of rhizosphere and topsoil microbial communities of rabbitfoot grass (*Polypogon monspeliensis*) grown in the presence or absence of selenium was performed by culture-based and culture-independent (polymerase chain-reaction denaturing gradient gel electrophoresis; PCR-DGGE) methods to evaluate the effect of Se on microbial communities and to help identify organisms responsible for Se volatilization. Microbial diversity was decreased after four weeks in the presence of Se (5 ppm), with a decrease in the number of DGGE bands and in the number of strains isolated by culture compared to plants grown without selenium. Conversely, several strains were observed in the +Se treatment that were absent from the -Se communities. Strains that were differentially observed in the +Se treatment will be used to measure the Se volatilization rate of each isolate with the goal of identifying the dominant microbial strains responsible for volatilization of Se.

10:15 32. Isotopic evidence for sources of lead contamination in SW Illinois
Brugam, Richard B; Kohn, Luci Ann P; Lin, Zhi-Qing; Williams, Phillip and Wilson, Matthew J. Southern Illinois University Edwardsville, Edwardsville, IL

Southwestern Illinois has been the site of lead smelters which released large amounts of heavy metals that accumulated in lake sediments and soils. Concentrations of lead from soils and lake sediments adjacent to smelters in Granite City and Collinsville and far from these sites were analyzed using ICP after digestion using EPA method 3050B. Lead isotopic composition was analyzed using mass spectrometry. A simple two-component mixing model was applied to the concentration and isotopic data. Samples from contaminated soils and lake sediments near the

decommissioned smelters contained a mixture of a high Pb-206 source with isotopic composition characteristic of SE Missouri mines and an intermediate Pb-206 source similar to Peoria loess. The loess is the parent material for SW Illinois soils. Sites some distance away from smelter sites contained lead representing a low Pb-206 source mixed with the Peoria loess source. We suggest that this low Pb-206 source was tetraethyl lead from automobiles and that the high Pb-206 sites near smelters were contaminated by the SE Missouri lead used by the smelters.

10:30 51. Tsunami Mitigation as Function of Sea Floor Slope and Near-Shore Undersea Trench Depth and Width

Benson, Julia H. Deerfield High School, Deerfield, IL

This experiment was intended to test two hypotheses: 1) tsunami amplitude for an initial wave amplitude increases with decreasing undersea slope and 2) increasing trench depth and width would each reduce tsunami amplitude. The behavior of 3 independent variables of slope and trench depth and width were to be used to model real world trench performance. A wooden wave tank 5 x 1 x 1 meters was nested in an above ground swimming pool housed in a residential basement. For each grade of sea floor, 28.6%, 33.3%, and 40%, wooden trenches of 40, 60, and 80 cm depths and widths were used in all combinations, along with a control of no trench. Five waves per trench configuration were tested. A 3-way factorial analysis evaluated the effects of the three independent variables using SAS. Trench depth and width each had an independent effect on reducing wave amplitude. Wave amplitude increased with decreasing ocean floor grade although trench benefit increased. The data suggests that a trench 133.3 meters wide and deep, offset from the shore by 13 meters with an ocean floor grade of 28.6% will reduce a 10 meter Tsunami by 53%, with a 78% reduction in energy transfer to land.

1:00 Business Meeting

Division: Health Sciences

9:00 33. A longitudinal study investigating the forces impacting the articular cartilage in the knees of football players

West, Sarah M; Schulz, Charles and Thorn, Judith. Knox College, Galesburg, IL.

Early degeneration of the articular cartilage in the knees of football players has been observed in athletes at the collegiate and professional levels. The premature degeneration is due to the abnormally high forces the knee joints must sustain during football performance. Long term evaluation of the forces impacting the cartilage may yield valuable information towards providing a measure for preventative care. Current methods for monitoring these forces include external manipulation or Magnetic Resonance Imaging of the joint. A new method of data collection was developed for the purpose of this study, which uses the Wii Fit Balance Board coupled with a Bluetooth enabled computer to collect data from athletes in a natural environment. A Knee Stability Evaluation Form was created to allow for athlete input. Fifty five division three collegiate football players were surveyed and tested at three instances throughout the course of a season. Survey results yielded significant differences in the relative levels of bodily pain, cartilage stiffness, and pain while

walking on a flat surface that the athletes experienced throughout the season. Analysis also found that players reported that the level of difficulty due to problems with their knees during tackling and pivoting/twisting movements changed significantly during the course of the season.

9:15 34. Association of maternal intravascular fetal material and obstetrical DIC

Benson, Michael D¹; Cheema, Navneet¹; Kaufman, Michael¹; Goldshmidt, Robert¹ and Beaumont, Jennifer². ¹Northwestern University, Chicago, IL, ²North Shore University, Health System, Chicago, IL.

Objective. To test the hypothesis that obstetrical DIC results from an excessive leak of fetal material into the maternal circulation.

Methods: All Cesarean hysterectomy cases for hemorrhage at our hospital from 1993 to 2002 were included. Fetal material intravascular presence was determined by two pathologists, blinded to each other and any clinical information. The percentage of those with any fetal material in the maternal circulation was calculated for each diagnosis for hemorrhage. For a given diagnosis, the percentage of intravascular fetal material in those with the given diagnosis was compared to those without that diagnosis using Fisher’s Exact Test. Most patients had multiple hemorrhage diagnoses. A two sample t-test was used to evaluate the difference in mean blood loss between those with and without intravascular fetal material.

Results*:

Hemorrhage Diagnosis	N with diagnosis	ANY intravascular fetal material N (%); P> 0.5 for all
Uterine rupture	5	1 (20.0)
Abruption	3	1 (33.3)
Atony	31	9 (29.0)
Placenta Previa	19	5 (26.3)
Acute hemorrhage, etc.	24	8 (33.3)
Coagulopathy (DIC)	7	2 (28.6)
Retained placenta	7	2 (28.6)

Mean EBL (cc):

No fetal material: 2759

+ Fetal material: 2389

P = 0.4971

*82% power to detect significant difference if DIC group 80% had fetal material and all others had 20% .

Conclusion

There was no association between the presence of intravascular fetal material and any specific hemorrhage diagnoses or amount of blood loss. While power to detect a relationship was low, excessive leakage of fetal material as a specific and exclusive mechanism of obstetrical DIC seems unlikely.

Division: Microbiology

9:30 35. A simulated digestion of echinacea induces macrophages to secrete pro- and anti-inflammatory cytokines through multiple receptors

Zurek, Oliwia W¹ and Thompson, Christopher R². ¹Knox College, Galesburg, IL, ²Loyola College, Baltimore, MD.

Echinacea purpurea, or the purple coneflower, has been used as an herbal remedy for centuries. Despite a wealth of anecdotal evidence, very little is understood about the actual cellular effects and mechanisms involved in treatment with echinacea. A number of in vitro experiments have shown that echinacea can enhance inflammatory response by activating phagocytes such as macrophages. More specifically, research suggests that bioactive compounds found in the herb can bind to receptors located on macrophages which then trigger the release of various cytokines. The goal of the following experiments was to determine if cannabinoid receptor 2 (CB2) is the sole receptor for echinacea. Our preliminary data suggests that echinacea can trigger macrophages to release IL-1 β , IL-6, IL-10, IL-12 and TNF- α even when CB2 is blocked. Therefore, our findings imply that echinacea's bioactive compounds can bind to receptors other than CB2.

9:45 36. Competition between an *E. coli* mutant (CH6) and the wildtype (MG1655) for different sugar sources.

Kelley, Melissa; Kruse, Joel; McCommas, Steven. Southern Illinois University Edwardsville, Edwardsville, IL.

Colon cancer is the second most common cause of cancer related deaths with 782,000 people being diagnosed each year. Fiber is thought to protect against colon cancer through interference with lectins. The natural flora in the colon also utilizes the fiber as a food source. Over a person's lifetime it might be possible that bacteria are evolving to digest the fiber more efficiently, and reducing its protective effects. To test this hypothesis, we used an *Escherichia coli* wildtype (MG1655) and a mutant (CH6) differing from the wildtype by a single point mutation, with galactose and glucose as models for fiber. Three competition experiments were performed to discover whether the mutant utilizes the sugars more efficiently than the wildtype, one containing 0.2% glucose, one with 0.2% galactose and one containing both 0.1% glucose and 0.1% galactose. It was found that the mutant outcompeted the wildtype in all three trials.

10:00 37. Evaluation of antioxidant and antimicrobial properties of Rooibos Tea Kombucha

de la Fuente, Anna; Beck, Hans T. Aurora University, Aurora, IL.

Kombucha, a fermented and sweetened tea beverage, is a thirst quenching drink and an effective health promoting remedy. Brewed in Asia as early as 220 BC, Kombucha is traditionally made with any one of various kinds of teas (i.e., black, green, oolong) and the "tea fungus" - a symbiotic colony of bacteria (e.g., *Acetobacter*, *Bacterium xylinum*) and fungi (e.g., *Schizosaccharomyces*, *Torula* sp.) that floats in the tea preparation vessel as a macroscopic solid mass. Scientific studies report Kombucha Tea contains powerful antioxidants and possesses antibacterial properties; however, we found no reports evaluating these properties in Kombucha prepared with the South African Rooibos Tea, a red tea made from leaves of *Aspalathus linearis* (Fabaceae). We explored the antioxidant and antimicrobial properties of Rooibos Tea Kombucha (RTK) beverage. The antioxidant ability of RTK

was evaluated spectrophotometrically using chemiluminescence (CL) of luminol catalyzed by horseradish peroxidase (HRP). Extremely low level of light emission was observed during luminol-HRP reaction; thus, further investigation of CL as a method for the evaluation of RTK's antioxidant ability is needed. The traditional disk diffusion method was used to evaluate the antimicrobial properties of RTK against Gram-negative bacteria (*Escherichia coli*), Gram-positive bacteria (*Staphylococcus aureus*), and bread mold (*Rhizopus stolonifer*). Antimicrobial action of RTK was detected against *E. coli* while no activity was observed against *S. aureus* and *R. stolonifer*.

10:15 Business Meeting

Division: Science, Mathematics and Technology Education

9:15 38. Designing new graduate programs in Teacher Leadership for the Illinois Mathematics and Science Partnership: Aurora University's Collaborative Model Beck, Hans T; Davis, Jane and Othman, Saib. Aurora University, Aurora, IL.

Aurora University's IMSP grant-supported graduate programs in Teacher Leadership (Elementary Math & Science, Secondary Mathematics, Secondary Life Science, and Secondary Earth Science) share program goals to: 1. Establish teacher leaders in science/math to improve teaching and learning of science/math; 2. Deepen teachers' content knowledge of science/math; 3. Develop reflective teachers who use Action Research to assess and improve their own teaching; and 4. Improve teachers' science/math skills so their students understand, apply and retain science and mathematics knowledge over time. Our program design and implementation have been developed collaboratively with our partners. These include East Aurora SD131 and West Aurora SD129, both high need school districts, and our community partners, Illinois Math and Science Academy, Packer Engineering Foundation, SciTech Hands On Science Museum, and Robert Crown Center for Health Education. Each program incorporates both Teacher Leadership (TL) and rigorous content-focused courses. Professional development in TL enables teachers to assist their peers in these content areas, improving instruction across buildings and districts, and to lead departments and influence curriculum. Content mastery is crucial to teachers' success in these programs, and may allow some to be endorsed in a new content area as well as being endorsed by the state as Teacher Leaders. Evaluation methods include pre- and post-testing both on a course and program level, and evaluating changes in performance (ISAT and PSAE) of the educators' own students.

9:30 39. Assessing the effectiveness of wet-lab simulations in biology education. Drake, Jane and Barry, Kelly J. Southern Illinois University Edwardsville, Edwardsville, IL

Polymerase Chain Reaction (PCR) is a technique for amplifying small amounts of DNA that has revolutionized molecular biology. Since PCR has had such a profound impact on how scientists study and manipulate DNA it has increasingly been incorporated into science curricula. The precise nature of the technique can make it extremely challenging in the inexperienced hands of high school and undergraduate students. The number of steps involved, improper sterile technique, and the handling of very small quantities of components all make PCR cumbersome in biology classrooms.

Additionally, laboratories in secondary schools demand nontoxic, noncarcinogenic, and inexpensive components. The noncarcinogenic electrophoresis stains used in secondary schools provide inferior visualization for analysis. Ambiguous results, expense, and class time required for teaching PCR can all be deterrents for a teacher. In order to encourage more widespread use of this technology in biology classrooms, we have developed curricula for PCR simulations to be used in place of traditional PCR. The PCR simulations are designed to yield clear and consistent results using minimal manipulations at minimal expense. Once the basic simulation technique is mastered, it can be widely adapted to compliment many different scenarios. Preliminary data collected from teaching the simulations in two undergraduate classes showed promising results. In an effort to duplicate our initial results and to refine the protocols, the curricula were taught in twelve classes of high school and undergraduate students in three different schools.

9:45 40. The effect of service learning and travel study on students' level of global competency.

AbuSharbain, Elaine M. Southern Illinois University Edwardsville, Edwardsville, IL.

Science education has an important role to play in the competitiveness of American workers in the global economy. Often overlooked is global competency, a set of skills and dispositions that enable workers to function and flourish with people from other ethnicities or from other cultures. Little has been done to incorporate global competency education in the science education curriculum or to help teachers infuse such skill sets into their K-12 courses. This research investigates the effect of service learning combined with a two week field study in a Costa Rican rainforest preserve, Carara National Park. Students work alongside park rangers and other personnel to improve park infrastructure and assist with environmental education outreach in the villages where poachers live. Global issues such as endangered wildlife, rainforest destruction, poaching and gentrification are part and parcel to the experience. Students begin to understand cultural differences while working with local people on these issues. Participants were asked to self report on pre and post tests their level of agreement with 10 indicators of global competency. Most items on the survey instrument show highly significant change from the pretest.

10:00 Business Meeting

Division: Zoology

9:00 41. Color preferences of day-flying insects inhabiting disturbed and undisturbed sites near Monteverde Cloud Forest Preserve, Costa Rica

Hamilton, Paul W; Reuschel, Leah M and Zettler, Lawrence W. Illinois College, Jacksonville, IL.

In the tropics, insects play a significant role in natural ecosystems (e.g., pollination), and some species transmit diseases to humans, livestock and crops. In the San Luis area of Costa Rica, a mixture of farmland, human settlements, and protected forests border one another, offering an opportunity to study the insects that frequent these different areas. In this study, we utilized pan traps of two colors (orange, yellow) to sample day-flying insects during March, 2008. Traps were

placed within three sites: 1) mature forest, 2) open pasture, and 3) the interface between forest and pasture (edge). At each site, two water-filled plastic pan traps were set-up – one yellow and one orange. A detergent (Brij-30) was added to each pan to break the water surface tension, permitting the rapid capture and subsequent asphyxiation of smaller insects that might otherwise escape. Insects were removed from traps after 24 hrs, placed in alcohol vials, and counted/identified in a laboratory at the University of Georgia's Ecolodge-San Luis. A total of 1,139 insects spanning 13 orders and 25 families were collected. Diversity was lower in the pasture compared to the rainforest and edge. Though not statistically significant, traps from the forest/pasture interface showed signs of an edge effect. A significantly higher number of Diptera and Hymenoptera were collected from yellow traps compared to orange traps. Relatively few insects collected belonged to families of medical/veterinary importance (e.g., Calliphoridae, Muscidae).

9:15 42. Analysis of home range size and movement patterns of the blackstripe topminnow, *Fundulus notatus* (Fundulidae)

Gerstenecker, Patricia A; Duvernell, David D and Brunkow, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

This research evaluated the home range size of the blackstripe topminnow, *Fundulus notatus*. Habitat preferences and the influence of sex, condition, and size on movement patterns were also investigated to provide an understanding of the effects of home range size in determining partitioning of individual feeding habitats. Resource partitioning affects species distribution which can have consequences on interspecific interactions, such as hybridization. Individuals were collected from Cahokia Creek, a small stream in southern Illinois. Each individual was injected with a unique combination of two elastomer tag markings. Weekly recapture events occurred from mid-June through August. We hypothesized that *F. notatus* individuals would conform to the restricted movement paradigm which states that the majority of stream fishes are non-mobile and restrict their movements to a home range that is well-defined within 20-50 meter stretches of stream. We further predicted that males and large individuals would exhibit territorial behavior and would therefore be less mobile than females and smaller individuals. We found that the majority of individuals remained in the pool of initial capture, suggesting that *F. notatus* individuals follow the restricted movement paradigm. The data also supported the predictions that large individuals and males exhibit territorial behavior and are less mobile than smaller individuals and females.

9:30 43. Cats (Felidae) and the risk of *Toxoplasma gondii* infection in terrestrial wildlife: a measure of ecosystem health

Fredebaugh, Shannon L; Mateus-Pinilla, Nohra E; McAllister, Milton; Wangen, Kimberly L; Warner, Richard and Rivera, Nelda. University of Illinois at Urbana-Champaign, Champaign, IL.

Toxoplasma gondii is a protozoan parasite for which all felids are the definitive host. Humans and wildlife can acquire *T.gondii* by accidentally consuming cat feces infected with *T.gondii* or consuming undercooked meat infected with the cyst form of *T.gondii*. We hypothesized that rural natural areas in close proximity to human buildings have larger populations of feral, free-roaming, and domestic cats and that an increase in occurrence of felids is associated with an increased risk for

T. gondii infection in wildlife in the area. A 2008 survey to determine occurrence of medium size mammals in a natural area was conducted using live trapping, scent stations and motion cameras. Eight trapping sites within the natural area were selected based on distance to buildings. Our preliminary analysis of all 3 survey methods indicated that sites within 300m of buildings had a larger number of medium size mammals and cats. The site with the highest seroprevalence rate (42.9%) was located close to human buildings; second and third highest rates (30.8% and 30.0%) were farther sites. Seroprevalence results indicate greater infection rates (30% to 55%) in raccoons, cats, and opossums captured close to buildings, compared to the same species captured farther from buildings. A 2009 wildlife survey will be conducted to increase power, sample size and follow-up on *T. gondii* infection rates within the natural terrestrial ecosystem.

9:45 44. Song repertoires and song learning in the Red-eyed Vireo, *Vireo olivaceus*
Scholl, Jacob D and Mountjoy, D James. Knox College, Galesburg, IL.

The Red-eyed Vireo (*Vireo olivaceus*) and its relatives (Aves: Vireonidae) have received little study in terms of song learning and song repertoires. Vireo species vary greatly in the number of song types in their repertoires, with Red-eyed Vireos having one of the largest repertoires. We studied Red-eyed Vireo song at the Green Oaks Biological Field Station in Knox County, IL. Individuals were captured and color-banded and age estimates were made based on the appearance and overall wear of the feathers. Songs were recorded and analyzed to determine the total number of song types in an individual's repertoire. To see if extended learning occurs in Red-eyed Vireos, we compared age and repertoire size of various individuals. Also, recordings from multiple years were compared in certain color-banded individuals to see if any changes occurred in repertoire size or song types used. Preliminary results suggest that there is no noticeable correlation between age and repertoire size. Similarly, individual repertoire size seems to be lower than previous studies suggest with the total number of song types ranging from 24-45. However, there is evidence that extended learning does in fact take place. One individual exhibited a complete turnover of song types from 2007 to 2008.

10:00 45. The effects of premating barriers on reproductive isolating mechanisms between two topminnow species: *Fundulus olivaceus* and *F. notatus* (Fundulidae)
Jablonski, Megan S; Schoeneck, Brian D and Duvernell, David D. Southern Illinois University Edwardsville, Edwardsville, IL.

Fundulus olivaceus and *F. notatus* are two closely related species of topminnows. They are morphologically similar and differ primarily in pigmentation patterns on their dorsal surfaces. Despite their varied habitats, contact zones between the two species occur and hybridization has been observed. In this experiment, allopatric and sympatric populations were studied to determine the extent of premating barriers between these species. Mate choice trials were performed and the offspring generated from these trials were genotyped in order to measure the degree of mate discrimination between the two species. It was hypothesized that males and females of both species would exhibit conspecific mate preference when given the option of mating with a heterospecific partner, that females of both species would demonstrate a stronger conspecific mate preference, and that sympatric populations would exhibit stronger conspecific mate preference as a result of reinforcement. While females exhibited strong conspecific mate preferences as predicted, males did not, and variations in the degree of mate discrimination among trials did not support reinforcement.

10:15 46. A preliminary survey of the micro-arthropods inhabiting terrestrial substrates near Monteverde Cloud Forest Preserve, Costa Rica.

Geroff, Ray K; Johnson, Lynnaun JAN; Marin, Derek and Zettler, Lawrence W. Illinois College, Jacksonville, IL.

More than one-half of Costa Rica's 500,000 species are thought to be insects, and a staggering number of these arthropods remain unstudied. This is especially true for species that inhabit substrates because many are overlooked due to their diminutive size and cryptic life style. Though small, it is thought that the micro-arthropods collectively play an important ecological role in tropical ecosystems. The aim of this study was to document the abundance and diversity of the arthropods that inhabit terrestrial substrates in an area bordering Monteverde Cloud Forest Preserve, Costa Rica. During March of 2008, three different habitats were explored for micro-arthropod diversity: 1) mature forest, 2) open pasture, and 3) pasture/forest interface (edge). For each habitat type, four leaf-litter/soil samples were collected, and each sample was separated by at least 100 m. Organic debris from a fourth habitat type (base of a remote waterfall) was also sampled. Immediately after collection, samples were transferred to Berlese funnels in a laboratory (University of Georgia's Ecolodge – San Luis). After 12 hrs, micro-arthropods were counted and identified using a dissection microscope. A wide range of insects were identified spanning 13 orders, most notably members of the Diplura (Campodeidae), and Collembola (Isotomidae). Each sample often yielded a different set of arthropods, and no group was recovered from all three habitat extremes. Members of the Protura were not observed.

10:30 47. Influence of habitat heterogeneity on habitat use of sympatric meadowlarks in northwest Illinois

Elbert, Daniel¹; Molano-Flores², Brenda and Wenny, Daniel². ¹University of Illinois at Urbana-Champaign, Champaign, IL, ²Illinois Natural History Survey, Champaign, IL.

Local habitat characteristics may be of particular importance in areas of sympatry where closely related species exploit similar resources but segregate across small habitat gradients. The aim of this study was to compare the relationships between structural habitat heterogeneity and heterogeneous species composition of plants, and their influence on meadowlark distribution patterns in an area of sympatry. In 2007 and 2008, we surveyed meadowlark populations and vegetation at 24 plots, three times during the breeding season at the Lost Mound Unit of the Upper Mississippi River National Wildlife Refuge, Jo Davies Co., IL. Overall, meadowlarks were more abundant at Lost Mound in 2007 than 2008 throughout the breeding season. In 2007 the population abundance of Eastern and Western meadowlarks was similar throughout the breeding season, though the average number of Western meadowlarks per study plot tended to be greater than that for Eastern Meadowlarks for two of the three sampling periods. In 2008 the population abundance of Eastern meadowlarks was greater throughout the breeding season than that of Western meadowlarks, and the average number of birds per study plot was similar for both species. In both years Western meadowlarks tended to associate with study plots having shorter and sparser grass cover, with a shallower litter layer and fewer shrubs and trees than study plots Eastern meadowlarks commonly associated with. These results suggest that management seeking to benefit both species at one site will need to consider a multiple-use approach.

1:00 48. Survey of threatened and endangered herpetofauna in the bluff corridor of Monroe County, Illinois

Weck, Robert and Marlen, Michael. Southwestern Illinois College, Belleville, IL.

The bluff corridor of Monroe County is one of Illinois' most biologically diverse regions. During the 2008 field season, we conducted a herpetological survey for five Illinois State Threatened and Endangered species at six natural areas in the bluff corridor: Angela's Prairie, Brickey-Goenterman Memorial Hill Prairie, William DeMint Memorial Hill Prairie, Fults Hill Prairie, Kidd Lake Marsh, and Salt Lick Point Land and Water Reserve. Target species included the eastern narrowmouth toad (*Gastrophryne carolinensis*), flathead snake (*Tantilla gracilis*), timber rattlesnake (*Crotalus horridus*), Great Plains rat snake (*Elaphe emoryi*), and the coachwhip (*Masticophis flagellum*). Ninety-eight individual encounters with four of the five target species were reported. *Masticophis flagellum* was not seen. The Fults Hill Prairie/Kidd Lake Marsh area had the highest concentration of target species with fifty-eight individual specimens observed. The eastern narrowmouth toad was the most numerous species encountered and the only target species seen at all six study sites. We found the flathead snake to be more common in the bluff corridor than previously documented.

1:15 49. Sub-urban sprawl, green space and the effects on bird diversity in Madison County, Illinois

Starr, Michael J. Southern Illinois University Edwardsville, Edwardsville, IL.

Urban sprawl has increased significantly during the last 50 years, with ever more people moving outward from city core regions, converting the rural lands adjacent to these communities into suburban developments. The result of this growth has been an increase in local pollution and traffic congestion as well as a decrease in biodiversity on lands within and adjacent to these developments. In the suburbs of Madison County (part of the eastern metropolitan area of St. Louis, MO), the impacts can be seen in both the types and numbers of birds seen in the subdivisions. But this study also shows that large areas of green space can support many of the bird species commonly lost in more developed areas.

1:30 50. Arm regeneration in juvenile *Octopus bimaculoides* (Mollusca: Cephalopoda)

Bennett, Heather and Hamilton, Paul. Illinois College, Jacksonville, IL.

Octopuses have long been known to regenerate lost or injured arms, however, this process has not been well documented in a controlled laboratory setting. In order to document arm regeneration in juveniles, six (6) juvenile octopuses (*Octopus bimaculoides*) were reared in a 700 gallon recirculating seawater system on the Illinois College campus. Animals were narcotized and arms were surgically removed. Animals were then monitored for arm regeneration over a period of six months. Regeneration was observed and measured in all treated individuals. Gross anatomical data will be shown and implications for future experiments will be discussed.

1:45 Business Meeting

DRIVING DIRECTIONS, PARKING, FLOOR PLANS

Driving Directions

Just 25 minutes from St. Louis, SIUE is easily accessible from a number of Interstate highways -- I-55, I-64, and I-70. Here's how to get here from each:



From north of campus: Take I-55 South to I-270 West. Use the I-270 directions below for the final directions to campus.

From south of campus: Take I-55 North to I-255 North (Chicago) to I-270 East. Use the I-270 directions below for the final directions to campus.



From east of campus: Take I-64 West to I-255 North (Chicago). Use the I-270 directions below for the final directions to campus.

From west of campus: Take I-64 West to I-255 North (Chicago). Take I-255 to I-270 East (Indianapolis). Use the I-270 directions below for the final directions to campus.

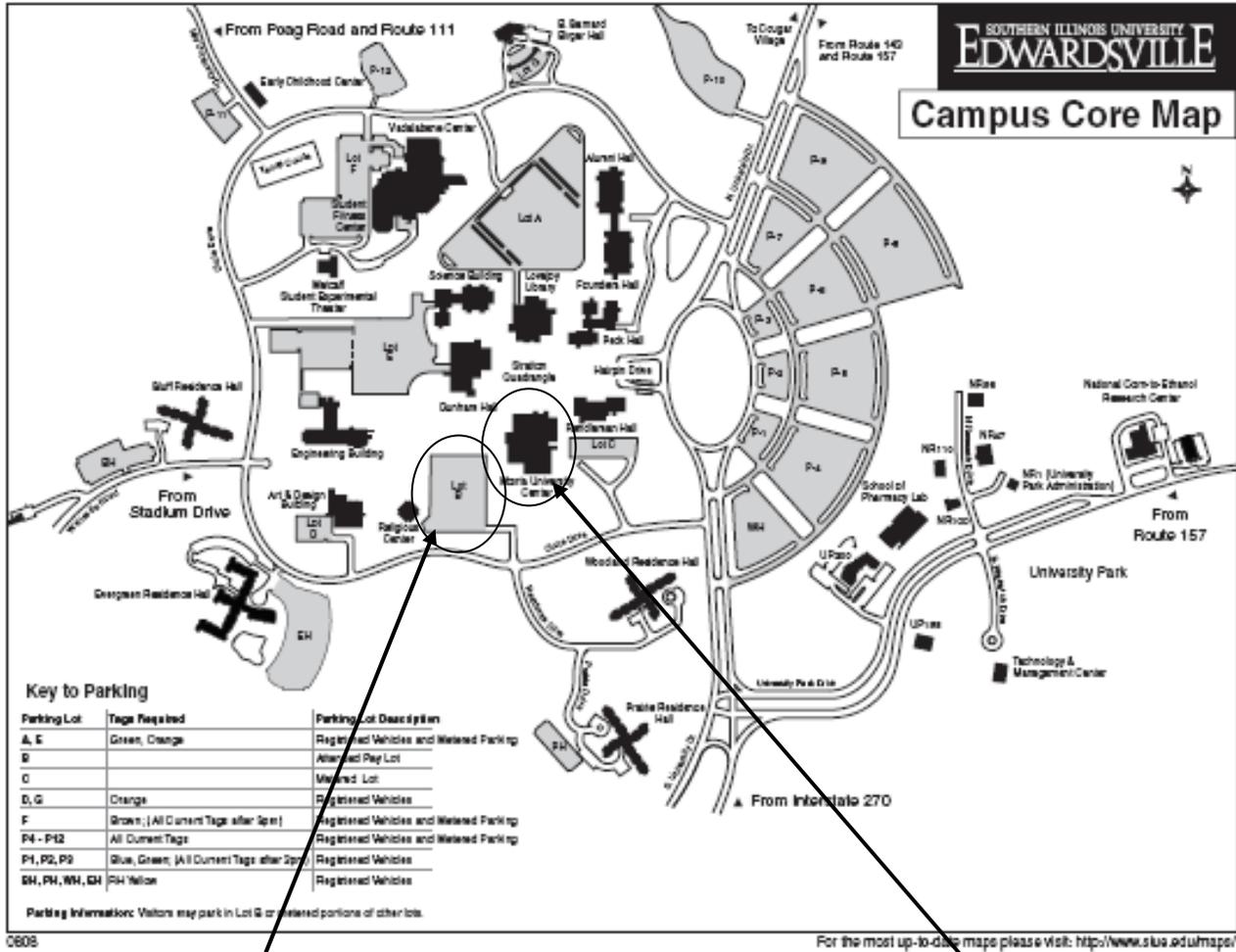


From east of campus: Take I-70 to I-270 West. Use the I-270 directions below for the final directions to campus.

From west of campus: Take I-70 to I-270 East into Illinois. If you are crossing into Illinois on the Jefferson Barracks Bridge, take I-255 North (Chicago) to I-270 East at Illinois 157 North exit. Use the I-270 directions below for the final directions to campus.

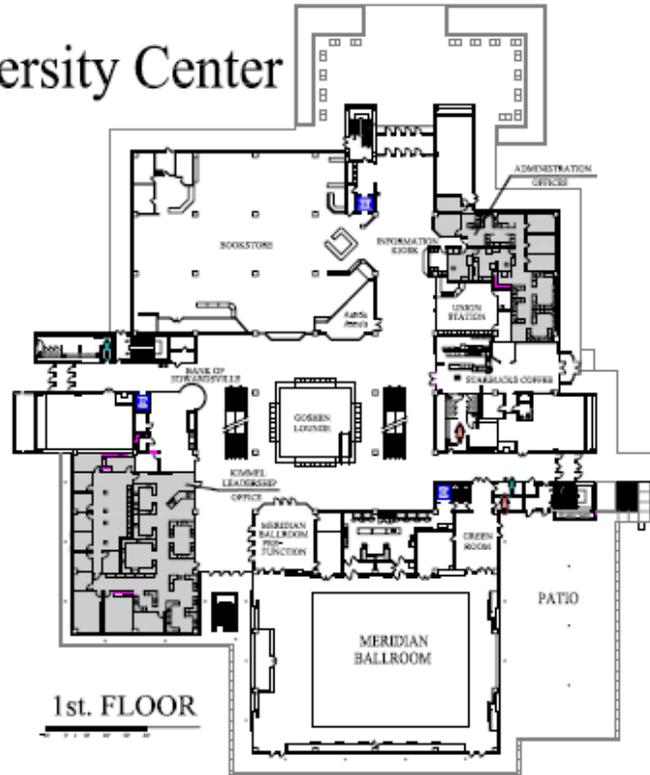
From I-270: Take the Illinois 157 North exit. Once you're on Illinois 157 North, going straight at the stop light (instead of following 157 to the right) will bring you straight to the campus core. Pay parking is available in Visitor Lot B.

Persons with disabilities may park in the disability parking spots in Visitor B on our campus core map.



Parking: Park in Lot B and obtain a parking pass at registration in the Morris University Center. Parking is free in any lot on Saturday.

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FUTURE MEETINGS

April 2009: SIUE

April 2010: Millikin

April 2011: OPEN

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Year	Fellow	Area
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1984	James E. House	Chemistry
1984	Harold M. Kaplan	Physiology
1984	Richard C. Keating	Botany
1984	James E. King	Paleobotany
1984	Willard D. Klimstra	Zoology
1984	William M. Lewis	Zoology
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1984	Lambertus H. Princen	Chemistry
1984	David G. Rands	Chemistry
1985	Robert C. Duty	Chemistry
1986	Ronald A. Browning	Physiology
1986	Richard L. Leary	Geology
1986	David S. Seigler	Botany
1988	Roger C. Anderson	Botany
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1990	Amrik Dhaliwal	Biology
1990	Leon Gershbein	Chemistry
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1991	George H. Fraunfelter	Geology
1992	Joseph E. Lambert	Chemistry
1992	R. Bruce McMillan	Anthropology
1993	Stanley A. Changnon	Geology
1995	Billy Geer	Biology
1995	Lawrence C. Matten	Botany
1996	Herbert L. Monoson	Botany
1996	Paul P. Sipiera	Geology
1996	Marian Smith	Botany
1998	Andrzej Bartke	Zoology
1999	Bonnie W. Styles	Anthropology
1999	Michael A. Goodrich	Zoology
2001	Howard E. Buhse, Jr.	Cell, Molecular, and Development Biology
2001	Ralph Troll	Biology
2002	Walter J. Sundberg	Botany
2003	Laurence E. Crofutt	Bacteriology
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2004	James Rastorfer	Environmental Science
2005	William McClain	Botany
2008	Janice M. Coos	Botany
2008	Richard B. Brugam	Environmental Science

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