TRANSACTIONS OF THE ILLINOIS STATE ACADEMY OF SCIENCE

Supplement to Volume 104

103rd Annual Meeting
April 8-9, 2011

Eastern Illinois University
Charleston, Illinois

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

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SCHEDULE OF EVENTS

Friday, April 8

11:00 – 5:30 **Registration** – 3rd Floor of University Union
11:00 – 1:00 **ISAS Council Meeting (includes lunch)** – Sullivan Room in University Union
12:00 **Lunch (on your own)**
12:00 – 4:00 **Poster Set-up** – Doudna Fine Arts Center Concourse
12:30 – 1:30 **Mini-symposium on Renewable Energy: Session 1** (in collaboration with the *ScienceFest*, hosted by the College of Sciences)

- Chris Laingen (Eastern Illinois University) – Is corn stover a viable alternative to wood chips at EIU's Renewable Energy Center?
- Dennis Evers (VOW Resources, Terra Haute, IN) – The VOW process: It's triple bottom line through bioaugmentation
- Eric Rund (Agtivities International, Farmer) – Crops for biofuels
- Dan Johnson (Eastern Illinois University) – Biodiesel production

1:30 – 2:30 **Mini-symposium on Renewable Energy: Session 2**

- Jason Ehrnthaller – Geothermal energy application
- Gina Wolf (Project Manager, Element Power) – Wind energy: From Greenfield to decommissioning

2:30 – 4:00 **Activities**

- Campus garden tour
- Whiteside garden tour
- EIU Renewable Energy Center tours

4:15 – 5:15 **Poster Session (Odd Numbers)** – Doudna Fine Arts Center
5:15 – 6:15 **Poster Session (Even Numbers)** – Doudna Fine Arts Center
6:15 – 6:30 **Break**
6:30 – 8:30 **Banquet/Keynote Address: Hans Blaschek** – Grand Ballroom of University Union (keynote open to the public)
Overnight Lawson Hall (EIU) or other arrangements

Saturday, April 9

7:00 – 8:00 **Breakfast** – Grand Ballroom of University Union
7:30 – 12:00 **Registration** – 3rd Floor of University Union
8:00 – 9:00 **Oral Presentations** – 3rd Floor of University Union
9:00 – 9:15 **Break**
9:15 – 10:30 **Oral Presentations** – 3rd Floor of University Union
10:30 – 10:45 **Break**
10:45 – 12:00 **Oral Presentations** – 3rd Floor of University Union
12:15 **Division Meetings** – 3rd Floor of University Union
12:30 – 2:00 **Lunch/ISAS Business Meeting** – Grand Ballroom of University Union
2:00 – 2:15 **Award Announcements** – Grand Ballroom of University Union
2:15 **103rd Annual ISAS Meeting Adjourned**

KEYNOTE ADDRESS

Hans Blaschek

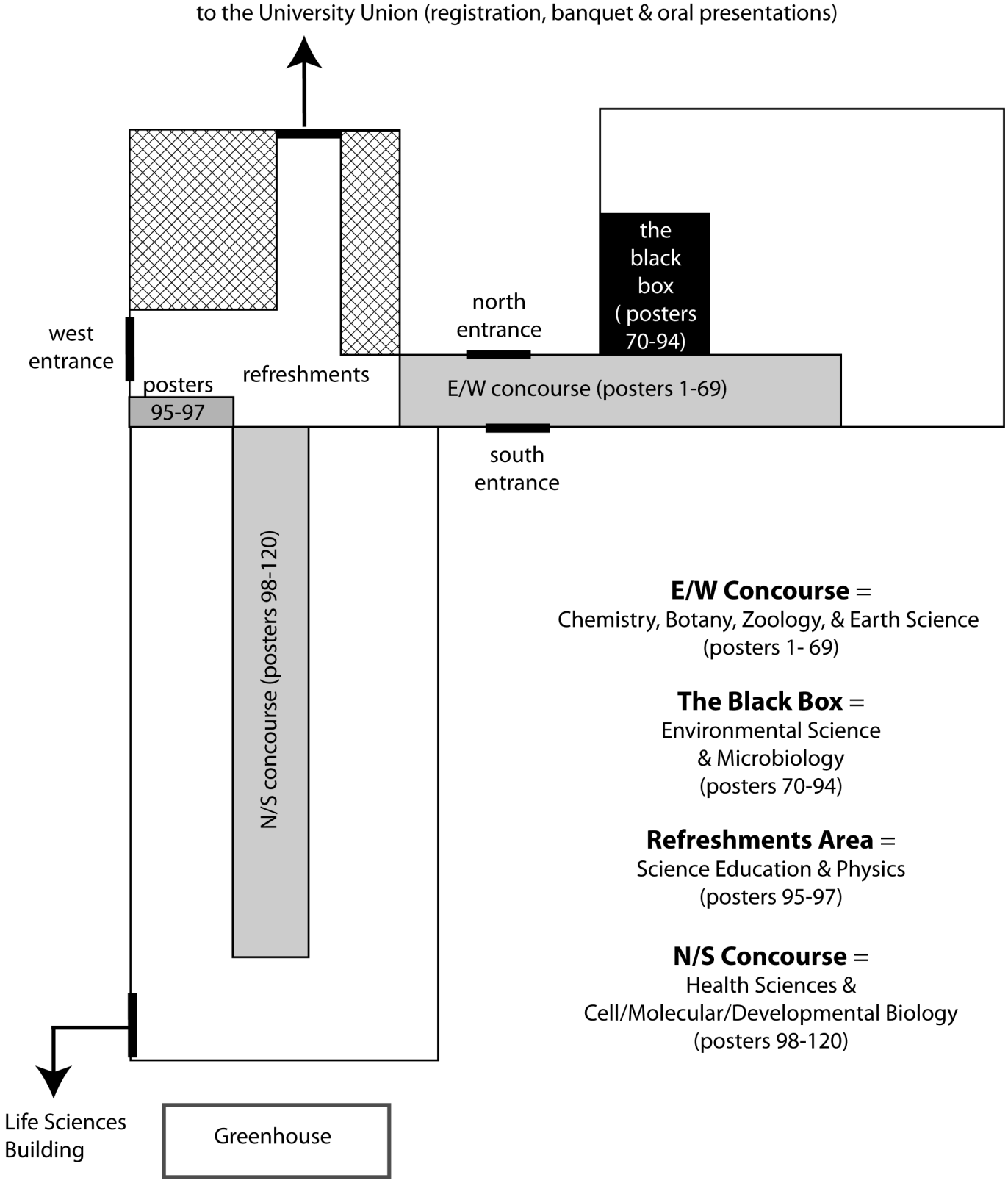
Near and Long-Term Opportunities for the Bioeconomy

Hans Blaschek
Professor and Director
Center for Advanced BioEnergy Research
University of Illinois
www.bioenergy.illinois.edu
blaschek@illinois.edu

Hans Blaschek received his Ph.D. in Food Science (Microbiology), at Rutgers University in 1980, his M.S. in Food Science at Rutgers University in 1977 and his B.A. in Biological Sciences at Rutgers College in 1974. He presently serves as the Interim Director for the Center for Advanced BioEnergy Research (CABER), University of Illinois where he is responsible for leading planning efforts for the Integrated Bioprocessing Research Laboratory. In addition, Hans holds the position of Theme Leader of Molecular Bioengineering of Biomass Conversion Research Theme with the Institute for Genomic Biology. He serves as an Assistant Dean, Biobased Research Initiatives in the Office of Research, College of Agricultural, Consumer and Environmental Sciences at the University of Illinois. He served as the Interim Head of the Department of Food Science and Human Nutrition, University of Illinois from 2000 - 2002. He has served as a Professor of Food, Microbiology/Biotechnology since 1991 in the same department. His research areas include: Genetic manipulation of microorganisms for biotechnological applications, examination of dry milling co-products as substrates for fermentation to value-added products, development of an integrated fermentation system for solvent production and recovery, pathogen transmission on minimally processed foods. Hans served for the U.S. Department of Agriculture as the Value-Added/Biofuels Panel Manager for NRI Competitive Grants Program from 1994-1995. He has also consulted on Biomass Conversion systems for DuPont and served as a Research Collaborator and Consultant for Mitsubishi Chemical and Research Institute Technology for Earth (RITE), Kyoto, Japan since 1994. He has chaired many sessions for symposia, including the Bio2006, "Adding Value to the Biorefinery: The Midwest Consortium for Sustainable Biobased Products and Energy", that was held in Chicago, IL. Another symposium he organized was the "UIUC Bioenergy Symposium: Focus on the Future of Biofuels and Chemicals", which was held in Urbana, IL May, 2006. He is also the co-founder and CSO of TetraVitae Bioscience, a company focused on scale-up and commercialization of the bio-butanol fermentation.

POSTER PRESENTATION MAP

All posters will be presented in the **Doudna Fine Arts Center** (DFAC). The following map of the DFAC gives the layout of presenter numbers and ISAS Divisions within the building.



E/W Concourse =
Chemistry, Botany, Zoology, & Earth Science
(posters 1- 69)

The Black Box =
Environmental Science
& Microbiology
(posters 70-94)

Refreshments Area =
Science Education & Physics
(posters 95-97)

N/S Concourse =
Health Sciences &
Cell/Molecular/Developmental Biology
(posters 98-120)

POSTER PRESENTATION SESSIONS

Poster presentations are Friday, April 8, in Doudna Fine Arts Center from 4:15 – 6:15 PM. Presenters can hang their posters up any time between 12:00 – 4:00 PM. Posters are to remain up until 6:15 on Friday. Attendees are encouraged to view posters at any time and visit with poster authors during the formal poster session. Presenters are expected to stand by their poster from either 4:15 – 5:15 PM (odd number posters) *OR* 5:15 – 6:15 PM (even number posters). Judges from each Academy Division, where applicable, will be reviewing posters at this time for award judging. An asterisk (*) indicates the presenters eligible for a Student Presentation Award.

Division: Chemistry

*** 1. New cathepsin B inhibitors containing C-terminal argininal thiosemicarbazones**
Guda, Bharat[1], Rahman, Franklin[1], Steele, Keegan[1], Kadasala, Naveen[2], Wen, Lisa[1] and McConnell, Rose M.[1] [1]Western Illinois University, Macomb, IL. [2]Purdue University, West Lafayette, IN.

*** 2. Cathepsin K inhibitors containing C-terminal argininal thiosemicarbazones**
Yermala, Durga[1], Tha, Soe[1], Obregon, Roxana[2], Kadasala, Naveen[3], Wen, Lisa[1] and McConnell, Rose M.[1] [1]Western Illinois University, Macomb, IL. [2]Northwestern University, Chicago, IL. [3]Purdue University, West Lafayette, IN.

*** 3. Synthesis and evaluation of new cathepsin D inhibitors containing hydroxyethylamine isosteres**
Akula, Prashanth and McConnell, Rose M. Western Illinois University, Macomb, IL.

*** 4. Solvent dependent chemoselective oxidation of alcohols using water-soluble *o*-iodoxybenzoic acid (IBX) derivatives**
Raya, Balaram, Jajam, Savithri and Vinod, Thottumkara K. Western Illinois University, Macomb, IL.

*** 5. *In-situ* generation and catalytic use of *o*-iodoxybenzoic acid for oxidation of alcohols: A green chemistry undergraduate experiment**
Madne, Kishore K., Pandey, Sonali R., Vishwabrahmana Saraf, Swetha and Vinod, Thottumkara K. Western Illinois University, Macomb, IL.

*** 6. Numerical analysis of the free radical addition polymerization model**
Ellis, Matthew A. Greenville College, Greenville, IL.

*** 7. Spectroscopy and inquiry-based learning in the chemistry curriculum**
Brauer, Shari D. and Justice, David C. Greenville College, Greenville, IL.

*** 8. Synthesis of transition metal-thioridazine complexes**
Gundameedi, Madhuri and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

*** 9. Synthesis and characterization of transition metal-chlorpromazine complexes**
Naini, Yakubreddy, Gouru, Dayakar R. and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

*** 10. Synthesis and characterization of transition metal-promazine complexes**
Gouru, Dayakar R., Naini, Yakubreddy and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

*** 11. Transition metal-ethopropazine complexes: synthesis and characterization**
Debbeti, Varun, Kasarla, Vujwala and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

*** 12. Manganese(III) oxidation of indigo carmine catalyzed by ruthenium(III) in acid medium: A kinetic study**
Thakkalapally, Vishnuvardhan R., Palakurthi, Bharath K., Cholker, Kishore and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

*** 13. Kinetics of glycine oxidation by manganese(III) in sulfuric acid medium**
Akita, Vikram, Poloju, Sridharq and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

*** 14. The effect of 1-methyl, 2,3 dimethylimadzolium tetrafluoroborate MDMIM ionic liquid on the adsorption behavior of some amino acids**
Aluguvelli, Kishore K., Alalwiat, Ahlam and Ahmad, Tarab. Western Illinois University, Macomb, IL.

*** 15. The effect of the counter ion of 1-methyl,3-buytl imidazolium ionic liquid salts as mobile phase additives on the retention behavior of tryptophan on reversed phase liquid chromatography**
Aluguvelli, Kishore K., Alalwiat, Ahlam and Ahmad, Tarab. Western Illinois University, Macomb, IL.

*** 16. The effect of 1-methyl, 3-butyllimadzolium tetrafluoroborate BMIMBF4 ionic liquid on the retention behavior of nitroaromatics and nitroanilines**
Utterback, Craig, Perkins, Deona, Heagy, Ashlie, Sharp, Stephanie and Ahmad, Tarab. Western Illinois University, Macomb, IL.

*** 17. The effect of substituted imidazolium tetrafluoroborate ionic liquids as a mobile phase additives on the adsorption behavior of some amino acids**
Ahmad, Tarab, Ahmad, Tariq and Aluguvelli, Kishore K. Western Illinois University, Macomb, IL.

*** 18. Microencapsulation of vitamins A and E into a dual biopolymer system: effect of water activity on the release profile**
Sherman, Michael, Jagarlamudi, Prathyusha, Gogieni, Varalashmi, Boley, Mark and Kouassi, Gilles. Western Illinois University, Macomb, IL.

*** 19. Phenolic contents in relation to antioxidant activity of blackberries, blueberries, blackcurrants, and cranberries**
Diawara, Fatoumata, Jagarlamudi, Pratyusha, Ahmad, Tarab, Gowda, Netkal, Afitlhile, Meshack and Kouassi, Gilles. Western Illinois University, Macomb, IL.

*** 20. Preparation and functionalization of CNB-Fe_3O_4 nanocomposites for detection purposes**
Redlinski, Bartomiej, Lucas, Joseph, Sherman, Michael, Boley, Mark and Kouassi, Gilles. Western Illinois University, Macomb, IL.

*** 21. Synthesis and characterization of copolymer hydrogels for use as vitreous substitutes**
Loch, Alicia M. Greenville College, Greenville, IL.

*** 22. Preparation of tripeptides containing C-terminal L-lysinal and ornithinal thiosemicarbazone as potential cathepsin B/K inhibitors**
Kazipeta, Karthik, Jin, Jin, Zhang, Shaozhong, Wen, Lisa and McConnell, Rose M. Western Illinois University, Macomb, IL.

*** 23. Preparation of new synthetic compounds containing N-aromatic piperazino group and thioxo-thiazolidinyl groups as potential cathepsin K inhibitors**
Bommana, Rupesh Reddy, Jin, Jin, Zhang, Shaozhong, Wen, Lisa and McConnell, Rose M. Western Illinois University, Macomb, IL.

*** 24. Thin-film perovskite-type electrodes for oxygen reduction catalysis**
Chandra, Keerthi, Kunz, Andrew and Mitrovski, Svetlana. Eastern Illinois University, Charleston, IL.

*** 25. Colloidal palladium(0) encapsulated in polydimethylsiloxane (PDMS): Fabrication and study of the catalytic ability for hydrogenation and hydrogenolysis reactions of various organic functional groups**
Miller, Josiah D., Andersh, Brad J. and Campbell, Dean J. Bradley University, Peoria, IL.

Division: Botany

26. Induction of callus tissue from mature stem explants of the endangered Kankakee mallow, *Iliamna remota* (Malvaceae)
Owen, Henry R., Estanda, Arnold B., Daugherty, Bradley M., Eident, Samuel A., Paul, Oindrila, Ervin, Stefanie L. and Grigg-Bailey, Ashley. Eastern Illinois University, Charleston, IL.

*** 27. Comparative leaf anatomy of C_3 and CAM species in Oncidiinae (Maxillarieae, Orchidaceae)**
Eident, Samuel A. and Carlsward, Barbara S. Eastern Illinois University, Charleston, IL.

*** 28. Fertilizer effects on the growth of *Silene regia* (family Caryophyllaceae)**
Wildenberg, Amanda J., Porreca, Anthony P., Coons, Janice M. and Coutant, Nancy E. Eastern Illinois University, Charleston, IL.

29. Morphological and molecular systematics of the genus *Triosteum* (Caprifoliaceae)
Ginder, Douglas J., Durso, Andrew M., Daugherty, Bradley M., Liu, Zhiwei and Tucker, Gordon C. Eastern Illinois University, Charleston, IL.

30. Colonization pattern of the wind-dispersed invasive tree *Ulmus pumila* (Ulmaceae)
Reese, Nathan, Laquet, Jennifer, Merritt, Lexie and Schulz, Kurt. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 31. Fire restoration of Mississippi River bluff hardwood forests at the Nature Institute (Madison County) and the Palisades Preserve (Jersey County)**
Sutton, Alexandra and Schulz, Kurt. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 32. *In vitro* shoot multiplication of *Desmanthus illinoensis*, a native perennial of agricultural interest**
Kirk, Joseph and Barry, Kelly. Southern Illinois University Edwardsville, Edwardsville, IL.

33. *In vitro* shoot multiplication of *Astragalus crassicarpus*, a native perennial endangered in Illinois
Ryan, Kevin and Barry, Kelly. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 34. Analysis of tree growth on long-term forest plots in Sweet William Woods, southwestern Illinois**
Webb, Leslie A. and Minchin, Peter R. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 35. Analysis of tree mortality on long-term forest plots in Sweet William Woods, southwestern Illinois**
Ozyurt, Nevin I. and Minchin, Peter R. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 36. Effects of white-tailed deer (*Odocoileus virginianus*) on bottomland forest restoration at the confluence of the Mississippi and Illinois Rivers**
McGuire, Benjamin M. and Minchin, Peter R. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 37. Highlights of some unique plant collections from the Whiteside Garden (Coles County, IL)**
Daugherty, Bradley M., Whiteside, Wesley C., Coutant, Nancy E. and Coons, Janice M. Eastern Illinois University, Charleston, IL.

*** 38. Production ecology during early succession in an old field in Rock Island county, northwestern Illinois**
Shelly, Ellen and Dziadyk, Bohdan. Augustana College, Rock Island, IL.

*** 39. Shading effects on the reproductive ecology of *Besseya bullii*, a rare species**
Chi, Katherin[1], Molano-Flores, Brenda[2], Collins, Michelle[1] and Abou-El-Seoud, Dalya.[1]
[1]University of Illinois at Urbana-Champaign, Champaign, IL. [2]Illinois Natural History Survey, Champaign, IL.

*** 40. Biodegradation of atrazine by fungi**
Presley, Gerald N. and Methven, Andrew S. Eastern Illinois University, Charleston, IL.

41. Sharing the same name: North American and European species of *Lactarius*
Methven, Andrew S. Eastern Illinois University, Charleston, IL.

Division: Zoology

42. Survey of the hemoparasites in avian vertebrates of central and southern Illinois
Annetti, Kendall L.[1], Mateus-Pinilla, Nohra[2], Kohrt, Laura[3] and Fredebaugh, Shannon.[2]
[1]University of Illinois, Urbana, IL. [2]Illinois Natural History Survey, Urbana, IL. [3]University of Illinois, Pathobiology, Urbana, IL.

*** 43. Thyroid axis mediation of development in a frog (*Eleutherodactylus coqui*: Anura: Leptodactylidae) without an aquatic tadpole stage**
Evans, Bryce and Jennings, David H. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 44. The effects of habitat on reproductive isolation in two species of topminnow (genus *Fundulus*)**
Stasik, Marcy, Stevenson, Aimee and Duvernell, David. Southern Illinois University Edwardsville, Edwardsville, IL.

45. Is anthropogenic habitat change the driving force of rapid evolution of southeastern US coastal deer populations?
Storm, Nicole L. and Novak, James M. Eastern Illinois University, Charleston, IL.

*** 46. Comparative analysis of yolk testosterone levels in captive avian species**
Briney, Katie M. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 47. Evaluating the impact of an altered thermal regime on sport fish assemblages**
Porreca, Anthony P., Colombo, Robert E., Pederson, Charles L. and Pant, Manisha. Eastern Illinois University, Charleston, IL.

*** 48. Vascular endothelial growth factor expression in lizards (*Sceloporus*; Phrynosomatidae) with divergent reproductive modes (oviparity vs. viviparity)**
Reese, Nathan E. and Jennings, David H. Southern Illinois University Edwardsville, Edwardsville, IL.

49. Functional morphology of *Gammarus pseudolimnaeus* (freshwater amphipod) and its relationship to drift in a fishless stream
Rhaesa, Michael A. and Brunkow, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 50. Biogeographic variation of two raccoon subspecies in Illinois**
Milton, Jennifer and Kohn, Luci. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 51. Scapular form in semi-arboreal and terrestrial carnivores**
Wells, Ashley and Kohn, Luci. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 52. Morphological variation in scapula and pelvic form in Mustelidae**
McNealy, Ashley, Volin, Christen and Kohn, Luci. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 53. Parrotfish fish species distribution and feeding habits in the waters surrounding Tobacco Caye, Belize, CA**
Park, So Yeon. Knox College, Galesburg, IL.

54. Flight induced oxidative stress in the honey bee, *Apis mellifera*
Hall, Kelsey, Haskell, Shelitha and Williams, Jason. Southern Illinois University Edwardsville, Edwardsville, IL.

55. The effect of differing antioxidant supplementation levels on oxidative stress and lifespan in male and female *Drosophila melanogaster*
Weis, Jordan, Limbachia, Reena, Wessling, Ryan and Williams, Jason. Southern Illinois University Edwardsville, Edwardsville, IL.

56. Locomotor behavior, microhabitat use, and activity pattern in the fire-bellied toad, *Bombina orientalis* (Anura: Bombinatoridae)
Bulger, Amanda L. and Essner, Jr., Richard L. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 57. Jumping kinematics in the Rocky Mountain tailed frog, *Ascaphus montanus* (Anura: Leiopelmatidae)**
Bulla, Andrew J. and Essner, Jr., Richard L. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 58. Jumping kinematics in the fire-bellied toad, *Bombina orientalis* (Anura: Bombinatoridae)**
Ellet, Lowell D. and Essner, Jr., Richard L. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 59. Jumping kinematics in the northern leopard frog, *Lithobates pipiens* (Anura: Ranidae)**
Singh, Kunal and Essner, Jr., Richard L. Southern Illinois University Edwardsville, Edwardsville, IL.

60. Influence of age and plant coverage on insect communities on green roofs
Steck, Tony, Retzlaff, William and Williams, Jason. Southern Illinois University Edwardsville, Edwardsville, IL.

~~*** 61. Handedness during prey capture in the Chinese mantid, *Tenodera aridifolia sinensis* (Mantodea: Mantidae)**~~ **CANCELLED**
Rhodes, Samantha R., Robertson, Marianne D. and Watson, Casey. Millikin University, Decatur, IL.

*** 62. Population status of silver carp on the Illinois River**
Stuck, Jason and Colombo, Robert. Eastern Illinois University, Charleston, IL.

Division: Earth Science

63. GIS modeling of fixed carbon and carbon dioxide sequestration from Greenscape Biomass, at Eastern Illinois University
Di Naso, Steven M., Gutowski, Vincent P. and Boatright, Kyle D. Eastern Illinois University, Charleston, IL.

64. Snow's cholera revisited: An integrative learning experience in geospatial statistical analysis
Di Naso, Steven M., Reynolds, Jennifer E. and Happ, Jena L. Eastern Illinois University, Charleston, IL

*** 65. Assessing sub-field growing patterns of soybean using NDVI and EVI for local Illinois producers**
Mustafa, Munia M., Rudibaugh, Mike A. and Ali, Iffat A. Lake Land College, Mattoon, IL.

66. Using GIS to identify riverine soils for use as potential wetland restoration areas in the Embarras River Watershed, east-central IL
Gutowski, Vincent P.[1], Di Naso, Steven M.[1] and Osterman, Daniel J.[2] [1]Eastern Illinois University, Charleston, IL. [2]USDA, NRCS, Toledo, IL.

*** 67. Vegetation classification and fire research of the northern Sierra Nevada Mountains**
Rentschler, Trisha S. and Smith, Betty E. Eastern Illinois University, Charleston, IL.

68. Flow structure and channel morphology at a large confluent-meander bend: Field investigation of the junction of the Ohio and Wabash Rivers
Riley, James D.[1] and Rhoads, Bruce L.[2] [1]Eastern Illinois University, Charleston, IL. [2]University of Illinois at Urbana-Champaign, Urbana, IL.

69. Box turtle population assessment and their contribution to the spread of invasive plants at SIUE
Hoffman, Eric and Walton, Elizabeth. Southern Illinois University Edwardsville, Edwardsville, IL.

Division: Environmental Science

*** 70. Storm water runoff of residential green roof systems**
Murphy, Daniel[1], Jennings, Denzil[1], Morgan, Susan[1], Jost, Vic[2], Luckett, Kelly[3] and Retzlaff, William.[1] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]Jost Greenhouses, St. Louis, MO. [3]St. Louis Metalworks Company, St. Louis, MO.

*** 71. Thermal flux of residential green roof systems**
Jennings, Denzil[1], Murphy, Daniel[1], Celik, Serdar[1], Jost, Vic[2], Luckett, Kelly[3] and Retzlaff, William.[1] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]Jost Greenhouses, St. Louis, MO. [3]St. Louis Metalworks Company, St. Louis, MO.

*** 72. Lead contamination in the biota of two southwestern Illinois lakes**
Wilson, Matthew J., Tripp, Timothy, Brugam, Richard B. and Lin, Zhi-Qing. Southern Illinois University Edwardsville, Edwardsville, IL.

73. Soil carbon content of prairie restoration areas and conventionally tilled soils in Illinois
Nicioli, Stephanie M., Mullins, Ben M., Freund, Matthew, Ribory, Karen E., Vanoskey, Amanda A. and McConnell, J. Scott. Western Illinois University, Macomb, IL.

74. Soil carbon content of native prairies and conventionally tilled soils in Illinois
Ribory, Karen E., Freund, Matthew, Mullins, Ben M., Nicioli, Stephanie M., Vanoskey, Amanda A. and McConnell, J. Scott. Western Illinois University, Macomb, IL.

75. Conservation strategies for wildlife managers: Analysis of repatriated box turtles
Khadka, Sarjana and Walton, Elizabeth. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 76. Evaluating the stormwater mitigation potential of living wall systems**
Thompson, Kelly, Woolbright, Mark, Morgan, Susan, Celik, Serdar and Retzlaff, William. Southern Illinois University Edwardsville, Edwardsville, IL.

77. Quantitative assessment of minerals and endocrine disrupting chemicals in river otters (*Lontra canadensis*) in Illinois
Rivera, Nelda A.[1], Mateus-Pinilla, Nohra E.[1], Fredebaugh, Shannon L.[1], Singh, Kuldeep[2], Carpenter, Samantha K.[1] and Lehner, Andreas F.[3] [1]Illinois Natural History Survey, University of Illinois at Urbana-Champaign, Champaign, IL. [2]College of Veterinary Medicine, University of Illinois Urbana-Champaign, Urbana, IL. [3]Diagnostic Center for Population and Animal Health, Michigan State University, Lansing, MI.

78. Coverboard survey at the Watershed Nature Center
Haag, Heidi E. and Walton, Elizabeth. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 79. The evaluation of *Sedum* cuttings as an establishment method on Midwestern green roofs**
Krutsinger, Roxane[1], Greeling, Ben[1], Retzlaff, William[1], Morgan, Susan[1], Luckett, Kelly[2] and Jost, Vic.[3] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]St. Louis Metalworks Company, St. Louis, MO. [3]Jost Greenhouses, St. Louis, MO.

*** 80. The perfect storm: Cause of death of American robins (*Turdus migratorius*) at Millikin University in Decatur, Illinois**
Huschen, Max S., McQuistion, Thomas E. and Horn, David J. Millikin University, Decatur, IL.

*** 81. Evaluating the thermal benefits of living wall systems**
Ostendorf, Mark, Woolbright, Mark, Morgan, Susan, Celik, Serdar and Retzlaff, William. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 82. A spatially explicit model to predict American robin occurrence on the Department of Energy's Savannah River Site**
Boatright, Kyle D. and Gaines, Karen F. Eastern Illinois University, Charleston, IL.

Division: Microbiology

83. Competition trials between a strain of *E. coli* (MG1655) and its isogenic derivative WRL10
Vu, Christine L. and McCommas, Steve. Southern Illinois University Edwardsville, Edwardsville, IL.

84. *E. coli* strain MG1655 growth in complete medium supplemented with maltose compared to a mutant strain, KR4
Stehlin, Courtney A. and McCommas, Steven A. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 85. Using polymerase chain reaction to detect nifH and vnfDGK in an acidophilic microbial community**
Flowers, Samantha L. and Hung, Kai F. Eastern Illinois University, Charleston, IL.

86. MK1 is a new mutant strain of *E. coli* adapted to growth in galactose/glucose medium
Mnyapara, Haron K. and McCommas, Steven A. Southern Illinois University Edwardsville, Edwardsville, IL.

87. Sequencing of the galR gene in a spontaneous mutant, CH6, of *E. coli*
McCommas, Steven A., Herbert, Christopher, Harken, Laura, McFarland, Kyle and Snyder, Caleb. Southern Illinois University Edwardsville, Edwardsville, IL.

88. Model system of *E. coli* competition for fiber using LB9 and MG1655
Wallace, Atiyayein A. and McCommas, Steven A. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 89. Investigating storage conditions to maximize the methionine-gamma-lyase enzyme activity of the acidophilic archaeon "*Ferroplasma acidarmanus*"**
Cavanah, Kylie A., Khan, Mohammed A. and Hung, Kai F. Eastern Illinois University, Charleston, IL.

90. Competition between wild type strain MG1655 and mutant strain WRL2
Lim, Namkun and McCommas, Steven A. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 91. Determination of antimicrobial efficacy of a commercial ambulance disinfectant**
Hoppenrath, Jean M. and McCracken, Vance J. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 92. Evaluation of *Helicobacter canadensis* (Camplylobacteriales; Helicobacteriaceae) colonization of the mouse gastrointestinal tract**
Crabtree, Amy J., Bertels, Brooklyn A. and McCracken, Vance J. Southern Illinois University Edwardsville, Edwardsville, IL.

93. Determining the nitrogen requirements of a defined medium for an acidophilic Archeon to enable testing of functional genomics
McClellan, Jared J., Khan, Mohammed A. and Hung, Kai F. Eastern Illinois University, Charleston, IL.

*** 94. Vitamin requirements of the bile acid-dehydroxylating intestinal bacterium *Clostridium scindens***
Paul, Oindrila and Daniel, Steve. Eastern Illinois University, Charleston, IL.

Division: Science Education

95. Aurora University's STEM-based internship experience in Biological Science
Beck, Hans T., Davis, Jane, Othman, Saib, Eagle, Sherry and de Lacey, Lora. Aurora University, Aurora, IL.

96. Summer research experiences for science students and educators: High school students and teachers doing cancer research at Western Illinois University
McConnell, Rose, Wen, Lisa and Vinod, Thottumkara K. Western Illinois University, Macomb, IL.

Division: Physics, Mathematics & Astronomy

*** 97. Computational study of the thermal properties of nanofluids**
Meadows, Alexander and Zou, Jie. Eastern Illinois University, Charleston, IL.

Division: Health Sciences

98. Cubicin effects on murine immune response
Adkins, Eric[1], Cerentano, Kari[2], Miles, Samantha[2], Nisbeth, Martel[2], Khazaeli, Sadegh[2] and Kitz, Dennis J.[1] [1]Southern Illinois University Carbondale, Carbondale IL. [2]Southern Illinois University Edwardsville, Edwardsville, IL.

99. Some immune responses are enhanced by tigecycline
Morgan, Michelle, Hazelhurst, Ryan, Hendree, Shannan, Khazaeli, Sadegh and Kitz, Dennis J. Southern Illinois University Edwardsville, Edwardsville, IL.

100. Glycopeptide antibiotic effects on host immune response
Fulling, Patrick, Hartman, Jason, Hurt, Mariah, Basso, Gina, Khazaeli, Sadegh and Kitz, Dennis J. Southern Illinois University Edwardsville, Edwardsville, IL.

101. Ticarcillin effects on host immune response
Miles, Samantha, Cerentano, Kari, Basso, Gina, Hartman, Jason and Kitz, Dennis J. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 102. Antagonism of adenosine A1 receptors by 8-cyclopentyl-1,3-dipropylxanthine stimulates respiration in newborn rats**
Marcelin, Alain C. and McGilliard, Kip L. Eastern Illinois University, Charleston, IL.

*** 103. Antagonism of adenosine A1 receptors by 8-cyclopentyl-1,3-dipropylxanthine stimulates heart rate in neonatal rats**
Cassidy, Daniel P. and McGilliard, Kip L. Eastern Illinois University, Charleston, IL.

*** 104. *Helicobacter canadensis* (Camplylobacteriales; Helicobacteriaceae) induces interleukin-6 expression in a mouse intestinal epithelial cell line**
Daniels, Abbey L. and McCracken, Vance J. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 105. A mouse model of infection by the emerging pathogen *Helicobacter canadensis* (Campylobacteriales; Helicobacteriaceae)**
Bertels, Brooklyn A. and McCracken, Vance J. Southern Illinois University Edwardsville, Edwardsville, IL.

Division: Cell, Molecular & Developmental Biology

*** 106. Putative neurotransmitter modulation of *Lumbricus terrestris* (Lumbricidae) body wall contractions**
Neal, Michael W. and Krajniak, Kevin. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 107. Effect of PKC activation on cell motility in EB1 knock-down mouse melanoma cells**
Cain, Janine M. and Schober, Joseph M. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 108. Chromosomal mapping of genes silenced in rodent cell hybrids**
Lopez, Andrew G., Roe, Allixandra L. and Bulla, Gary. Eastern Illinois University, Charleston, IL.

109. Competing a mutant *E. coli* strain, RDF3, with wild-type strain, MG1655 in a rich medium
Cain, Kimber and McCommas, Steven. Southern Illinois University Edwardsville, Edwardsville, IL.

110. The action of decamethonium on the gut of the earthworm, *Lumbricus terrestris* (Lumbricidae)
Krajniak, Kevin G. and Kuo, Chien. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 111. Apoptosis induction by hygromycin B in human cancer cells**
Hanson, Katie F.[1], Marten, Andrew[1], Santander, Javier[2] and Wanda, Paul E.[1] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]Arizona State University Tempe, Tempe, AZ.

*** 112. Investigations of a putative G-protein coupled receptor in *Schizophyllum commune* (Aphyllophorales)**
Dorchincez, Kate M. and Fowler, Thomas J. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 113. Phase shift temperature as a marker for membrane fluidity increases during UV-induced apoptosis**
Robb, Dustin, Diecker, Garrett, Shaw, Michael and Wanda, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 114. Staining *Schizophyllum commune* (Aphyllophorales) with DAPI and Pontamine Fast Scarlet 4B to visualize a dikaryon to diploid transition**
Bridges, Brandy L. and Fowler, Thomas J. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 115. FMRFamide receptors in *Lumbricus terrestris* (Lumbricidae) gizzard and intestine**
Miller, Tyler M. and Krajniak, Kevin. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 116. Pheromone receptor-like gene *prl1* is unlinked to the *matB* locus in *Schizophyllum commune* (Aphyllophorales)**
Babyak, Meagan L. and Fowler, Thomas J. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 117. Difference in phenotypic expression between two transformed constitutive receptors is not due simply to copy number of the introduced gene**
Bauza, Joel T. and Fowler, Thomas J. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 118. UV-A and UV-B induction of lysosomal membrane permeabilization in human HL-60 leukemia cells**
Martens, Andrew J., Bishop, Nick, Worthington, Ronald and Wanda, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

*** 119. Analysis of the gravity persistent signal in the gps5 mutant**
Egan, Matthew J. and Luesse, Darron R. Southern Illinois University Edwardsville, Edwardsville, IL.

120. GABA's effect on the crop-gizzard of the earthworm *Lumbricus terrestris* (Lumbricidae)
Stassi, Kory. Southern Illinois University Edwardsville, Edwardsville, IL.

ORAL PRESENTATION SESSIONS AT A GLANCE

	Martinsville^	Charleston	Mattoon	Paris	Arcola/Tuscola
8:00 AM	Botany		~~Cell Biology~~ cancelled talk	Chemistry	Zoology
8:15 AM	Botany		Cell Biology	Chemistry	Zoology
8:30 AM	Botany		Cell Biology	Chemistry	Zoology
8:45 AM	Botany		Cell Biology		~~Zoology~~ cancelled talk
9:00 AM	**Break**	**Break**	**Break**	**Break**	**Break**
9:15 AM	Botany	~~Science Edu~~ cancelled talk	Cell Biology	Computer	Zoology
9:30 AM	Botany	Science Edu	Cell Biology	Computer	Zoology
9:45 AM	Botany	Science Edu	Cell Biology	Physics	Zoology
10:00 AM	Botany	Science Edu	Microbiology	Physics	Zoology
10:15 AM	Botany		Microbiology		
10:30 AM	**Break**	**Break**	**Break**	**Break**	**Break**
10:45 AM	Botany		Microbiology	Environmental	Zoology
11:00 AM	Botany		Health	Environmental	Zoology
11:15 AM	Botany		Health	Environmental	Zoology
11:30 AM	Botany		Health	Environmental	Zoology
11:45 AM	Botany			Environmental added talk	
12:00 PM	Botany				
12:15 PM	**Div. Meeting**	**Div. Meeting**	**Div. Meeting**	**Div. Meeting**	**Div. Meeting**

^All rooms are located on the third floor of the University Union.

Division Meeting Schedule

All division meetings will be held at 12:15 pm on the third floor of the University Union.

Meeting Room	**Division**
Martinsville	Botany
Oakland	Cell, Molecular & Developmental Biology
Charleston	Chemistry
Sullivan	Computer Science
Tuscola	Earth Science
Paris	Environmental Science
Mattoon	Health Sciences/Microbiology
Sullivan	Physics, Mathematics, & Astronomy
Charleston	Science Education
Arcola	Zoology

ORAL PRESENTATION SESSIONS

Oral presentations are Saturday, April 9, from 8:00 AM – 12:15 PM on the third floor of the University Union. Presenters will have 15 minutes for their presentations. An asterisk (*) indicates the presenters eligible for a Student Presentation Award.

Division: Botany
University Union – Martinsville Room
Session Moderator – Gordon Tucker

8:00 AM *** 1. The understory flora of Duck Creek Nature Trail at Silver Springs State Park, Kendall County, Illinois**
Mestek, Gerry and Beck, Hans T. Aurora University, Aurora, IL.

8:15 AM **2. Phenological niche separation from native species increases reproductive success of an invasive species: *Alliaria petiolata* (Brassicaceae)**
Timpe, Megan J. and Anderson, Roger C. Illinois State University, Normal, IL.

8:30 AM *** 3. Pre-contact plant use at the Gehring Site: Synergy between culture and environment**
Guthrie, Johanna M., Holt, Julie Z., Vogel, Gregory and Brugam, Richard B. Southern Illinois University Edwardsville, Edwardsville, IL.

8:45 AM *** 4. Evidence for hybridization between *Schoenoplectus hallii* and *S. saximontanus* (Cyperaceae) using ISSR markers**
Stapay, Tara[1], Smith, Marian[1], McKenzie, Paul[2] and Esselman, Elizabeth.[1] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]U.S. Fish and Wildlife Service, Columbia, MO.

9:00 AM **Break**

9:15 AM *** 5. Reproductive biology of *Minuartia patula* (Caryophyllaceae) in northeastern Illinois**
Pearion, Michelle L.[1] and Molano-Flores, Brenda.[2] [1]University of Illinois Champaign-Urbana, Champaign, IL. [2]Illinois Natural History Survey, Champaign, IL.

9:30 AM **6. Preliminary results of the reassessment of INAI Category I natural areas**
Schennum, Wayne E.[1], Vogel, Randy L.[1], Wibbenmeyer, Joshua A.[1], Cellini, Jarrett B.[1] and Wilker, John R.[2] [1]Applied Ecological Services, West Dundee, IL. [2]Illinois Department of Natural Resources, Springfield, IL.

9:45 AM **7. Replicated field trial of two methods used for the control of invasive shrub honeysuckles (Caprifoliaceae: *Lonicera* spp.)**
Schulz, Kurt, Wright, Jessica and Ashbaker, Sabrina. Southern Illinois University Edwardsville, Edwardsville, IL.

10:00 AM *** 8. An analysis of the history of development of three oak-hickory forest fragments in southwestern Illinois as a predictor of current patterns of biodiversity**
Fritzgerald, Adam S., Minchin, Peter R. and Walton, Elizabeth M. Southern Illinois University Edwardsville, Edwardsville, IL.

10:15 AM *** 9. *Ex vitro* soil establishment, and re-introduction of the Federally endangered Hawaiian endemic, *Platanthera holochila* (Orchidaceae)**
Wood, Erin M.[1], Moller-Jacobs, Lillian L.[1], Fugate, Tegan[1], David, Shanna E.[1], Zettler, Lawrence W.[1] and Perlman, Steve.[2] [1]Illinois College, Jacksonville, IL. [2]National Tropical Botanical Garden, Kalaheo, Kauai, HI.

10:30 AM **Break**

10:45 AM *** 10. Protocorms of an epiphytic orchid (*Epidendrum amphistomum*) recovered *in situ*, and identification of associated mycorrhizal fungi using molecular markers**
Moller-Jacobs, Lillian L.[1], Ross, April Y.[1], Corey, Laura L.[1], Zettler, Lawrence W.[1] and Richardson, Larry W.[2] [1]Illinois College, Jacksonville, IL. [2]Florida Panther National Wildlife Refuge, Naples, FL.

11:00 AM *** 11. Incidence of pestiferous scales (Hemiptera: Asterolecaniidae, Coccidae, Diaspididae) on epiphytic orchids in the Florida Panther National Wildlife Refuge**
Fugate, Tegan[1], Furness, Amber N.[1], Zettler, Jennifer A.[2], Zettler, Lawrence W.[1] and Richardson, Larry W.[3] [1]Illinois College, Jacksonville, IL. [2]Armstrong Atlantic State University, Savannah, GA. [3]Florida Panther National Wildlife Refuge, Naples, FL.

11:15 AM *** 12. Viability assessment of orchid mycorrhizal fungi in prolonged cool (4-6 C) storage to benefit conservation**
Furness, Amber N., Fortney, Jenifer and Zettler, Lawrence W. Illinois College, Jacksonville, IL.

11:30 AM *** 13. Predictors of the diversity and quality of the summer herbaceous community in fragmented oak-hickory forests**
Laquet, Jennifer L. and Minchin, Peter R. Southern Illinois University Edwardsville, Edwardsville, IL.

11:45 AM *** 14. Using hand-crosses and field observation to investigate pollen flow between American (*Celastrus scandens*) and Oriental bittersweet (*C. orbiculatus*)**
Zaya, David N.[1], Leicht-Young, Stacey A.[2], Pavlovic, Noel B.[2] and Ashley, Mary V.[1] [1]University of Illinois at Chicago, Chicago, IL. [2]United States Geological Survey, Porter, IN.

12:00 PM **15. Woody composition and structure of upland forest at Carpenter Park Nature Preserve: Implications for management**
Ting, Tih-Fen. Department of Environmental Studies, University of Illinois at Springfield, Springfield, IL.

12:15 PM **Division Meeting**
Martinsville Room – University Union

Division: Cell, Molecular & Developmental Biology
University Union – Mattoon Room
Session Moderator – Tom Fowler

~~8:00 AM~~ **~~*1. Analysis of protein expression and cytotoxicity differences in MCF7 and MDA MB 231 breast cancer and U2OS osteosarcoma cells due to pesticide exposure~~ CANCELLED**
Rich, Jessica D. and Schultz-Norton, Jennifer R. Millikin University, Decatur, IL.

8:15 AM ***2. Real-time analysis of Ddah1 predicts that increased concentrations increase susceptibility to myocardial infarction**
Ahuja, Anita N.[1], Pettus, Janette[2], Mennie, Amanda[2] and Kwitek, Anne E.[2] [1]Knox College, Galesburg, IL. [2]University of Iowa, Iowa City, IA.

8:30 AM ***3. Identification and characterization of small non-coding RNAs in *Dictyostelium***
Lu, Ya-Lin and Jones-Rhoades, Matthew W. Knox College, Galesburg, IL.

8:45 AM ***4. Type 2 diabetes mellitus: The role of excess nutrients in β-cell defects**
Vernier, Stephanie B., Wanda, Paul E., Schober, Joseph, Neumann, Bill, Brenegan, Teryn and Kwon, Guim. Southern Illinois University Edwardsville, Edwardsville, IL.

9:00 AM **Break**

9:15 AM ***5. Water stress in insect cells**
Anderson, John M.[1], Hand, Steve C.[2], Menze, Michael A.[1] [1]Eastern Illinois University, Charleston, IL. [2]Louisiana State University, Baton Rouge, LA.

9:30 AM ***6. The effects of excess nutrients on B-cell regenerative processes and its role in B-cell function**
Brenegan, Teryn V., Wanda, Paul E., Vernier, Stephanie B. and Kwon, Guim. Southern Illinois University Edwardsville, Edwardsville, IL.

9:45 AM ***7. Intersectin (itsn1) is critical for successful *Xenopus laevis* gastrulation**
Coatney, Caroline G. and Thorn, Judy M. Knox College, Galesburg, IL.

12:15 **Division Meeting**
Oakland Room – University Union

Division: Chemistry
University Union – Paris Room
Session Moderator – Dean Campbell

8:00 AM *** 1. Selectivity observed in the iodine atom economic co-iodination of dienes using elemental iodine and (diacetoxyiodo)benzene**
Kistammagiri Nalla, Madhumitha R. and Vinod, Thottumkara K. Western Illinois University, Macomb, IL.

8:15 AM *** 2. Selective introduction of alpha-beta-unsaturation in diketones**
Saichek, Nicholas and Vinod, Thottumkara K. Western Illinois University, Macomb, IL.

8:30 AM *** 3. Nanoencapsulation of vitamin K into a multi-polymer system using power ultrasound**
Gogieni, Vara Lashmi, Jagarlamudi, Pratyusha, Boley, Mark and Kouassi, Gilles. Western Illinois University, Macomb, IL.

12:15 PM **Division Meeting**
Charleston Room – University Union

Division: Computer Science
University Union – Paris Room
Session Moderator – Jim McQuillan

9:15 AM *** 1. An API towards usable secure authentication**
Nareguda, Shashivardhan Reddy and George, Binto. Western Illinois University, Macomb, IL.

9:30 AM *** 2. An algorithm for multi-core query processing**
Jebeli, Misagh and Maskarinec, Martin. Western Illinois University, Macomb, IL.

12:15 PM **Division Meeting**
Sullivan Room – University Union

Division: Environmental Science
University Union – Paris Room
Session Moderator – Nic Guehlstorf

10:45 AM *** 1. Identification of invasive weeds and evaluation of three weeding treatments on a Midwestern green roof**
Greeling, Benjamin A.[1], Krutsinger, Roxane[1], Morgan, Susan[1], Retzlaff, William[1], Luckett, Kelly[2] and Jost, Vic.[3] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]Green Roof Blocks, St. Louis, MO. [3]Jost Greenhouses, Des Peres, MO.

11:00 AM *** 2. Using bone collagen isotopic composition to differentiate catfish foraging sites in the Illinois River**
Little, Kayla L., Brugam, Richard B., Vogel, Gregory, Kohn, Luci and Holt, Julie Z. Southern Illinois University Edwardsville, Edwardsville, IL.

11:15 AM *** 3. Selenium accumulation and tolerance in white button and baby bella mushrooms**
Haddad, Sam[1], Kelly, Charlie[2] and Lin, Zhi-Qing.[1] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]Monterey Mushrooms, Inc., Watsonville, CA.

11:30 AM *** 4. Fate of [^{14}C] Metolachlor in different soil types under anaerobic and aerobic environmental conditions**
Kanissery, Ramdas[1] and Sims, Gerald.[2] [1]University of Illinois at Urbana-Champaign, Urbana, IL. [2]USDA - ARS, Urbana, IL.

11:45 AM *** 5. The Effects of Herbicides Aminopyralid and Glyphosate on *Dipsacus laciniatus* (Dipsacacae) of different taproot diameters**
Damos, Rachel N. and Parrish, Judy D. Millikin University, Decatur, IL.

12:15 PM **Division Meeting**
Paris Room – University Union

Division: Health Sciences
University Union – Mattoon Room
Session Moderator – Vance McCracken

11:00 AM *** 1. The backhand frisbee throw: Experience vs. accuracy**
Kurian, David T. Knox College, Galesburg, IL.

11:15 AM **2. An examination of the long-term effects of administering chronic treatment of paroxetine to juvenile rats**
Nellett, Kathryn C. Knox College, Galesburg, IL.

11:30 **3. Contact lens compliance and care of a college-aged population**
Bugajski, Christopher J. Knox College, Galesburg, IL.
12:15 PM **Division Meeting**
Mattoon Room – University Union

Division: Microbiology
University Union – Mattoon Room
Session Moderator – Vance McCracken

10:00 AM *** 1. Assessing Dictyostelid diversity through culture-dependent and culture-independent assays**
DeMaria, Sara F. and Jones-Rhoades, Matthew W. Knox College, Galesburg, IL.
10:15 AM *** 2. *In vivo* expression of cloned *Saccharomyces cerevisiae* S-adenosyl-L-methionine (SAM) permease (SAM3 gene) facilitates uptake of SAM by *Escherichia coli***
Markwell, Blake P. and Hughes, Jeffrey A. Millikin University, Decatur, IL.
10:30 AM **Break**
10:45 AM *** 3. Biochemistry of two putative methionine-gamma-lyases in the degradation of L-methionine by an acidophilic Archaeon "*Ferroplasma acidarmanus*"**
Khan, Mohammed A. and Hung, Kai F. Eastern Illinois University, Charleston, IL.
12:15 PM **Division Meeting**
Mattoon Room – University Union

Division: Physics, Mathematics & Astronomy
University Union – Paris Room
Session Moderator – Casey Watson

9:45 AM *** 1. Modeling the pulsation rate of cepheid variable stars as a function of mass**
Kersten, Bill and Watson, Casey R. Millikin University, Decatur, IL.
10:00 AM *** 2. Chandra X-ray constraints on sterile neutrino warm dark matter**
Polley, Nick and Watson, Casey R. Millikin University, Decatur, IL.
12:15 PM **Division Meeting**
Sullivan Room – University Union

Division: Science Education
University Union – Charleston Room
Session Moderator – Kelly Barry

~~9:15 AM~~ ~~**1. Analysis of most frequently cited papers on science teaching strategies relative to best practices**~~ **CANCELLED**
Wise, Kevin. Southern Illinois University, Carbondale, IL.
9:30 AM **2. Aurora University's IMSP program impact**
Beck, Hans, Davis, Jane, Othman, Saib, Eagle, Sherry, Patel, Chetna and de Lacey, Lora. Aurora University, Aurora, IL.
9:45 AM **3. Supporting student learning in science through content management and research guides**
Jackson-Beck, Lauren and Beck, Hans. Aurora University, Aurora, IL.

10:00 AM *** 4. Assessing the teaching methods within the anatomy and physiology laboratory**
Jabs, Ashley and Barry, Kelly. Southern Illinois University Edwardsville, Edwardsville, IL.

12:15 PM **Division Meeting**
Charleston Room – University Union

Division: Zoology
University Union – Arcola/Tuscola Room
Session Moderators – David Duvernell and Paul Brunkow

8:00 AM *** 1. Phenotypic plasticity in the freshwater snail *Elimia potosiensis* (Gastropoda: Pleuroceridae) in response to hydrodynamic gradients**
Miller, Stephanie J. and Brunkow, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

8:15 AM *** 2. Physics versus phylogeny in North American sunfishes (Centrarchidae)**
Astroth, Katherine, Hubbs, Melissa and Brunkow, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

8:30 AM *** 3. Functional morphology of the craniofacial complex in four Mustelidae**
Harding, Morgan and Kohn, Luci. Southern Illinois University Edwardsville, Edwardsville, IL.

~~8:45 AM **4. Fossil mammals and ice age temperatures in Illinois**~~ **CANCELLED**
Ruez, Jr., Dennis R. University of Illinois at Springfield, Springfield, IL.

9:00 AM **Break**

9:15 AM *** 5. Demographics of a commercially exploited population of flathead catfish in the Wabash River**
Moody, Cassi and Colombo, Robert. Eastern Illinois University, Charleston, IL.

9:30 AM *** 6. A comparative examination of enemy release in invasive carp of the Wabash River**
Wilcox, Justin and Laursen, Jeff. Eastern Illinois University, Charleston, IL.

9:45 AM *** 7. Preliminary survey of the class Insecta at Starhill Forest Arboretum (Menard Co., IL).**
Ray, Haleigh A.[1], Zettler, Lawrence W.[1] and Sternberg, Guy.[2] [1]Illinois College, Jacksonville, IL. [2]Starhill Forest Arboretum, Petersburg, IL.

10:00 AM *** 8. A parasitological survey of pen-raised bobwhite quail (*Colinus virginianus*) in Illinois**
Rolfsen, Bryan P. K. and Laursen, Jeff. Eastern Illinois University, Charleston, IL.

10:30 AM **Break**

10:45 AM *** 9. Innate predator recognition and cultural transmission of predator recognition in the zebra finch (*Taeniopygia guttata*)**
Wiggen, Kelly E. and Templeton, Jennifer J. Knox College, Galesburg, IL.

11:00 AM *** 10. Heterospecific eavesdropping in Kirk's dik-dik (*Madoqua kirkii*)**
Sapp, Scott. Knox College, Galesburg, IL.

11:15 AM *** 11. The effect of host to parasite egg ratio on cowbird egg ejection by American robins**
Lang, Allison Karlien and Bollinger, Eric K. Eastern Illinois University, Charleston, IL.

11:30 AM *** 12. Multivariate habitat models for neotropical migrant songbirds in fragmented oak-hickory forest in southwestern Illinois**
French, Zachary L., Minchin, Peter R. and Essner, Jr., Richard L. Southern Illinois University Edwardsville, Edwardsville, IL.

12:15 PM **Division Meeting**
Arcola Room – University Union

POSTER PRESENTATION ABSTRACTS

An asterisk (*) indicates the presenters eligible for a Student Presentation Award.

Division: Chemistry

*** 1. New cathepsin B inhibitors containing C-terminal argininal thiosemicarbazones**

Guda, Bharat[1], Rahman, Franklin[1], Steele, Keegan[1], Kadasala, Naveen[2], Wen, Lisa[1] and McConnell, Rose M.[1] [1]Western Illinois University, Macomb, IL. [2]Purdue University, West Lafayette, IN.

Cathepsin B, a lysosomal cysteinyl protease, has been proposed to be involved in the progression and metastatic spread of breast cancer. Associations have been made between high concentrations of cathepsin B in tumor cells and poor patient prognosis in primary breast cancer. Active cathepsin B localized to the plasma membrane has been shown in invasive bladder tumor cells whereas noninvasive tumor cells have cathepsin B confined to the lysosomes. This suggests that membrane-associated cathepsins may participate in tumor invasion. Specific protease inhibitors could lead to the development of therapeutic agents for treatment of several types of cancer. Described is the design and synthesis of cathepsin B inhibitors containing thiosemicarbazones. Kinetic data, the Vmax and Km values, for the enzyme-catalyzed reaction and inhibitor constants, K_i and K_i values, for these inhibitors are reported using N-Carbobenzoxy-L-Arginine-4-nitroanilide as the substrate.

*** 2. Cathepsin K inhibitors containing C-terminal argininal thiosemicarbazones**

Yermala, Durga[1], Tha, Soe[1], Obregon, Roxana[2], Kadasala, Naveen[3], Wen, Lisa[1] and McConnell, Rose M.[1] [1]Western Illinois University, Macomb, IL. [2]Northwestern University, Chicago, IL. [3]Purdue University, West Lafayette, IN.

Cathepsin K is a lysosomal cysteine protease which is abundantly expressed in osteoclast cells. This enzyme is responsible for the resorption in bone remodeling. Cathepsin K is also secreted from breast cancer cells and is considered a target for drug treatment. The objective of this research was to prepare functional recombinant cathepsin K enzyme to be used in the development of new cathepsin K inhibitors. Human procathepsin K gene was overexpressed in *E. coli* strain BL21(DE3)pLysS as a His-tagged fusion protein. Procathepsin K was prepared by washing and solubilizing the inclusion bodies. Then the protein was purified by a Ni-NTA affinity column, followed by a dilution and dialysis to refold the procathepsin K. The procathepsin K was then activated by the aid of porcine pepsin. Inhibition data was measured using various tripeptides containing C-terminal argininal thiosemicarbazones, using N-Carbobenzoxy-L-Arginine-4-nitroanilide as the substrate.

*** 3. Synthesis and evaluation of new cathepsin D inhibitors containing hydroxyethylamine isosteres**

Akula, Prashanth and McConnell, Rose M. Western Illinois University, Macomb, IL.

Cathepsin D is an aspartyl protease similar to the HIV-1 aspartyl protease in substrate specificity. Cathepsin D has emerged in recent years as a prognostic indicator in several types of carcinoma, including bladder cancer, colorectal cancer, breast cancer and lung cancer. Also, cathepsin D has been associated with the development of Alzheimer's disease. Therefore, protease inhibitors can

lead to the development of therapeutic agents for treatment of many types of carcinomas and Alzheimer's disease. Specific proteinase could lead to the development of therapeutic agents for treatment of many types of carcinomas. Described is the design and synthesis of inhibitors containing substituted hydroxyethyl piperazine isosteres.

*** 4. Solvent dependent chemoselective oxidation of alcohols using water-soluble *o*-iodoxybenzoic acid (IBX) derivatives**

Raya, Balaram, Jajam, Savithri and Vinod, Thottumkara K. Western Illinois University, Macomb, IL.

o-Iodoxybenzoic acid (IBX), a highly versatile hypervalent iodine(V) reagent has been heralded as a mild and efficient oxidant for a variety of synthetic transformations ranging from oxidation of alcohols to oxidation of amines and oxidative deprotection of dithianes. Mechanistic investigation of the various oxidative transformations using IBX has shown that the reagent can act as a single electron transfer (SET) agent and thus the oxidations employing IBX can either adopt radical or ionic pathways. Recently we have reported the synthesis and use of three water-soluble derivatives of IBX in our laboratory and a careful evaluation of the mechanism of oxidation of alcohols using the water-soluble hypervalent iodine reagents in different solvents, including water, have allowed us to map out a series of feasible and predictable chemoselective oxidations from knowledge of the C-H bond dissociation energies of the bond involved in the oxidation step. Synthesis of a variety of diols and triols and the selective oxidation of the different alcohol groups will be presented. A plausible mechanistic rationale for the chemoselective oxidation of the different alcohol groups will also be presented.

*** 5. *In-situ* generation and catalytic use of *o*-iodoxybenzoic acid for oxidation of alcohols: A green chemistry undergraduate experiment**

Madne, Kishore K., Pandey, Sonali R., Vishwabrahmana Saraf, Swetha and Vinod, Thottumkara K. Western Illinois University, Macomb, IL.

The practice of green chemistry (sustainable chemistry), aimed at the synthesis, manufacturing or processing of chemicals and chemical products with minimal impact on our environment has become mainstream in chemical industries. A survey of recent chemical literature also reveals active research in academic laboratories to uncover greener alternates to well known synthetic protocols and to discover new green synthetic methodologies. Though the new and safer practice of chemistry has provided opportunities to attract more young people to the discipline, the development of a well-balanced green chemistry curriculum that incorporates sufficient green experiments and procedures to compare and contrasts the benefits to traditional methods is still in its infancy. Undergraduate organic chemistry curriculum highlights the use of oxochromium (VI) and amine-based oxochromium reagents such as PCC and PDC as reagents of choice for oxidation of alcohols. Laboratory curriculum, on the other hand, also demonstrates the use of household bleach and hydrogen peroxide as benign substitutes for these transformations. Use as *o*-iodoxybenzoic acid (IBX) and Dess-Martin periodinane (DMP) for oxidation of alcohols are not mentioned as benign and safe alternates for oxidation of alcohols and experiments involving the use of these reagents are not part of the current laboratory curriculum either. Herein we report a green undergraduate experiment using *in-situ* generated IBX as an oxidant for oxidation of alcohols.

*** 6. Numerical analysis of the free radical addition polymerization model**
Ellis, Matthew A. Greenville College, Greenville, IL.

Free Radical Addition Polymerization (FRAP) is an important and widely used technique for producing polymers. The accepted mechanism for this process results in a set of four, coupled differential equations for which an exact analytical solution does not exist. However, application of the Steady State Approximation (SSA) leads to simple algebraic solutions for this system that can be used to give important information on reaction parameters and resulting polymer properties. Although, the SSA has been applied and shown to accurately predict many properties of different addition polymerization systems for over 50 years, it does not permit a full analysis of the system dynamics. The objective of this research is to use computational methods to generate numerical solutions for the complete FRAP mechanism permitting examination and evaluation of parameters and properties not accessible through the SSA approach. Stiff-solver algorithms were used to provide numerical solutions to the full, mechanistic form of these polymerization systems which were then compared to the steady state results and published data. The results show excellent agreement between the numerical analysis, SSA and published FRAP data from the early papers in this field.

*** 7. Spectroscopy and inquiry-based learning in the chemistry curriculum**
Brauer, Shari D. and Justice, David C. Greenville College, Greenville, IL.

The benefits of supplementing traditional teaching methods with inquiry-based learning and the advantages of exposing chemistry students to instrumental methods of analysis earlier in their curriculum is the interest of this research. In light of a wealth of educational research supporting inquiry-based instructional methods and early hands-on exposure to spectroscopy, a set of three sequential General Chemistry laboratory exercises has been developed to introduce ^{13}C NMR, ^{1}H NMR, and IR spectroscopy through a discovery-based learning approach. A molecular modeling laboratory exercise has also been developed to introduce students to computer modeling techniques that will aid them in their experience with the IR spectroscopy exercise.
Since this series of exercises is designed to be inquiry-based, students will learn valuable spectroscopic theories and techniques while improving their ability to effectively work and think within a group to solve problems. These skills will serve them well throughout their undergraduate science career and beyond. The laboratory exercises have been used in the first semester of Organic Chemistry and are being implemented into the second semester of General Chemistry this Spring.

*** 8. Synthesis of transition metal-thioridazine complexes**
Gundameedi, Madhuri and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

N-Alkylphenothiazines (NAPTZs) are biologically active heterocyclic compounds. Their coordinating behavior has gained much importance due to their applications in medicine and chemical analysis. NAPTZ ligands such as thioridazine hydrochloride (TRHCl) are used as psychotherapeutic and antihistaminic drugs. Considering the fact that platinum(II)-NAPTZ complexes are used as antitumor agents, several transition metal-TRHCl complexes have been synthesized with the assumption that they would behave as more potent and less toxic antitumor drugs than the free TRHCl itself. In the present research project, four transition metal complexes of the TRHCl ligand with metal salts, such as $ZnBr_2$, $CdBr_2$, CdI_2, and $HgBr_2$, have been synthesized. New products have been characterized based on their elemental analysis, molar

conductance, magnetic susceptibility, IR, NMR and mass spectroscopic data. The molecular formulations and structures of the complexes will be presented in the conference. Additionally, plans are underway to study the *in vitro* antioxidant and free radical scavenging activities of these complexes. Acknowledgement: We thank the Western Illinois University Research Council and the National Cancer Institute-NIH (AREA grant # 1R15 CA115404-01) for support.

*** 9. Synthesis and characterization of transition metal-chlorpromazine complexes**
Naini, Yakubreddy, Gouru, Dayakar R. and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

N-alkylphenothiazine (NAPTZ) derivatives, including chlorpromazine, are biologically active heterocyclic compounds. Research work on these compounds was stimulated by the discovery of their antihelmintic action. In recent years coordinating behavior of NAPTZs has gained much importance due to their extensive applications in industry, medicine, and chemical analysis. Chlorpromazine (CP) is used in medicine as an antipsychotic, antiemetic, antihistaminic and inodilation drug. The present project involves the synthesis and purification of the metal complexes of the CPHCl ligand with metal salts such as $ZnBr_2$, $CdBr_2$, CdI_2, and $HgBr_2$. Products have been characterized based on their elemental analysis, melting point, conductance, magnetic susceptibility, IR, NMR, and mass spectral data. The available results along with suitable molecular structures will be presented in the conference. Plans are also underway in our laboratory to study the antioxidant and free radical scavenging activities of these complexes. Acknowledgement: We thank the Western Illinois University Research Council and the National Cancer Institute-NIH (AREA grant # 1R15 CA115404-01) for support.

*** 10. Synthesis and characterization of transition metal-promazine complexes**
Gouru, Dayakar R., Naini, Yakubreddy and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

Phenothiazines are tricyclic compounds which are used in medicine as neuroleptic, antipsychotic, antihistaminic, and inodilation drugs. N-alkylaminophenothiazine (NAPTZ) derivatives, such as promazine hydrochloride ($C_{17}H_{20}N_2S.HCl$ or PHCl), are prominent members of this class of drugs. Some NAPTZs have an electron-withdrawing group such as a halogen or CF_3 in position-2. In this project, we have studied the synthesis, purification, and characterization of four PMHCl complexes of transition metal halides, such as $ZnBr_2$, CdI_2, $CdBr_2$, and $HgBr_2$. The new metal-PHCl complexes have been characterized based on their analytical results such as the melting point, elemental analysis, magnetic susceptibility, and molar conductance , IR, NMR, and mass spectral data. Based on their analytical data, tentative molecular structures for the new complexes will be presented in the conference. Additionally, plans are also underway to study the *in vitro* antioxidant and free radical scavenging activities of these complexes. Acknowledgement: We thank the Western Illinois University Research Council and the National Cancer Institute-NIH (AREA grant # 1R15 CA115404-01) for support.

*** 11. Transition metal-ethopropazine complexes: synthesis and characterization**
Debbeti, Varun, Kasarla, Vujwala and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

Phenothiazines (PTZs) are the group of tranquilizing agents that are tricyclic in nature and are used as antihistaminic and antipsychotic drugs. N-Alkylaminophenothiazine derivatives

(NAPTZs) such as ethopropazine hydrochloride ($C_{19}H_{24}N_2S.HCl$ or EPHCl) are some of the important members of this class. In the present project, it is emphasized on the synthesis and characterization of transition metal complexes of the EPHCl ligand. Four transition metal complexes of the EPHCl ligand with metal salts, such as $ZnBr_2$, $CdBr_2$, CdI_2, and $HgBr_2$, have been synthesized and purified by recrystallization. These products have been characterized based on their elemental analysis, molar conductance, magnetic susceptibility, IR, NMR, and mass spectral data. The molecular formulations and structures of the complexes will be discussed. Plans are also underway in our laboratory to study the antioxidant and free radical scavenging activities of these new complexes. Acknowledgement: We thank the Western Illinois University Research Council and the National Cancer Institute-NIH (AREA grant # 1R15 CA115404-01) for support.

*** 12. Manganese(III) oxidation of indigo carmine catalyzed by ruthenium(III) in acid medium: A kinetic study**

Thakkalapally, Vishnuvardhan R., Palakurthi, Bharath K., Cholker, Kishore and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

Manganese(III)-porphyrin reactions have been reported as possible models for closely related and biologically significant systems. In the present project, the manganese(III) sulfate stock solution has been prepared using a standard electrochemical method of anodic oxidation of manganese(II) in 3.00 M H_2SO_4 medium. The Indigo carmine (IC)-Mn(III) reaction catalyzed by Ru(III), under pseudo-first-order conditions of [Mn(III)] >> [IC], has been spectrophotometrically monitored at the λmax of IC (610 nm) at constant temperature. The experimental rate law for the reaction is, rate = $k [IC][H^+]^x[Ru(III)]^y$, where x and y are fractional orders. The reaction rate shows a zero-order dependence on the concentration of the oxidant, Mn(III), indicating its involvement in fast steps following the slow step. Additionally, the effects on the rate of adding the reduction product, Mn(II), and the oxidation product of IC (isatin sulfonate, IS) have been found to be negligible. Variations of the ionic strength and the dielectric constant of the reaction medium have negligible effect on the rate. Activation parameters, namely, E_a, $\Delta S^{\neq}$, $\Delta H^{\neq}$, $\Delta G^{\neq}$, have been evaluated using Arrhenius and Eyring plots based on the effect of temperature. A suitable mechanism consistent with the experimental kinetic data and a derived rate law will be presented. Acknowledgement: We thank the Western Illinois University Research Council and the National Cancer Institute-NIH (AREA grant # 1R15 CA115404-01) for support.

*** 13. Kinetics of glycine oxidation by manganese(III) in sulfuric acid medium**

Akita, Vikram, Poloju, Sridharq and Made Gowda, Netkal M. Western Illinois University, Macomb, IL.

Glycine (Gly; NH_2CH_2COOH) is the smallest of the amino acids commonly found in proteins. It is used in pharmaceuticals and foods. In the present study, a stock solution of manganese(III) has been prepared by a standard electrochemical method of anodic oxidation of 0.20 M manganese(II) sulfate in 3.0 M H_2SO_4 solution. The Gly-Mn(III) reaction under pseudo-first-order conditions of [Gly] >> [Mn(III)] has been spectrophotometrically monitored at a fixed λ_{max} and constant temperature. The experimental rate law for the redox reaction is, rate = $k' [Mn(III)] [Gly]^x [H^+]^y$, where x and y are fractional orders. The effects, on the reaction rate, of the reduction product, Mn(II), and ionic strength of the reaction medium have been found to be negligible. Based on the temperature variation studies, activation parameters, E_a, $\Delta S^{\neq}$, $\Delta H^{\neq}$, $\Delta G^{\neq}$,

have been evaluated using Arrhenius and Eyring plots. A mechanism consistent with the experimental kinetic and activation data and a derived rate law will be presented in the conference. Acknowledgement: We thank the Western Illinois University Research Council and the National Cancer Institute-NIH (AREA grant # 1R15 CA115404-01) for support.

*** 14. The effect of 1-methyl, 2,3 dimethylimadzolium tetrafluoroborate MDMIM ionic liquid on the adsorption behavior of some amino acids**

Aluguvelli, Kishore K., Alalwiat, Ahlam and Ahmad, Tarab. Western Illinois University, Macomb, IL.

Room temperature ionic liquids have recently gained recognition as environmentally "green" solvents because of their extremely low volatility as compared to traditional volatile organic compounds (VOCs). RTILs posses other properties like low melting point (<100^{o}C), Chemical and thermal stability, No flammability, high ionic conductivity, high heat capacity, high thermal conductivity and wide electrochemical potential window. Because of their favorable properties they are currently investigated in analytical chemistry application. ILs have been explored as functional stationary phases for gas chromatography (GC), additives for high-pressure liquid chromatography (HPLC), and electrolytes for capillary electrophoresis (CE).
In this study the ionic liquid 1-methyl, 2, 3 dimethylimadzolium tetrafluoroborate (MDMIMBF4) is investigated as a mobile phase additive for the adsorption behavior of some amino acids on reversed phase liquid chromatography. The adsorption isotherms were determined by the frontal analysis method and the adsorption data are fitted to a Langmuir model. An excellent agreement was found between the experimental overloaded band profiles and the calculated profiles.

*** 15. The effect of the counter ion of 1-methyl,3-buytl imidazolium ionic liquid salts as mobile phase additives on the retention behavior of tryptophan on reversed phase liquid chromatography**

Aluguvelli, Kishore K., Alalwiat, Ahlam and Ahmad, Tarab. Western Illinois University, Macomb, IL.

Room temperature ionic liquids have recently gained recognition as environmentally "green" solvents because of their extremely low volatility as compared to traditional volatile organic compounds (VOCs). RTILs posses other properties like low melting point (<100^{o}C), Chemical and thermal stability, No flammability, high ionic conductivity, high heat capacity, high thermal conductivity and wide electrochemical potential window. Because of their favorable properties they are currently investigated in analytical chemistry application. ILs have been explored as functional stationary phases for gas chromatography (GC), additives for high-pressure liquid chromatography (HPLC), and electrolytes for capillary electrophoresis (CE). In this study two ionic liquids that contain the 1-methyl, 3-butyl imidazolium (MBMIM) salts with different counter-ions; chloride and tetrafluoroborate are investigated as a mobile phase additive for the adsorption behavior of tryptophan on reversed phase liquid chromatography. The adsorption isotherms were determined by the frontal analysis method and the adsorption data are fitted to a Langmuir model. An excellent agreement was found between the experimental overloaded band profiles and the calculated profiles.

*** 16. The effect of 1-methyl, 3-butyllimadzolium tetrafluoroborate BMIMBF4 ionic liquid on the retention behavior of nitroaromatics and nitroanilines**

Utterback, Craig, Perkins, Deona, Heagy, Ashlie, Sharp, Stephanie and Ahmad, Tarab. Western Illinois University, Macomb, IL.

The identification of explosives and their degradation products is important in forensic and environmental applications. Complete separation of these structurally similar compounds using reversed-phase liquid chromatography has proven to be a challenge.
The 8330 EPA method for the trace analysis of explosives includes isocratic HPLC separations of 14 components using C18 columns. These separations typically take over 30 min and are unable to separate all the compounds and a second column is usually needed leading to an increase in the analysis time and sample handling complexity. These disadvantages have led to the search for alternative LC for the separation of explosives. Room temperature ionic liquids RTILs are salts with melting points at or close to room temperature. They are good solvents, highly polar, environmentally benign, nonvolatile, nonflammable, and stable in air or water. RTILs can be used to adjust the selectivity as well as to enhance the resolution by improving the peak shapes. In the present work we will investigate the effect of using BMIM salts as a mobile phase additives on the retention behavior, peak shapes and resolution of the explosives using two C18 reversed phase columns.

*** 17. The effect of substituted imidazolium tetrafluoroborate ionic liquids as a mobile phase additives on the adsorption behavior of some amino acids**

Ahmad, Tarab, Ahmad, Tariq and Aluguvelli, Kishore K. Western Illinois University, Macomb, IL.

Ionic liquids (IL) or room temperature ionic liquids (RTIL) are a type of salts that are liquid at low temperature (100^{o}C). Common ionic liquids, are composed of 1,3-dialkylimidazolium and 1-alkylpyridinium cations combined with chloride, tetrafluoroborate, hexafluoroborate and nitrate anions. Because RTIL are good solvents for both inorganic and organic materials, they are non-volatile, nonflammable, thermally stable, and recyclable solvents. Currently they are being investigated widely as “green chemistry” solvents. In this study the 1, 3 dialkyl substituted imidazolium ionic liquids are used as mobile phase additives for the reversed phase liquid chromatography of tryptophan. The effect of the chain length of the alkyl substituents and the effect of the counter anion of the imidazolium ionic liquids on the adsorption and retention behavior of tryptophan on reversed phase liquid chromatography is investigated. The adsorption isotherms of tryptophan were determined by the frontal analysis method. The data were fitted to different models like the s-shaped isotherm and the Langmuir isotherm depending on the type of the ionic liquid used. The shapes of the profiles of tryptophan were studied and compared to the calculate band profiles.

*** 18. Microencapsulation of vitamins A and E into a dual biopolymer system: effect of water activity on the release profile**

Sherman, Michael, Jagarlamudi, Prathyusha, Gogieni, Varalashmi, Boley, Mark and Kouassi, Gilles. Western Illinois University, Macomb, IL.

Encapsulation has been widely used by the food and pharmaceutical industries for coating microscopic amount of essential nutrients. The introduction of nanotechnology to various fields including foods and pharmaceuticals offer new possibilities for engineering minute coatings and

deliveries of drugs and essential compounds to improve stability, gastrointestinal uptake, and controlled delivery. In this study vitamin A and E were encapsulated into a dual polymer system of whey protein, and *kappa*-carrageenan using power ultrasound. The resulting microcapsules were freeze-dried and their sizes were measured using atomic force microscopy (AFM). Aliquots of the microcapsules were stored at various water activities (a_w) conditions in the range between 0.333 and 0.769, to examine the effect of a_w on the release profile of the encapsulated vitamins. Preliminary results indicate that the sizes of the particles were between 6 and 12 micrometers and 78 % of the vitamins were effectively encapsulated. Furthermore, at a_w of 0.662, the highest percentage of vitamins (85%) was released from the microcapsules. This indicated that a_w 0.662 was the ideal humidity condition for sustained release of microencapsulated vitamins at room temperature.

*** 19. Phenolic contents in relation to antioxidant activity of blackberries, blueberries, blackcurrants, and cranberries**

Diawara, Fatoumata, Jagarlamudi, Pratyusha, Ahmad, Tarab, Made Gowda, Netkal M., Afitlhile, Meshack and Kouassi, Gilles. Western Illinois University, Macomb, IL.

Phenolic compounds such as phenolic acid and flavonoids are widely distributed in plants, fruits and berries. Flavonoids are secondary plant metabolites and are characterized by phenylbenzopyran in their chemical structure. These compounds represent a diverse group and are classified based on the type of hydroxyl substitutions on the heterocyclic benzopyran ring. Flavonoids are widely studied because of their health benefits in humans. In this study, we measured the total amount of phenolics (TP) and flavonoids (TF), and flavonoid composition in blackberries, blueberries, blackcurrants and cranberries. The measurements were done using spectroscopy and HPLC methods. Antioxidant activity was measured from berry extracts, and the relationship between antioxidant activity and the total amount of phenolics and flavonoids was established. A positive correlation was observed between TF and the antioxidant activity. The data suggest that the flavonoid content might be a good indicator of the antioxidant potential in berries. The order of TF was cranberries< blackberries< blackcurrants< blueberries.

*** 20. Preparation and functionalization of CNB-Fe_3O_4 nanocomposites for detection purposes**

Redlinski, Bartomiej, Lucas, Joseph, Sherman, Michael, Boley, Mark and Kouassi, Gilles. Western Illinois University, Macomb, IL.

The development of detection devices is trending toward integrating nanosystems with active bio-elements and means of information transduction. Combination of nanomaterials such as carbon nanotubes (CNB) and magnetic nanoparticles (Fe_3O_4) can lead to nanocomposites with value-added properties, which are needed for detection of disease-related biomolecules. In this study nanocomposites of CNB-Fe_3O_4 were prepared by hydrothermal precipitation and sonication. The resulting nanocomposites were functionalized with proteins and DNA strands after cross linking the CNB surfaces with carbodiimide. The sizes of the nanocomposites were determined using atomic force microscopy (AFM) and the attachment of protein onto the complexes was confirmed by Fourier transform infrared spectroscopy (FTIR). Addition of a solution containing fluorescent-tagged complementary DNA strands resulted in hybridization of DNA that was confirmed by fluorescent spectroscopy. The strategy developed can serve for detection of protein molecules and for recognition of biological entities, including disease-related cells and biological hazards.

*** 21. Synthesis and characterization of copolymer hydrogels for use as vitreous substitutes**
Loch, Alicia M. Greenville College, Greenville, IL.

The natural vitreous is the jelly part of the eye behind the lens. There is a continuing need for better artificial vitreous substitutes that are used in retinal surgery and eye injury repair. This is a study of copolymer hydrogels that employ disulfide reversible cross-linkers, allowing the synthesis of hydrogels that can be reduced, liquefied, purified, injected as a liquid and re-gelled by oxidation in the ocular cavity. Poly(Acrylamide/Acrylic Acid/n-Phenyl Acrylamide) [Am/AA/NPA] gels cross-linked with Bis-Acryloyl Cystamine [BAC] (reversible cross-linker), containing either 10 or 20% AA were synthesized with an ammonium persulfate/TEMED free radical polymerization system. By gel permeation chromatography, the reduced liquefied copolymers molecular weight was ~275,000. Rheology was performed at 1.25-1.75 w/w concentration of the re-gelled copolymers. The increase in AA increases the storage modulus and decreases the re-gelling concentration of the copolymers. At 72 hours, 1.5% re-gelled co-polymer gave ~ 30% inhibition of growth of retinal pigment epithelial cells in tissue culture, while morphology appeared relatively normal. These materials have promise as artificial vitreous substitutes.

*** 22. Preparation of tripeptides containing C-terminal L-lysinal and ornithinal thiosemicarbazone as potential cathepsin B/K inhibitors**
Kazipeta, Karthik, Jin, Jin, Zhang, Shaozhong, Wen, Lisa and McConnell, Rose M. Western Illinois University, Macomb, IL.

Cathepsins are proteases associated in the cell growth and regulation. In cancer cells, expression of cathepsins is very high and they cause cell motility leading to metastatic spread of cancer. Cathepsin B and K are papain-like cysteine proteases. Cathepsin B has emerged as a prognostic indicator in several cancers such as breast cancer, lung cancer and colon cancer. Cathepsin K has been implicated in the progress of bone resorption. Inhibition of protease before it spreads is the safer way to control the cancerous growth. Tripeptides containing C-terminal aldehyes have been developed as new cathepsin B inhibitors. It was found some of these tripeptides showed the inhibition on cathepsin K as well. Described is the synthesis of tripeptides containing C-terminal L-lysinal and ornithinal semicarbazone. The inhibition data of these synthetic tripeptides on cathepsin K will be tested.

*** 23. Preparation of new synthetic compounds containing N-aromatic piperazino group and thioxo-thiazolidinyl groups as potential cathepsin K inhibitors**
Bommana, Rupesh Reddy, Jin, Jin, Zhang, Shaozhong, Wen, Lisa and McConnell, Rose M. Western Illinois University, Macomb, IL.

Cathepsin K, a member of the CA1 family of lysosomal cysteine proteases, is considered to be the major enzyme responsible for degradation of bone matrix. It is abundantly expressed in osteoclasts. The special function of cathepsin K is an efficient collagenase that cleaves type I and II collagen, in this way it plays a key role in bone resorption. Mutations in the cathepsin K gene that results in deficiency of this enzyme causes recessive bone sclerosing disorder called in pycnodysostosis. Therefore, inhibition of Cathepsin K offers a promising mechanism for the treatment of diseases characterized by excessive bone loss such as osteoporosis. The first two cathepsin K inhibitors balicatib and odanacatib show great potential in treatment of osteoporosis.

Synthesis of cathepsin K inhibitors is a novel approach for bone diseases which involve bone resorption. Cathepsin K has become a significant target for osteoporosis and rheumatoid arthritis and has been linked to bone metastasis of human breast adrenocarcinoma. The main objective of this project is to determine an efficient way for synthesis of the important precursors and develop new synthetic compounds containing N-aromatic piperazino group and thioxo-thiazolidinyl group as potential cathepsin K inhibitors. The synthesis of the target molecules will be described.

*** 24. Thin-film perovskite-type electrodes for oxygen reduction catalysis**

Chandra, Keerthi, Kunz, Andrew and Mitrovski, Svetlana. Eastern Illinois University, Charleston, IL.

Perovskite-type oxidation-reduction catalysts are used extensively for oxidation of carbon-monoxide and reduction of nitrogen oxides, important processes in exhaust gas emission control. Their use as oxygen cathodes in low-temperature fuel cells has been limited. The aim of this project is to synthesize thin-film perovskite-type catalysts, explore their activity in the electrochemical oxygen reduction reaction and identify the structure-property relationships that determine their electrochemical behavior. Thin-film perovskite-type $La_{1-x}Sr_xMnO_3$ (LSMO) electrodes synthesized by laser ablation were used as catalysts and catalytic supports for deposition of noble metals (Ag and Pd). The catalysts were tested as oxygen cathodes and their electrocatalytic activity correlated with the deposition conditions. The noble-metal modified catalysts exhibit significant improvements in the electrocatalytic activity towards the electrochemical oxygen reduction. Surface analysis experiments currently in progress are being employed to understand the catalytic roles of the noble metals. Atomic-force microscopy and X-ray photoelectron spectroscopy are used for understanding the morphology and stability of the film as well as the surface distribution of the metals and their chemical state. Results from these studies should significantly contribute in understanding the behavior of perovskite-type oxides in a broad array of applications.

*** 25. Colloidal palladium(0) encapsulated in polydimethylsiloxane (PDMS): Fabrication and study of the catalytic ability for hydrogenation and hydrogenolysis reactions of various organic functional groups**

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

Palladium is widely used as a catalyst for hydrogenation reactions. Colloidal palladium, with its large surface area, can be considered a more effective catalyst than bulk palladium metal. However, colloidal palladium particles are sufficiently small to pass through most conventional filters. A solution to this problem is to encapsulate the colloidal palladium in a larger material. Polydimethylsiloxane (PDMS) was chosen as the material to encapsulate the colloidal palladium, in part due to the polymer permeability to nonpolar solvents, substrates, and gases. The Pd/PDMS rectangular blocks were produced by soaking cured PDMS rectangular blocks in a palladium(II) solution. The Pd/PDMS was dissolved and characterized by ICP analysis, scanning electron microscopy, and transmission electron microscopy. The Pd/PDMS rectangular blocks were studied as catalysts for the hydrogenation of a number of alkenes, alkynes, and an aromatic aldehyde. The Pd/PDMS rectangular blocks also were used as a catalyst for the hydrogenolysis of a benzyl alcohol, a benzyl ether, a nitro group, and an aromatic halide.

Division: Botany

26. Induction of callus tissue from mature stem explants of the endangered Kankakee mallow, *Iliamna remota* (Malvaceae)

Owen, Henry R., Estanda, Arnold B., Daugherty, Bradley M., Eident, Samuel A., Paul, Oindrila, Ervin, Stefanie L. and Grigg-Bailey, Ashley. Eastern Illinois University, Charleston, IL.

The Kankakee mallow (*Iliamna remota*) is an herbaceous, perennial of the Malvaceae family and is endangered in Illinois. The purpose of this study was to determine an efficient disinfestation procedure and the most effective levels of auxin and cytokinin needed to regenerate callus tissue from mature stem explants. The disinfestation process involved immersions in 95% EtOH, 0.1% $HgCl_2$, and 10-20% NaOCl, followed by three sterile water rinses. Culture media were composed of Murashige & Skoog (MS) medium containing 0.5 mg/L indolebutyric acid (IBA) with 0.1 mg/L thidiazuron (TDZ)(#1), 0.2 mg/L TDZ(#2), or 0.3 mg/L TDZ(#3); or MS medium containing 0.5 mg/L naphthaleneacetic acid (NAA) with 0.1 mg/L TDZ(#4), 0.2 mg/L TDZ(#5), or 0.3 mg/L TDZ(#6). Explants were cultured for three weeks and then transferred to media without TDZ for an additional 3 weeks. Out of 216 explants cultured, 64% were lost to contamination (58% for the control explants). Culture medium 1, 2, 3, and 5 produced similarly high rates of callus production. These results indicate that the concentrations and ratios of the auxin and cytokinin have a relatively wide range in their effectiveness for calligenesis, and IBA was found to have a more positive influence than NAA.

*** 27. Comparative leaf anatomy of C_3 and CAM species in Oncidiinae (Maxillarieae, Orchidaceae)**

Eident, Samuel A. and Carlsward, Barbara S. Eastern Illinois University, Charleston, IL.

The subtribe Oncidiinae is a diverse group of orchids within the tribe Maxillarieae, consisting of 55 genera and 1700 species. In this group, there have been many studies examining morphological and anatomical variation as well as metabolic pathway of carbon fixation, but most have not incorporated anatomy with a physiological aspect of inquiry. The objective of our research was to examine the differences in leaf anatomy between species of Oncidiinae that utilize CAM, C_3, or an intermediate type of photosynthesis. We used previously published carbon isotopic composition and leaf titratable acid levels as guideposts for specimen selection within Oncidiinae, selecting species that range from strong CAM to strong C_3 to determine the pattern of anatomical variation. To document this variation, we examined the following characteristics: mesophyll and cuticle thickness, pattern and placement of water-storage cells, fiber-bundle placement, and stomatal distribution. Leaves were fixed for several days and stored in 70% ethanol. Cross and longitudinal sections were made using a sliding microtome and stained in Heidenhain's iron-alum haematoxylin and safranin. Paradermal preparations of leaf epidermises were made by making leaf scrapings that were stained in safranin. Observations were made with a Zeiss Axioskop 40 microscope and measurements were made using ImageJ software. We found that the most predictive anatomical features for photosynthetic pathway were mesophyll thickness and distribution of water-storage cells in the leaf.

*** 28. Fertilizer effects on the growth of *Silene regia* (family Caryophyllaceae)**
Wildenberg, Amanda J., Porreca, Anthony P., Coons, Janice M. and Coutant, Nancy E. Eastern Illinois University, Charleston, IL.

Royal catchfly, *Silene regia*, is an endangered prairie forb in Illinois. Recovery attempts often use transplants. Protocols exist for growing horticultural plants, but little is reported for transplant establishment in natural areas. Our objective was to compare fertilizers for growing *S. regia* transplants. Plants were grown in growth chambers with 3 fertilizer treatments: a 20-20-20 liquid fertilizer solution at 1.25 g/L applied bi-weekly or weekly, and an Osmocote 14-14-14 four-month slow release solid fertilizer at 14.6 g/L. Seeds were planted in soilless mix with 30 replications. After 10 weeks, shoot and root growth were measured. Shoot growth comparing only the two liquid fertilizers showed a significant difference between the control and two liquid fertilizers, with no difference between weekly and bi-weekly for crown diameter, number of dead leaves or leaf area. Weekly fertilizer was greater than bi-weekly fertilizer for number of side rosettes, fresh mass or dry mass. Root growth showed no significant difference in root scores, but a significant difference between control and liquid fertilizers for root length, fresh mass or dry mass. When comparing weekly liquid with solid fertilizer, all shoot growth was greater for solid fertilizer. Root growth was not different between weekly liquid and solid fertilizer, but both fertilizers were significantly greater than the control. Overall solid fertilizer mixed into soil was best for growth of *S. regia*. Future studies will compare how plants grown with these fertilizers will survive when transplanted into natural areas.

29. Morphological and molecular systematics of the genus *Triosteum* (Caprifoliaceae)
Ginder, Douglas J., Durso, Andrew M., Daugherty, Bradley M., Liu, Zhiwei and Tucker, Gordon C. Eastern Illinois University, Charleston, IL.

The genus *Triosteum* (Caprifoliaceae: Asteridae) consists of 6 species, 3 native to Asia and 3 to North America. This disjunction is seen in nearly 120 genera in 60 plant families, relicts of the once widespread Holarctic flora. Gould and Donoghue provided a phylogeny of this genus using molecular characters. We combined a molecular analysis with our own coding for morphological characters to evaluate the proposed relationships between members of *Triosteum*. Using herbarium specimens and literature, we assembled a dataset of morphological characters including the same species of *Triosteum* and outgroups used in the molecular-based analysis by Gould and Donoghue. We excluded any apomorphic characters. We selected four outgroup taxa from *Leycesteria* and *Symphoricarpos*, other genera of Caprifoliaceae. We obtained sequence data for all taxa for two genes, ITS and *waxy*, from GenBank. Unlike Gould and Donoghue, we recovered *T. sinuatum* as the outgroup to the North American clade [*T. perfoliatum* + *T. angustifolium* + *T. aurantiacum*] using three different methods, with 96-98% of bootstraps supporting this branch depending on the method. This probably reflects differences in our models of molecular evolution, because in only two of our three trees did the data sets differ by inclusion of the morphological characters.

30. Colonization pattern of the wind-dispersed invasive tree *Ulmus pumila* (Ulmaceae)
Reese, Nathan, Laquet, Jennifer, Merritt, Lexie and Schulz, Kurt. Southern Illinois University Edwardsville, Edwardsville, IL.

Siberian elm (*Ulmus pumila*) has been widely used in the Midwest as a windbreak and hedge planting. Like all elms, it reproduces at a young age, featuring large crops of wind-dispersed

seeds. Numerous accounts refer to it as a weed in horticultural settings, and as a significant and damaging invader of high light communities. As part of a class project, we quantified the pattern of establishment in an abandoned grassy field on the Southern Illinois University Edwardsville Campus (Madison County). We hypothesized that the abundance and age structure of an invading population would follow a negative exponential decline with distance from a presumed parental population to the south. Trees were harvested at 11.5 m intervals down three 60 m transects, basal diameter was measured, and rings were counted. The number of stems per plot showed a near perfect conformity to an inverse-square relationship with distance. No significant trend in age with distance was present, although there were marked reductions in diameter and average stem growth increment (mean increment per stem) with distance. Mean stem growth increment per plot declined significantly with the number of stems per plot, suggesting intense competition. These patterns contrast with those observed in bird dispersed Asiatic shrub honeysuckles (*Lonicera* spp.), which show a weaker distance relationship with seed sources and much less evidence of intraspecific competition.

*** 31. Fire restoration of Mississippi River bluff hardwood forests at the Nature Institute (Madison County) and the Palisades Preserve (Jersey County)**

Sutton, Alexandra and Schulz, Kurt. Southern Illinois University Edwardsville, Edwardsville, IL.

Prior to human settlement, the Mississippi River bluff north of Alton, IL, was once a diverse forest system composed of oak (*Quercus* spp.) and hickory (*Carya* spp.). Because of the human suppression of fire disturbances, the understory vegetation is threatened by canopy closure caused by sugar maple (*Acer saccharum*) recruitment and invasion by Asiatic honeysuckle (*Lonicera maackii*). At The Nature Institute (TNI) in Godfrey, IL, land managers have been practicing seasonal burning in order to prevent canopy closure and maintain species diversity. At the Palisades Preserve, a similar site further north near Grafton, IL, burning is planned, but has not begun. We compared summer understory vegetation on a burned northwest slope at the TNI to three similar unburned sites at the Palisades. The burned TNI site featured less bare surface, higher species richness, and greater herbaceous biomass production than the Palisades sites. Upper and middle slope positions at each site were quite similar. The TNI site exhibits much greater spatial variation in vegetation cover, which suggests a wider diversity of microhabitats.

*** 32. *In vitro* shoot multiplication of *Desmanthus illinoensis*, a native perennial of agricultural interest**

Kirk, Joseph and Barry, Kelly. Southern Illinois University Edwardsville, Edwardsville, IL.

The Illinois bundleflower (*Desmanthus illinoensis*) is a warm season perennial legume. It is native to the plains and prairies of the Midwest in the United States. With deep roots and the ability to adapt to several different soil types and climate conditions, Illinois bundleflower is an important native plant. Illinois bundleflower improves soil quality through nitrogen fixation and it serves as a nutritious perennial forage crop. It produces numerous seeds of high nutritional value so the potential exists for its use as a grain crop as well. The purpose of this study is to initiate *in vitro* shoot multiplication of Illinois bundleflower. Fungal contamination has been a recurring problem when attempting to surface sterilize Illinois bundleflower seeds. We describe a three step process for effectively reducing fungal contamination. Surface sterilized seeds were germinated in ½ MS. The seedlings were placed in culture tubes of ½ MS containing varying concentrations of the cytokinin BA in order to determine the appropriate BA concentration for shoot multiplication.

33. *In vitro* shoot multiplication of *Astragalus crassicarpus*, a native perennial endangered in Illinois

Ryan, Kevin and Barry, Kelly. Southern Illinois University Edwardsville, Edwardsville, IL.

Groundplum milkvetch (*Astragalus crassicarpus*) is a perennial legume native to the prairies of North America and endangered in Wisconsin and Illinois. It is found in Macoupin, Madison, St. Clair and Will counties of Illinois. The purpose of this research project is to initiate in vitro shoot multiplication of *A. crassicarpus* for the purpose of plant propagation through tissue culture. *Astragalus crassicarpus* seeds were surface sterilized in 10% bleach, 0.1% Tween 20 and placed on ½ MS for germination. Axenic seedlings were transferred to ½ MS containing varying concentrations (0, 1, 5, and 10 mg/L) of the cytokinin BA in order to determine the appropriate BA concentration for shoot multiplication.

*** 34. Analysis of tree growth on long-term forest plots in Sweet William Woods, southwestern Illinois**

Webb, Leslie A. and Minchin, Peter R. Southern Illinois University Edwardsville, Edwardsville, IL.

The core of Sweet William Woods, located on the campus of Southern Illinois University Edwardsville, has been mature oak-hickory forest for at least 100 years and was recently included in a campus nature preserve. Effective management will require information on forest dynamics. Eight 0.1 ha long-term study plots were set up in fall 2005 and each tree with a diameter at breast height (DBH) of at least 2.5 cm was identified, tagged and measured. Sugar maple dominates the forest, both in terms of numbers and basal area. We remeasured trees on four of the plots in fall 2010, tagged and measured new recruits and noted mortality. Tree falls and loss of major limbs, due to wind and ice storms, had created large canopy gaps on plots 1 and 2, but not on plots 3 and 4. We hypothesized that: (1) sugar maples on plots 1 and 2 would have higher growth rates than those in plots 3 and 4 and that (2) the difference would be more pronounced for smaller trees. Annual growth rates were calculated and analyzed using Analysis of Variance. Sugar maples in gap plots had a mean DBH growth rate (0.28 cm/yr) significantly higher than those in non-gap plots (0.20 cm/yr), supporting hypothesis 1. Hypothesis 2 was rejected, since trees with DBH < 20 cm grew more slowly (0.16 cm/yr) than larger trees (0.32 cm/yr). The DBH > 20 cm class includes midcanopy trees whose growth probably responded to increased light levels and canopy trees that may have experienced release from below-ground competition. To obtain useful information on growth of other species, a larger sample area is required.

*** 35. Analysis of tree mortality on long-term forest plots in Sweet William Woods, southwestern Illinois**

Ozyurt, Nevin I. and Minchin, Peter R. Southern Illinois University Edwardsville, Edwardsville, IL.

The core of Sweet William Woods, located on the campus of Southern Illinois University Edwardsville, has been mature oak-hickory forest for at least 100 years and was recently included in a campus nature preserve. Effective management will require information on forest dynamics. Eight 0.1 ha long-term study plots were set up in fall 2005 and each tree with a diameter at breast height (DBH) of at least 2.5 cm was identified, tagged and measured. Sugar

maple dominates the forest, both in terms of numbers and basal area. Other canopy tree species include hickories, hackberry, white ash, oaks, basswood and slippery elm. We remeasured trees on four of the plots in fall 2010, tagged and measured new recruits and noted mortality, identifying the cause if possible. Tree falls and loss of major limbs, due to wind and ice storms, had created large canopy gaps on plots 1 and 2, but not on plots 3 and 4. We hypothesized that (1) mortality on gap plots would be lower than on nongap plots and (2) mortality would be higher for smaller trees. Only sugar maple had sufficient data for analysis. Differences in mortality between gap and non-gap plots were tested using generalized linear modeling with binomial errors and logit link. No mortality occurred for sugar maples with DBH > 20 cm, while smaller trees had an annual mortality of 2.68%, thus supporting hypothesis 2. For the smaller trees, annual mortality in gap sites (2.20%) was lower than in nongap sites (3.03%), supporting hypothesis 1. To obtain useful information on mortality of other species, a larger sample area is required.

*** 36. Effects of white-tailed deer (*Odocoileus virginianus*) on bottomland forest restoration at the confluence of the Mississippi and Illinois Rivers**

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

The degree to which rubbing and browsing by white-tailed deer (*Odocoileus virginianus*) may limit success in bottomland hardwood forest restorations was examined experimentally at the Two Rivers National Wildlife Refuge, Illinois. On a field being restored to bottomland savannah, five groups of RPM trees planted in 2008 were selected and metal mesh deer guards were rearranged to give roughly equal numbers of guard heights of 1.52 m, 1.22 m, 0.91 m, and no guard for each of four species: *Carya illinoinensis*, *Quercus bicolor*, *Q. macrocarpa*, and *Q. palustris*. Each tree was tagged and basal diameter and height were measured. Five additional tree groups were planted in 2009 with roughly equal numbers of 1.52 m, 1.22 m, and no guard for each of the same four species included in the first experiment, plus *Q. lyrata*. Trees were tagged and their basal diameter and height measured. Heights and basal diameters were remeasured in winter 2010 and the amount of deer rubbing was quantified as the area of bark removed. Preliminary analyses show that rubbing was lower for guarded trees in both experiments. In the 2009 restoration groups, basal diameter growth was higher for trees with 1.22 m or 1.52 m guards, compared to controls with no guard. Mortality was 2.5 times higher for trees with no guard compared to guarded trees in the 2009 groups. Additional analyses will allow us to separate the effects of deer damage from those of extended flooding. The results will allow managers to quantify the costs and benefits of protecting trees on bottomland restoration sites from deer damage.

*** 37. Highlights of some unique plant collections from the Whiteside Garden (Coles County, IL)**

Daugherty, Bradley M., Whiteside, Wesley C., Coutant, Nancy E. and Coons, Janice M. Eastern Illinois University, Charleston, IL.

Wesley Whiteside started a garden near Charleston, IL, in 1963. His efforts created a 5 acre botanical garden containing unique native and exotic species. Six noteworthy collections at the Whiteside Garden are highlighted. First, a collection of *Magnolia* spp. is found including Asian species and nearly all North American species. Three native *Magnolia* spp. (Bigleaf-*Magnolia macrophylla*, Umbrella-*Magnolia tripetala* and Pyramid-*Magnolia pyramidata*) are found rarely

in cultivation in the Midwest. Second, a Daylily breeding collection including ~500 cultivars is used for a breeding program focused on extension of blooming into late fall. Third, Illinois natives are included in the garden. Some unique examples include Bottle Gentian (*Gentiana andrewsii*), Skunk Cabbage (*Symplocarpus foetidus*) and Showy Lady Slipper (*Cypripedium reginae*). Fourth, bog gardens include Grass Pink Orchid (*Calopogon tuberosus* var. *tuberosus*), Sundews (*Drosera* spp.), Pitcher Plants (*Sarracenia* spp.) and Venus Fly Trap (*Dionaea muscipula*). Fifth, the garden features rare and unusual species not found in major botanical gardens of the Midwest such as Franklin Tree (*Franklinia alatamaha*), *Stewartia* species, Dove Tree (*Davidia involucrata*) and Asian Skunk Cabbage (*Lysichiton camtschatcense*). Sixth, a gymnosperm collection includes 5 *Ephedra* spp., Japanese Cedar (*Cryptomeria japonica*), Cedar of Lebanon (*Cedrus libani*) and weeping types. These 6 collections are a sample of plant materials found in this garden. Preservation of this garden is important as an invaluable resource for education and research.

*** 38. Production ecology during early succession in an old field in Rock Island county, northwestern Illinois**

Shelly, Ellen and Dziadyk, Bohdan. Augustana College, Rock Island, IL.

Net primary production was analyzed in an old field during the growing seasons of 2008-2010. Abandoned after a dozen years of row cropping, the study area is a half hectare agricultural field contiguous with the Beling Ecological Preserve located near the Rock River in Rock Island County, northwestern IL. In a continuing study, floristic structure and biomass production are being analyzed at three permanent study sites (15 m X 20 m), each a different distance from the adjacent forest edge. Aboveground biomass production was estimated through the harvest method at two week intervals through the growing season (early June - early September). Site locations (distance from the forest edge) and estimate of the peak standing crop (g/m^2) in 2008/2009/2010 at each are: Site I - 2 m, 258/502/420 (the wettest site); Site II - 20 m, 345/424/445 (a better drained site); Site III - 40 m, 515/559/471 (the driest location). Year to year biomass variation appears to be a complex interaction of seasonal flooding characteristic of this lowland site and the changing floristic composition of early succession. Analysis of the number of rooted seedlings of the dominant tree species *Acer saccharinum* in the forest indicates significant increase (density per m^2) across two years 2009/2010 at site I - 19/59, site II - 17/53 and site III - 4/28.

*** 39. Shading effects on the reproductive ecology of *Besseya bullii*, a rare species**

Chi, Katherin[1], Molano-Flores, Brenda[2], Collins, Michelle[1] and Abou-El-Seoud, Dalya.[1]
[1]University of Illinois at Urbana-Champaign, Champaign, IL. [2]Illinois Natural History Survey, Champaign, IL.

Besseya bullii (Plantaginaceae) is a rare, prairie-savanna plant species endemic to the Midwestern United States. In this study, we wanted to determine the effects of shading on reproduction of *B. bullii* populations in the state of Illinois (U.S.A.); specifically, we were interested in the effects of shading on inflorescence morphology (e.g., flower density), reproductive output (e.g., fruit/seed set), and fitness (i.e., seed germination). Populations were visited in 2008 and 2009, and assigned to one of three habitat categories using degree of canopy closure: open, semi-shaded, and shaded. At each population, infructescences were used to determine: (1) fruit density, (2) fruit set, (3) seed set, and (4) germination. Results from infructescences show that fruit density was significantly higher for open and semi-shaded

habitats compared to shaded habitats; that fruit and seed set for open and semi-shaded habitats were significantly higher than for shaded habitats; and that seed germination did not differ among habitats. These results show that closed canopy habitats negatively impact reproduction in *B. bullii* by reducing fruit density and fruit/seed set. Based on our findings, we recommend woody species removal to promote and increase the reproductive success of *B. bullii*.

*** 40. Biodegradation of atrazine by fungi**
Presley, Gerald N. and Methven, Andrew S. Eastern Illinois University, Charleston, IL.

Atrazine is a widely used herbicide in the United States and in many other countries. Recently atrazine has been identified as a potential human endocrine disruptor and a potential health hazard due to its widespread use and presence in the environment. Although, atrazine slowly degrades in nature, it makes its way into our water supply via agricultural runoff. Bioremediation has been considered as a possible remedy to widespread atrazine contamination. Wood and plant litter degrading fungi are good candidates for use in bioremediation because they have evolved adaptable enzyme systems capable of deriving organic carbon from complex, heterogeneous plant polymers. A number of species have also been studied extensively regarding their metabolism of xenobiotics including atrazine. In this study several wood degrading and litter decomposing fungi will be tested for the capability of degrading atrazine. The fungi will be grown in liquid basal medium containing atrazine for 21 days. The amount of atrazine remaining in solution will be measured using high performance liquid chromatography (HPLC). The capabilities of exceptionally good atrazine degrading fungi will further be analyzed by tracking the disappearance atrazine over the 21 day period using HPLC.

41. Sharing the same name: North American and European species of *Lactarius*
Methven, Andrew S. Eastern Illinois University, Charleston, IL.

Historically, North American literature in systematic mycology has used scientific names for mushrooms based on the work of four great European mycologists: Fries, Persoon, Bulliard and Scopoli. Descriptions and illustrations of mushrooms in early North American mycological writings were compared with European literature even though abbreviated descriptions and stylized illustrations made such comparisons superficial. The result is a body of literature in which names have been loosely applied and even 20th century workers have attached European names to American mushrooms based on tradition rather than on meticulous examination. As a result, a large number of names in use for mushrooms in the Appalachian Mountains originated in Europe. For example, a survey of the list of mushroom species in the Great Smoky Mountains National Park (GSMNP) revealed that more than one third of the 1500 mushroom names in the list originated in Europe. In the genus *Lactarius*, more than two dozen of the 100+ species of *Lactarius* reported from the GSMNP feature names of European origin. The proposed project is intended to: 1) determine if European and Appalachian species of *Lactarius* are the same; 2) establish concepts and neotypes for European taxa of *Lactarius* where necessary; 3) name and establish types for Appalachian taxa of *Lactarius* where appropriate; and, 4) assess the mycogeography of European and Appalachian species of *Lactarius*.

Division: Zoology

42. Survey of the hemoparasites in avian vertebrates of central and southern Illinois
Annetti, Kendall L.[1], Mateus-Pinilla, Nohra[2], Kohrt, Laura[3] and Fredebaugh, Shannon.[2]
[1]University of Illinois, Urbana, IL. [2]Illinois Natural History Survey, Urbana, IL. [3]University of Illinois, Pathobiology, Urbana, IL.

Avian blood parasites (hematozoa) are potentially pathogenic organisms found in wild birds. Hematozoa infections have been correlated with decreased reproduction and body condition, but no studies have been conducted in Illinois. Our objective was to determine the type, prevalence, and incidence of hematozoa in Illinois avian species. With the aid of IDNR biologists, blood samples were obtained from 8 avian species (n=67) in 12 Illinois counties from April to October. Two blood smears per bird were air dried, fixed, and stained with Diff Quick® (modified from Phalen et al, 1995). Slides were examined for *Leucocytozoon* spp., *Trypanosoma* spp., *microfilariae*, *Haemoproteus* spp. and *Plasmodium* spp. until 10,000 red blood cells (RBC) were inspected. Parasite intensity was recorded as the number of parasites present/10,000 RBC. *Haemoproteus* spp., *Plasmodium* spp., and *Leucocytozoon* spp. infections were found in 44.44%, 33.33%, and 22.22% of wild turkeys (*Meleagris gallopavo*) (n=9). *Haemoproteus* spp. and *Plasmodium* spp. infections were found in 48% and 7.41% of mourning doves (*Zenaida macroura*) (n=27). *Plasmodium* spp. were identified in 6.67%, of wood ducks (*Aix sponsa*) (n=15) and *Haemoproteus* spp. in 33.33% of mallards (*Anas platyrhynchos*) (n=3). No hematozoa infections were identified in Canada geese (*Branta canadensis*) (n=9), brown-headed cowbirds (*Molothrus ater*) (n=2), house finch (*Carpodacus mexicanus*) (n=1), or Gadwall (*Anas strepera*) (n=1). Our results were similar to studies in Vermont and Michigan, with variances likely due to our small sample size for some species.

*** 43. Thyroid axis mediation of development in a frog (*Eleutherodactylus coqui*: Anura: Leptodactylidae) without an aquatic tadpole stage**
Evans, Bryce and Jennings, David H. Southern Illinois University Edwardsville, Edwardsville, IL.

Metamorphic frogs undergo a two-stage pattern of development where they first develop into an aquatic tadpole stage before undergoing metamorphosis to a terrestrial adult stage. While this is the ancestral developmental pattern, a novel form of development has evolved in *Eleutherodactylus coqui*. Upon hatching, *E. coqui* already exhibits adult morphology: a process known as direct-development. In metamorphic frogs, thyroid hormones play a pivotal role in mediating the transition from tadpole to adult. Metamorphic frogs do not have a histologically identifiable thyroid gland until the larval stage, and do not produce thyroid-stimulating hormone (TSH) until well after hatching. The current study focuses on thyroid gland formation and pituitary production of TSH during *E. coqui* embryogenesis. We are using standard histology and immunohistochemistry to document initial formation and subsequent activity of both the thyroid gland and pituitary TSH production in *E. coqui*. If the derived developmental pattern observed in *E. coqui* results from precocious thyroid action, we predict that the formation of thyroid axis components will occur during the embryonic period (prior to hatching), and that the activity of the thyroid axis will be similar to what is observed in metamorphic frogs undergoing metamorphosis.

*** 44. The effects of habitat on reproductive isolation in two species of topminnow (genus *Fundulus*)**
Stasik, Marcy, Stevenson, Aimee and Duvernell, David. Southern Illinois University Edwardsville, Edwardsville, IL.

Two closely related topminnow species, *Fundulus notatus* and *Fundulus olivaceus*, live in different environments but are occasionally found in contact zones where they hybridize to a limited extent. To simulate a natural contact zone, we established an artificial heterogeneous environment of alternating deep and shallow habitats. This environment was replicated twice, each consisting of an array of five round pools connected linearly by four shallow troughs. Environments were populated with juveniles of both *F. notatus* and *F. olivaceus* individuals in summer 2009 and individuals were allowed to overwinter. Spawning substrates were introduced in both the deep and shallow habitats in spring 2010, and eggs were collected weekly. Eggs were genotyped with one nuclear and one mtDNA locus. We wanted to address two questions: 1) do either of the species exhibit a preference in spawning habitat, and 2) to what extent does this habitat preference contribute to reproductive isolation. We found that *Fundulus olivaceus* showed no preference in location of laying eggs whereas *Fundulus notatus* individuals had a strong preference for laying eggs in a deep water habitat. We also found that there was evidence of assortative mating within habitats that contributed to reproductive isolation.

45. Is anthropogenic habitat change the driving force of rapid evolution of southeastern US coastal deer populations?
Storm, Nicole L. and Novak, James M. Eastern Illinois University, Charleston, IL.

Many factors can affect the growth rate and asymptotic size of animals. Factors such as genetics, food availability and the exact food species are among these. Since the 1960's, the coastal areas and islands in Georgia, North Carolina, and South Carolina have become vacation destinations with large and lavish resort communities built to accommodate the large number of visitors to areas that were once called home by just a small number of residents. These developments brought with them non-native plants and improved soil quality for both native and non-native plants. During this same time period, the white-tailed deer (*Odocoileus virginianus*) native to the areas began to increase in size, as measured by skull size, which is not a phenotypically labile character in mammals. The purpose of this project is to determine whether the increased size of deer is due to higher nutritional values of these non-native plants and whether deer diets have adapted to include plants of higher nutritional content. Analysis proceeded by comparing the rumen contents of deer collected from the early 1970's to the late 1990's in comparable areas including both developed resort areas and undeveloped or minimally developed native habitats. The research showed that diet of the deer has changed over time and the diets are different between deer recovered from resort areas compared to deer recovered from native habitats. This implicates change in available food and a change in the deer's food preferences as a driving force in the increased body size seen in white-tailed deer from these populations.

*** 46. Comparative analysis of yolk testosterone levels in captive avian species**
Briney, Katie M. Southern Illinois University Edwardsville, Edwardsville, IL.

Significant amounts of maternal hormones, such as testosterone, estrogen, and androstenedione are deposited into the yolks of avian eggs. The transfer of these hormones offers a mechanism for maternal effects. These hormones, especially androgens, have considerable effects on the

growth, rate of development, behavior, and even survival of the chicks. Previous studies have shown that yolk androgen levels differ among species and that yolk androgen levels correlate positively with incubation period and negatively with the duration of the nestling period. The purpose of this project is to provide a comparative analysis of yolk testosterone concentrations between nine different captive avian families. To date, other comparative work has only utilized wild populations. Steroid hormones were extracted using ethanol and subsequent radioimmunoassays for testosterone were performed. Results from this study will be compared to other published studies and will add to the body of knowledge of levels of yolk hormones in avian eggs.

*** 47. Evaluating the impact of an altered thermal regime on sport fish assemblages**
Porreca, Anthony P., Colombo, Robert E., Pederson, Charles L. and Pant, Manisha. Eastern Illinois University, Charleston, IL.

A site specific rule change granted by The Illinois Pollution Control Board to Ameren Energy Generating Co. allows increased thermal loading in May and October on Coffeen Lake, a reservoir utilized by a power station capable of generating 945 megawatts of electricity. The goal of this project is to monitor the biological impacts on the sport fish populations of the lake. Sampling was done during fall 2010 and consisted of 6.25 hours of three-phase AC electrofishing from 5 separate sites on the reservoir. Species sampled were largemouth bass, bluegill, redear sunfish, white crappie, black crappie, and channel catfish. Using relative weight (Wr) as an index of condition, we found largemouth bass were robust throughout the reservoir (Wr =101.0). Relative density of largemouth bass was low in the cooling loop (22 fish/hour) compared to the lower temperature upper pool (70 fish/hour). Bluegill (426 fish/hour) and redear sunfish (75 fish/hour) were caught in all sites in high numbers. Average size for both bluegill (67.5 mm) and redear sunfish (106.0mm) was low in this reservoir. We had low catch rates of both white crappie (3.2 fish/hr) and black crappie (2.9 fish/hr) in all reaches. During winter and spring 2011 we will increase effort to include additional electrofishing and trapnetting to increase sample sizes of black crappie, white crappie, and channel catfish.

*** 48. Vascular endothelial growth factor expression in lizards (*Sceloporus*; Phrynosomatidae) with divergent reproductive modes (oviparity vs. viviparity)**
Reese, Nathan E. and Jennings, David H. Southern Illinois University Edwardsville, Edwardsville, IL.

There are two major patterns of reproduction in vertebrates: oviparity where eggs are laid and develop externally, and viviparity, where embryos develop internally. Oviparity is the most common reproductive pattern in fishes, amphibians, reptiles, and is the only pattern seen in birds. In contrast, almost all mammals, with the exception of monotremes, exhibit viviparity. In lizards, a number of species have evolved viviparous reproduction from oviparous ancestors. Increasing oxygen demands in late gestation is one of the primary barriers to the transition from oviparity to viviparity. One mechanism to overcome this obstacle is to increase vascular growth (angiogenesis) in the oviduct and embryonic membranes. In vertebrates, angiogenesis is regulated by the activity of vascular endothelial growth factors (VEGF) which are key factors in initiating blood vessel growth. The primary goal of the current study is to use immunohistochemistry to identify VEGF antibodies capable of recognizing lizard VEGF proteins and set the framework for a more extensive study on the levels and distribution of VEGF among closely related species of lizards that vary in reproductive strategy. We are

focusing on the viviparous lizard *Sceloporus jarrovi*, as placental structure and function have been described previously, and closely related oviparous species of *Sceloporus* are available for analysis. As a positive control, we examined VEGF expression in chicken (*Gallus gallus*) embryos and extra-embryonic membranes.

49. Functional morphology of *Gammarus pseudolimnaeus* (freshwater amphipod) and its relationship to drift in a fishless stream

Rhaesa, Michael A. and Brunkow, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

Freshwater amphipods are important to nutrient cycling within stream systems and are critical food sources for fish and waterfowl. They can be the dominant invertebrate in fishless stream reaches, but little is understood about their functional morphology, particularly the mechanisms that might be used in conjunction with swimming behavior to avoid drift. We sampled amphipods (*Gammarus pseudolimnaeus*) from a high gradient spring source down to lower reaches of a stream draining the bluffs above Grafton, IL. Lengths of the fifth, sixth, and sevenths pereopods were all significantly positively correlated with pleon length, our estimate of body size. However, while size-corrected leg lengths differed significantly among sampling sites (MANOVA $P < 0.042$), they did not do so in relation to position in the drainage. The relationship between leg length and body size also did not differ significantly among sites, suggesting a lack of correlation between morphology of the largest pereopods and hydraulic regime. Drift avoidance in this population may thus be mediated through other morphological structures, or through behavioral mechanisms.

*** 50. Biogeographic variation of two raccoon subspecies in Illinois**

Milton, Jennifer and Kohn, Luci. Southern Illinois University Edwardsville, Edwardsville, IL.

Biogeographic differences have long been studied throughout various locations and taxa. In Illinois, differences between mammal populations have been associated with glaciations. Two raccoon subspecies have been identified in Illinois, *Procyon lotor lotor* and *P. l. hirtus*. We test for significant differences between the subspecies in craniofacial morphology. Subspecies were tested for differences in 16 dimensions, including dimensions of the face and braincase. Significant differences between subspecies were found in dimensions of the braincase. Distinction of raccoon populations may have resulted as a result of separation of populations associated with glaciations, as well as subsequent population dynamics.

*** 51. Scapular form in semi-arboreal and terrestrial carnivores**

Wells, Ashley and Kohn, Luci. Southern Illinois University Edwardsville, Edwardsville, IL.

Within biology it is useful to know how locomotion affects skeletal morphology because living and extinct animal morphology can then be related to behavior. The goal of my research was to identify components of the scapula that relate to locomotion, independent of phylogeny in the raccoon (*Procyon lotor*) compared to gray fox (*Urocyon cinereoargenteus*) and red fox (*Vulpes vulpes*). This is a useful comparative study because it is a test of whether there are general patterns to be found in scapulae of climbing mammals compared to scapulae of more terrestrial taxa. Three-dimensional coordinates of 10 locations on scapula were recorded on adult scapulae of raccoon, red fox and gray fox, and landmarks were converted to dimensions to describe scapula form. Scapular morphology was associated with each taxon's degree of arboreality,

based on published research on their behavior and ecology. Form differences associated with climbing indicate the interaction of scapula form and locomotion.

*** 52. Morphological variation in scapula and pelvic form in Mustelidae**
McNealy, Ashley, Volin, Christen and Kohn, Luci. Southern Illinois University Edwardsville, Edwardsville, IL.

Both terrestrial and aquatic locomotion are found within the Family Mustelidae, which includes the mink (*Mustela vison*), long-tailed weasel (*Mustela frenata*), river otter (*Lontra canadensis*), and the American badger (*Taxidea taxus*). While taxa within the Family may walk, swim or dig, each usually favors one primary mode of locomotion. Pelvis form is expected to be influenced by both reproduction and locomotion, while scapula form is primarily influenced by locomotion. The primary purpose of this study is to determine if there are regional differences in the scapula and pelvis associated locomotion differences in these Mustelidae, and if these differences can be associated with their specific mode of locomotion. We measured 8 scapula dimensions and 6 pelvis dimensions of 60 mink, 16 long-tailed weasels, 14 otters and 12 badgers. Size adjusted data were tested for differences in scapula form and pelvis form between species. There are significant differences between the taxa in regions of the scapula and pelvis associated with locomotor differences. Mink and weasels are similar to each other in scapula and pelvis form, and otters and badgers exhibit similar scapula and pelvis form. These results are consistent with the functional constraints associated with the Mustelid activity and locomotion.

*** 53. Parrotfish fish species distribution and feeding habits in the waters surrounding Tobacco Caye, Belize, CA**
Park, So Yeon. Knox College, Galesburg, IL.

Parrotfish, family Scaridae, are a very large group of colorful reef fish, difficult to categorize due to their ability to change their color, patterns, and gender. Named after their powerful beaks formed of fused incisor-like teeth, they feed mainly on sea-grass and algae that grows on coral, playing a crucial role in sand formation but have also been reported to damage the reefs. The objective of this study was to identify the species of parrotfish found in the Tobacco Caye waters (part of the South Water Caye Marine Reserve, a World Heritage Site that includes the Belize barrier reef), determine their feeding habits and territorial behavior. Fourteen parrotfish species have been documented in Belizean waters. Of these, seven species were found around Tobacco Caye as well as one species that had previously reported in the Caribbean but not in Belizean waters. Both the juvenile and terminal phase of that species were sighted in various habitats. Nearly all parrotfish around Tobacco Caye moved in large schools of mixed species feeding on the abundant turtle grass and algae growing on coral rubble. They were rarely seen defending a territory or nipping at living coral and, at least in this area of abundant food, do not appear to be damaging the reef.

54. Flight induced oxidative stress in the honey bee, *Apis mellifera*
Hall, Kelsey, Haskell, Shelitha and Williams, Jason. Southern Illinois University Edwardsville, Edwardsville, IL.

Reactive oxygen species (ROS) can have profound biological impacts in virtually every tissue and are the basis for the “oxidative stress” theory of aging. Flying honey bees produce the highest mass-specific metabolic rate measured, suggesting their flight muscles may experience

high levels of oxidative stress during normal activities. In addition, naturally occurring forager flight results in a reduced ability to mitigate ROS as total anti-oxidant capacity and catalase levels decrease in older bees. However, no studies to date have found increases in cellular level damage in aged foragers. In this ongoing study, we used the metabolic differences between nurse bees (which rarely fly) and forager bees to test the hypothesis that flight activity rather than age induces oxidative damage in honey bee flight muscle. We are measuring levels of advanced oxidative products (a measure of protein oxidative damage) and lipid peroxidation (a measure of membrane oxidative damage) in flight muscle of 10-12 day-old foragers, which had 1-2 days of foraging experience, foragers aged 23-25 days, which had been foraging for at least 10 days prior to collection, and foragers aged 27-28 days, which had been actively foraging for only 1-2 days prior to collection. To determine if activity, rather than age induced oxidative damage, we compared foragers to age-matched nurses.

55. The effect of differing antioxidant supplementation levels on oxidative stress and lifespan in male and female *Drosophila melanogaster*

Weis, Jordan, Limbachia, Reena, Wessling, Ryan and Williams, Jason. Southern Illinois University Edwardsville, Edwardsville, IL.

Reactive oxygen species (ROS) can damage all components of the cell including lipids, proteins and DNA and are the basis for the "oxidative stress" theory of aging. Antioxidants function to mitigate the effects of ROS by reducing them to less damaging or native state molecules. Supplementation of antioxidants through food can increase lifespan although the effects are highly variable. To determine if this variation is due to gender and/or antioxidant concentration, we measured lifespan and parameters of oxidative stress in *Drosophila melanogaster* supplemented with various concentrations of thioproline (L-(-)-Thiazolidine-4-carboxylic acid). Days until 50% mortality increased by an average of 4.5 d for males supplemented with 0.1%, 0.3%, and 0.5% (wt./vol.) thioproline compared to controls (23.9 d). However, there was no increase in lifespan for males supplemented with 0.7% thioproline. In contrast, females supplemented with 0.1% and 0.3% thioproline were similar to controls (averaging 30 d until 50% mortality), while supplementation with 0.5% and 0.7% decreased lifespan compared to controls, averaging only 24.5 d until 50% mortality. This ongoing study is currently analyzing parameters of oxidative stress including levels of advanced oxidation products (proteins damaged by ROS) and lipid peroxidation on animals supplemented with either 0, 0.3 or 0.7% thioproline for either 0, 10, or 20 days.

56. Locomotor behavior, microhabitat use, and activity pattern in the fire-bellied toad, *Bombina orientalis* (Anura: Bombinatoridae)

Bulger, Amanda L. and Essner, Jr., Richard L. Southern Illinois University Edwardsville, Edwardsville, IL.

The Fire-bellied Toad, *Bombina orientalis*, is a small, semi-aquatic frog that inhabits a variety of aquatic habitats throughout eastern Asia. Observations of this species are primarily anecdotal and their behavior has not been examined in a systematic way. We studied the locomotor behavior, microhabitat use, and activity pattern of *B. orientalis* in a naturalistic enclosure as part of an effort to establish ecological relevance for a wide array of taxa spanning the anuran phylogeny. Frogs (n=5) were filmed moving in the enclosure individually over a 24-h period using a 4-camera IR surveillance system (Q-See). Behavioral observations were recorded using the bout method of continuous sampling. *Bombina orientalis* preferred terrestrial substrates over

intermediate and aquatic substrates. Crawling was the most frequently observed behavior, followed by jumping. *Bombina orientalis* was primarily diurnal, exhibiting a bimodal activity pattern, with peaks from 6-10 am and 2-6 pm.

*** 57. Jumping kinematics in the Rocky Mountain tailed frog, *Ascaphus montanus* (Anura: Leiopelmatidae)**

Bulla, Andrew J. and Essner, Jr., Richard L. Southern Illinois University Edwardsville, Edwardsville, IL.

All frogs are assumed to jump in a similar manner. However, detailed studies of jumping behavior are lacking in many frog groups, including the most primitive living frogs of the family Leiopelmatidae. This basal clade diverged from all other frogs (Lalagobatrachia) at least 170 mya, prior to the breakup of Pangaea. Leiopelmatids retain a suite of primitive morphological features, including nine amphicoelous presacral vertebrae, free ribs, epipubic cartilage, and a "tail-wagging" muscle. They are also known to exhibit primitive swimming and landing behaviors. We examined the kinematics of the takeoff phase of jumping in the Rocky Mountain Tailed Frog (*Ascaphus montanus*), a semi-aquatic leiopelmatid, as part of a larger study comparing jumping across the anuran phylogeny. Frogs (n=6) were filmed jumping in an arena with high-speed video at 250 fps. Three-dimensional kinematic analysis was conducted by digitizing key landmarks overlying joints of the forelimbs, hindlimbs, and body. This generated a suite of angular, timing, and performance variables that were used to statistically compare jumping in A. montanus with frogs from other anuran families. We determined that takeoff behavior in *A. montanus* was less complex than that exhibited by lalagobatrachian frogs (i.e., fewer degrees of freedom) possibly providing insight into the ancestral condition for anuran jumping.

*** 58. Jumping kinematics in the fire-bellied toad, *Bombina orientalis* (Anura: Bombinatoridae)**

Ellet, Lowell D. and Essner, Jr., Richard L. Southern Illinois University Edwardsville, Edwardsville, IL.

The Fire-bellied Toad, *Bombina orientalis*, is a basal representative of a highly successful clade (Lalagobatrachia) that includes all extant frogs (>5000 sp.) except family Leiopelmatidae. Detailed studies of jumping behavior are lacking in many frog taxa, including basal lalagobatrachians. We examined the kinematics of the takeoff phase of jumping in the semi-aquatic Fire-bellied Toad, (*Bombina orientalis*), as part of a larger study comparing jumping across the anuran phylogeny. Frogs were filmed jumping in an arena with high-speed video at 250 fps. Three-dimensional kinematic analysis was conducted by digitizing key landmarks overlying joints of the forelimbs, hindlimbs, and body. This generated a suite of angular, timing, and performance variables that were used to statistically compare jumping in *B. orientalis* with frogs from other anuran families. We determined that takeoff kinematics in *B. orientalis* and lalagobatrachian frogs in general, exhibited a greater degree of complexity (i.e., more degrees of freedom) than was observed in leiopelmatid frogs.

*** 59. Jumping kinematics in the northern leopard frog, *Lithobates pipiens* (Anura: Ranidae)**
Singh, Kunal and Essner, Jr., Richard L. Southern Illinois University Edwardsville, Edwardsville, IL.

Frogs are a model organism for biologists, as evidenced by their ubiquitous presence in biology classrooms. The Northern Leopard Frog, *Lithobates pipiens*, is an advanced long-distance jumping representative from a highly successful clade (Lalagobatrachia) that includes all extant frogs (>5000 sp.) except family Leiopelmatidae. We examined the kinematics of the takeoff phase of jumping in the semi-aquatic *L. pipiens*, as part of a larger study comparing jumping across the anuran phylogeny. Frogs were filmed jumping in an arena with high-speed video at 250 fps. Three-dimensional kinematic analysis was conducted by digitizing key landmarks overlying joints of the forelimbs, hindlimbs, and body. This generated a suite of angular, timing, and performance variables that were used to statistically compare jumping in *L. pipiens* with frogs from other anuran families. We determined that takeoff kinematics in *L. pipiens* and lalagobatrachian frogs in general, exhibited a greater degree of complexity (i.e., more degrees of freedom) than was observed in leiopelmatid frogs.

60. Influence of age and plant coverage on insect communities on green roofs
Steck, Tony, Retzlaff, William and Williams, Jason. Southern Illinois University Edwardsville, Edwardsville, IL.

The effects of age and plant coverage on insect communities were investigated between 8-20-10 and 10-1-10 on green roofs located on the campus of Southern Illinois University Edwardsville. Insect collections were made using pitfall traps on green roofs that were either established within a year (Rendleman Hall and Student Success Center) or had been in place for at least five years prior to insect collection (Engineering building, EB). To determine if green roof insect communities were similar to ground level landscaping, we also sampled in a rain garden (planted in Sept. 2009) near the green roofs. We collected a total of 916 insects comprising six orders and 19 different families with ground beetles (Coleoptera: Carabidae) and crickets (Orthoptera: Gryllidae) being the most abundant, representing 34 and 41% of collection respectively. The most recently established green roofs had the lowest rate of insect collection, averaging 0.07 ± 0.05 insects trap-1 day-1 while having an average of 61% plant coverage. In contrast, rate of insect collection and plant coverage was considerably higher for the EB green roof (0.58 ± 0.07 insects trap-1 day-1and 71%). Interestingly, the rain garden had similar rates of insect collection as the EB green roof, 0.58 ± 0.11 insects trap-1 day-1 but had lower plant coverage (42%). We are currently analyzing insect species richness, diversity, and evenness as well as percent similarity between each of the collection sites.

~~* 61. Handedness during prey capture in the Chinese mantid, *Tenodera aridifolia sinensis* (Mantodea: Mantidae)~~ CANCELLED
Rhodes, Samantha R., Robertson, Marianne D. and Watson, Casey. Millikin University, Decatur, IL.

Although many studies have been conducted on handedness in vertebrates, studies on handedness in invertebrates are rare. In the few studies that exist, flies, crustaceans, ants, bees, and spiders have all shown asymmetry of limb usage. Our work focuses on the handedness of praying mantids (*Tenodera aridifolia sinensis*), which serve as an ideal candidate for this type of

experiment because of their prominent forelimbs and aggressive predatory behavior. We began with over 900 mantids from 8 egg sacs, with 14 specimens reaching adulthood. During each instar, we observed the behavior of each mantid with one prey item at a time over several trials, recording the forelimb it used to successfully capture the prey. Our results show that 55%-80% of mantids in a typical population exhibit handedness, with statistically consistent numbers of right and left-handed organisms - in contrast to the right-handed dominance observed in humans.

*** 62. Population status of silver carp on the Illinois River**
Stuck, Jason and Colombo, Robert. Eastern Illinois University, Charleston, IL.

The silver carp, *Hypophthalmichthys molitrix*, is an invasive species that has received increased attention as the species moves closer to the economically important ecosystem of the Great Lakes. We sought to estimate the population demographics of silver carp on the Illinois River and assess their invasion potential. Two-hundred and fifty silver carp were captured using DC electrofishing. All fish were weighed to the nearest gram and measured to the nearest millimeter. A cleithrum bone was extracted from each fish for the purpose of age determination. Each cleithrum was cut into cross-sections of 640 micrometers using an Isomet Low Speed Saw, and then a dissecting microscope was used to ascertain the age of the fish. The samples ranged in size from 376 mm to 717 mm, with the average being 489.9 mm. Ages ranged from 0 to 6 years old, with an average of 1.65 years old. One and two year old fish represented the majority of the population, 44.8% and 41.6% respectively. This population shows rapid growth during the early years of life reaching an average of 460 mm for age 1 fish. The quick growth is possibly due to high predation or competition from native fish species. Regular collection of age, growth, and mortality statistics for the silver carp provide state and federal agencies with up to date information to make management decisions. We plan to continue researching this project on the Illinois River for the next 1.5 years along with adding sampling from the Wabash River to provide comparative analysis between the two river populations.

Division: Earth Science

63. GIS modeling of fixed carbon and carbon dioxide sequestration from Greenscape Biomass, at Eastern Illinois University
Di Naso, Steven M., Gutowski, Vincent P. and Boatright, Kyle D. Eastern Illinois University, Charleston, IL.

As part of the Eastern Illinois University Carbon Footprint Analysis, an ongoing EIU Sustainability Initiative, and the Green EIU Program, the Geographic Information Sciences Lab, with interns from the Department of Biology, produced a Carbon Sequestration Model for the campus greenscape. We designed and implemented a geoprocessing workflow using Esri ModelBuilder to analyze and process allometric data and automate biomass calculations for trees at the species level, extrapolated from a compilation of linear regression equations found in the U.S.F.S Comprehensive Database of Diameter-Based Biomass Regressions for North American Tree Species. Assisting in granting EIU the designation of Tree Campus USA, a program of the National Arbor Day Foundation, this endeavor provided an Integrative Learning Experience for Geography and Biology interns in asset-inventory, and automated CO_2 Sequestration Modeling Techniques using GIS. As CO_2 is one of many greenhouse gases contributing to Global Warming, Carbon Sequestration is a long-term methodology for storing CO_2 captured through various chemical, biological, and physical processes. The sequestration of carbon from this part

of the biome reduces the total Earth Carbon Footprint by semi-permanently fixing carbon within tree tissue, contributing to the overall Earth Carbon Balance. Our results indicate a Total Wet Weight Biomass of 4.39 Gg, a Total Dry Weight Biomass of 2.31 Gg, or approximately 1,591 metric tons of carbon, sequestering 5,828 metric tons of CO_2.

64. Snow's cholera revisited: An integrative learning experience in geospatial statistical analysis

Di Naso, Steven M., Reynolds, Jennifer E. and Happ, Jena L. Eastern Illinois University, Charleston, IL

In this Integrative Learning Exercise for Geographic Information Science II: Advanced Spatial Analysis, students were asked to assess and investigate Dr. John Snow's identification of the Broad Street Pump as the source for the numerous deaths occurring from Cholera in the St. James Parish, Soho District of London, England, in September of 1854. Students were given only a reproduction of the well-known "Snow Cholera Map" and were required to reproduce Snow's data in an Esri Geodatabase Model. A thorough knowledge of several Esri Analysis, Spatial Analyst, and Spatial Statistics Tools was given, supplemental to lectures and a short film on Snow's work. As Dr. Snow previously demonstrated, our GISci Lab analysis reveals that the frequency, proximity, and clustering of these phenomena in relation to the Broad Street Pump, reveals spatial patterning in Snow's recorded observations through a quantifiable, and statistically viable, geospatial representation of these data, whereby the microscopic vibrio cholerae, becomes a macroscopic visualization under the powerful eye of Applied Geographic Information Science. We find that the patterning and magnitude of cholera deaths in the Soho District are not the result of random chance and point to the Broad Street Pump as the source of vibrio cholera in the Soho District. This poster represents the results of our Integrative Learning Experience.

*** 65. Assessing sub-field growing patterns of soybean using NDVI and EVI for local Illinois producers**

Mustafa, Munia M., Rudibaugh, Mike A. and Ali, Iffat A. Lake Land College, Mattoon, IL.

With a harvested land cover of 9.05 million acres, the state of Illinois in 2010 contributed around 15% of the soybean production in the US yielding 466 million bushels. The assessment of crop health is very important to the local farmers. Crop health can be visually observed by the greenness of the leaves. The greenness relates to soil parameters and harvest yield. In this pilot study the greenness has been determined by measuring chlorophyll content using spectrophotometric method (DMSO-acetone extraction, absorption of light at specific wavelengths), handheld chlorophyll content meter (transmission of light through the leaf tissue), the Normalized Difference Vegetation Index (NDVI), and the Enhanced Vegetation Index (EVI) values interpreted from the Moderate-Resolution Imaging Spectroradiometer (MODIS, reflection of light from green vegetation) mounted on the NASA satellites. These results were compared with the soil parameter data and harvest yield to assess sub-field growing pattern in two unmixed MODIS pixels (40 acre). The results show a positive correlation between the greenness indices, nutrient data, and the harvest yield. These findings strongly indicate that the remote sensing method (NDVI and EVI) can be used for in-season assessment of vegetation health and crop stress at the sub-field level, consequently can enable farm managers to better manage farming and the environmental impact.

66. Using GIS to identify riverine soils for use as potential wetland restoration areas in the Embarras River Watershed, east-central IL
Gutowski, Vincent P.[1], Di Naso, Steven M.[1] and Osterman, Daniel J.[2] [1]Eastern Illinois University, Charleston, IL. [2]USDA, NRCS, Toledo, IL.

In this study, areas of hydric and partially hydric floodplain soils in the 100-year floodplain of the Embarras River and its tributaries were identified. Floodplain areas were the focus of the study because upland hydric areas are less likely to be taken out of production and floodplain areas are more likely to provide continuous corridors and access to water and habitat for wildlife. For the 10 counties in the watershed, data from Soil Data Mart, Web Soils, online soils surveys, published soils surveys, and the allstate hydric soils list, were used to characterize soil types based on existing drainage criteria, flooding and ponding frequency & duration, and landform type. We designed and implemented a geospatial soils data model for the Embarras River Watershed built upon the Esri geodatabase model framework. The model facilitated the identification of areas of maximum restoration potential for land and wildlife conservation purposes. For soils to be considered hydric, they must contain 85 to 100% hydric soil types, for soils to be considered partially hydric, they must contain 2 to 15% hydric soils. Floodplains in the watershed contained 83,397 acres of hydric soils, 98,450 acres of partially hydric soils and 1,306 acres of non-hydric soils. Mapping of the areas of greatest potential for successful wetland restoration will assist conservation officials an opportunity to target landowners for available programs.

*** 67. Vegetation classification and fire research of the northern Sierra Nevada Mountains**
Rentschler, Trisha S. and Smith, Betty E. Eastern Illinois University, Charleston, IL.

Ponderosa Way is a firebreak located along the western side of the Sierra Nevada Mountains, CA. The firebreak was constructed by the Civilian Conservation Corps (CCC), a federal public works program that provided employment for people during the Great Depression when jobs were not readily available. The firebreak served numerous purposes, including fire prevention, a military route, and provided people with economic stability. The original distance of Ponderosa Way was estimated to be 800 miles in length, but the firebreak was never finished. Through research and virtual mapping, Ponderosa Way has been recreated using a Normalized Difference Vegetation Index (NDVI), past fire data, and satellite images to examine the effectiveness of this historic firebreak. Reclassification of vegetation data and recent data obtained from local governments presented a means to evaluate those areas most susceptible to future fires by vegetation type classification. This research will also provide current information on fire and vegetation data to assist in preparation and prevention of forest fires.

68. Flow structure and channel morphology at a large confluent-meander bend: Field investigation of the junction of the Ohio and Wabash Rivers
Riley, James D.[1] and Rhoads, Bruce L.[2] [1]Eastern Illinois University, Charleston, IL. [2]University of Illinois at Urbana-Champaign, Urbana, IL.

Recent investigations of confluent-meander bends, a type of river junction planform that develops when a tributary joins a meandering channel along the outer bank of a bend, reveal differences in flow structure and bed morphology from patterns typically found in meander bends or angular confluences with straight channels. This study examines how fluvial processes identified in laboratory experiments and at a small confluent-meander bend scale to a larger

junction with wider channels. Field data were collected at the confluence of the Wabash and Ohio Rivers, where the Wabash enters the Ohio slightly upstream of the apex of a meander bend. Measurements of 3D velocity components and bed topography were obtained with an acoustic Doppler current profiler for two hydrological events with different momentum flux ratios. A core of high-velocity flow with strong helical motion in the curving Ohio River abruptly turns the tributary into the downstream channel, inducing a counter-rotating helical cell along the outer bank of the bend. The combined flows accelerate over a central region of bed scour, which is flanked by bars along the inner bend and downstream junction corner. Substantial morphologic change occurred at the junction between measurement dates due to large, Wabash River-dominant discharges and the development of a meander cut-off upstream of the confluence on the tributary. Increased tributary penetration into the confluence deflected the Ohio River toward the inner bank, which heavily eroded the point bar and deposited a large amount of sediment through the junction.

69. Box turtle population assessment and their contribution to the spread of invasive plants at SIUE

Hoffman, Eric and Walton, Elizabeth. Southern Illinois University Edwardsville, Edwardsville, IL.

The SIUE Turtle Research and Recovery Lab is continuing research and assessment of box turtle, *Terrapene* spp., populations on campus. This investigation includes a demographic analysis through trapping, marking, and releasing turtles back into their natural habitat at the point of capture. The research is being conducted in order to further understand box turtle dynamics in the Madison County area. Additionally, it is possible that box turtles are aiding in the spread of two invasive species: bush honeysuckle, *Lonicera tatarical*, and autumn olive, *Elaegnus umbellate*, which may serve as a source of sustenance long after native fruit–producing plants have senesced. Conducting research on box turtles is crucial to determining whether they assist in the spread of these invasive species in our study area. The goal of this study is to continue to collect demographic data through a trapping study and to analyze fecal content for the presence of invasive plant seeds. The research will map native and invasive plant species in correlation with where the box turtles are found to identify spatial relationships between turtles and these invasive species. Preliminary results of this on-going study will be presented.

Division: Environmental Science

*** 70. Storm water runoff of residential green roof systems**

Murphy, Daniel[1], Jennings, Denzil[1], Morgan, Susan[1], Jost, Vic[2], Luckett, Kelly[3] and Retzlaff, William.[1] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]Jost Greenhouses, St. Louis, MO. [3]St. Louis Metalworks Company, St. Louis, MO.

Green roofs have become a popular mechanism of reducing storm water runoff. In order to determine the runoff retention potential of a residential green roof system, eighteen shingled roof models were constructed at three different slope angles, 1˚, 20˚ (5/12), and 40˚ (10/12). A modular green roof system designed for residential roofs was installed on nine of the roofs. The roof models were divided into three replications in a completely randomized design. Each replication includes two roof models at each slope angle, one of which is fitted with a green roof and the other is a conventional shingled roof model. The green roof models were planted with mixed plantings of seven *Sedum* species: *S. kamtschaticum*, *S. reflexum*, *S. sexangulare*, *S.*

album, *S. spurium*, *S. floriferum* 'Weihenstaphaner Gold', and *S. immergrunchen*. Gutters were installed on each of the roof models, and barrels were placed at the ends of the gutters in order to collect storm water runoff. After each precipitation event, the amount of runoff in each barrel was measured, and the amounts collected for each roof model were compared. Out of the 15 dates sampled initially in this study, more runoff was collected from the control roofs on 10 of the dates compared to runoff from the green roof models. In addition, storm water runoff was different between different roof pitches on nine of the monitoring dates.

*** 71. Thermal flux of residential green roof systems**

Jennings, Denzil[1], Murphy, Daniel[1], Celik, Serdar[1], Jost, Vic[2], Luckett, Kelly[3] and Retzlaff, William.[1] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]Jost Greenhouses, St. Louis, MO. [3]St. Louis Metalworks Company, St. Louis, MO.

Green roofs have been demonstrated to reduce the thermal flux of a building, thus reducing energy demand and the need for space conditioning. In order to determine the thermal performance of a residential green roof system, eighteen shingled roof models were constructed at three different slope angles, 1˚, 20˚ (5/12), and 40˚ (10/12). A modular green roof system designed for residential roofs was installed on nine of the roof models. The roof models were divided into three replications in a completely randomized design. Each replication includes two roof models at each slope angle, one of which is fitted with a green roof and the other is a conventional shingled roof. The green roof models were planted with mixed plantings of seven *Sedum* species: *S. kamtschaticum*, *S. reflexum*, *S. sexangulare*, *S. album*, *S. spurium*, *S. floriferum* 'Weihenstaphaner Gold', and *S. immergrunchen*. Temperatures of the undersides of each of the eighteen roof decks were monitored at midday once a month for 13 months. We have determined that the green roofs were significantly cooler than the control roofs for each month during this study period. In addition, there are thermal differences due to roof slope in the control and green roof models.

*** 72. Lead contamination in the biota of two southwestern Illinois lakes**

Wilson, Matthew J., Tripp, Timothy, Brugam, Richard B. and Lin, Zhi-Qing. Southern Illinois University Edwardsville, Edwardsville, IL.

Horseshoe Lake near Granite City is an ox bow located near the site of a Lead (Pb) smelter. Sediment of Horseshoe Lake has been shown to have elevated Pb concentrations. Some investigators have suggested that Pb is excluded from higher trophic levels. The lead contamination of the Lake makes it a good site to test where lead will be accumulated in lake biota. By the analysis of organisms from different trophic levels it is possible to determine where and how the lead is affecting the biota of the lake. It is also necessary to analyze the biota of a non-polluted lake for comparison. The biota of Cougar Lake on Southern Illinois University Edwardsville campus was chosen as a control, because of Cougar Lake's well known background and lack of Pb contamination. The hypothesis for this experiment is that organisms from Horseshoe Lake will have much higher lead concentrations than Cougar Lake. Samples phytoplankton, zooplankton, benthic invertebrate and fish bone were prepared using EPA method 3050b. They will be analyzed using ICP-MS. Preliminary data shows that fish from Horseshoe Lake have higher concentrations of Pb than those from Cougar Lake.

73. Soil carbon content of prairie restoration areas and conventionally tilled soils in Illinois
Nicioli, Stephanie M., Mullins, Ben M., Freund, Matthew, Ribory, Karen E., Vanoskey, Amanda A. and McConnell, J. Scott. Western Illinois University, Macomb, IL.

Living organisms, the atmosphere, non-living organic matter, certain minerals, and dissolved gases have carbon as a fundamental component. Carbon readily changes oxidation state as it cycles within the environment. The rapid rise in atmospheric carbon dioxide has increased concerns regarding global warming. Atmospheric carbon dioxide might be reduced if carbon held in soils as organic matter is increased. As plants die, some of their carbon may be retained in soils as organic matter. Current public efforts in Midwestern regions of the United States are restoring farmland to native prairie conditions, and should increase soil carbon content. Investigations of restored prairies and analogous soils under cultivation were conducted to determine soil carbon differences. The carbon contents of analogous soils of prairie restoration areas with farmed lands were compared. Statistical analyses of soil carbon indicated more carbon may be retained in the surfaces of restored prairies compared to conventionally tilled soils.

74. Soil carbon content of native prairies and conventionally tilled soils in Illinois
Ribory, Karen E., Freund, Matthew, Mullins, Ben M., Nicioli, Stephanie M., Vanoskey, Amanda A. and McConnell, J. Scott. Western Illinois University, Macomb, IL.

Carbon plays many important roles in environmental systems due to its abundance on Earth. The best known role of carbon to the general public may be atmospheric carbon. The rise of concerns such as global warming, greenhouse gases, and carbon footprints has increased public unease. Carbon dioxide is one of the greenhouse gases. Carbon dioxide gas enters the atmosphere by living organisms and fossil fuel emissions from industrialization. Native prairies and cultivated soils were sampled and analyzed for soil carbon content. Comparisons were made for soils taken from native prairies and compared to adjacently located cultivated soils that were used to produce corn, soybean, or both. All soil samples taken from both prairie and cultivated lands were analyzed for soil carbon using wet oxidation commonly referred to as the Walkley-Black method. The soil carbon contents were statistically analyzed to determine that soils from native prairies contained significantly more soil carbon than adjacent cultivated soils that had undergone tillage. The greatest amounts of soil carbon were found in the upper 0 to 7.5 cm depth of all soils and deceased with depth.

75. Conservation strategies for wildlife managers: Analysis of repatriated box turtles
Khadka, Sarjana and Walton, Elizabeth. Southern Illinois University Edwardsville, Edwardsville, IL.

There are three box turtles species found on the Southern Illinois University Edwardsville (SIUE) campus including the eastern box turtle, *Terrepene carolina carolina*; the three-toed box turtle, *Terrapene carolina triunguis*; and the ornate box turtle, *Terrepene ornata ornata*. Box turtle species have experienced significant declines throughout their range as a result of habitat destruction, human consumption, and pet trade demands. The ornate box turtle is listed as "endangered" by the state of Illinois. It is possible that with a small investment of time (1 year or less), sick or injured turtles may be restored to health and returned to their native habitat. The Turtle Research and Recovery Lab at SIUE works to restore injured box turtles back to health so they can return to their natural habitat. Four recovered turtles stayed at a "halfway" house for two months before being fitted with transmitters and released back into their native habitat. The

specific objective of this research was to determine how turtles responded in their natural habitat after release including total distance traveled, home range, and habitat preferences. We also studied specific habitat characteristics such as soil temperature and pH values of nearby water sources. These turtles and one locally trapped turtle were tracked daily using radio-telemetry and a GPS unit; all locations and variables were mapped in a GIS.

*** 76. Evaluating the stormwater mitigation potential of living wall systems**

Thompson, Kelly, Woolbright, Mark, Morgan, Susan, Celik, Serdar and Retzlaff, William. Southern Illinois University Edwardsville, Edwardsville, IL.

Eighteen circular (7-foot diameter) green retaining walls have been located on the SIUE campus. Walls are arranged in a completely randomized design, utilizing five *Sedum* treatments and one unvegetated control. The project is designed to evaluate the capacity of green wall systems to reduce stormwater runoff and to mitigate urban flooding. In a preliminary stormwater saturation test, we determined that a planted wall produced a delay in runoff of approximately 20 minutes in comparison to an unvegetated wall. This delay appears to be present in the emerging data, particularly following intense rain events. For total stormwater runoff, data collected so far indicates that walls planted with *Sedum phedimus* produce the least amount of stormwater runoff while unplanted control walls and walls planted with *Sedum spurium* produce the most runoff. Our evaluation so far indicates that living wall systems have the potential to reduce storm water runoff.

77. Quantitative assessment of minerals and endocrine disrupting chemicals in river otters (*Lontra canadensis*) in Illinois

Rivera, Nelda A.[1], Mateus-Pinilla, Nohra E.[1], Fredebaugh, Shannon L.[1], Singh, Kuldeep[2], Carpenter, Samantha K.[1] and Lehner, Andreas F.[3] [1]Illinois Natural History Survey, University of Illinois at Urbana-Champaign, Champaign, IL. [2]College of Veterinary Medicine, University of Illinois Urbana-Champaign, Urbana, IL. [3]Diagnostic Center for Population and Animal Health, Michigan State University, Lansing, MI.

Toxic minerals and endocrine disruptors contaminants (EDCs) can impact both human and wildlife health. We performed a quantitative assessment of minerals and EDCs in river otters (*Lontra canadensis*) in Illinois, and compared them to historical data. Liver samples were collected from 13 Illinois river otters that died between 2009 and 2010. Mercury (Hg), cadmium (Cd) and chromium (Cr) were detected in 77%, 54% and 38% otters respectively. Although only Cr had been reported in Illinois *L. canadensis* the others had been reported in Illinois mink in 1996. Cd levels (mean = 0.127ppm wet weight) were similar to previous reports in Illinois mink but this is the first detection in *L. canadensis*. Diisobutyl phthalate and significant phenolic compounds were detected in 15% of otters. Detectable levels of 1,2-dihydronaphthalenes were found in 53% of the otters. No bisphenol A, flame retardants, or organophosphates were found. Current Hg levels in 23% of our otters are above toxic limits in most mammalian species (1ppm). River otters are semi-aquatic mammals at the top of the trophic food chain in aquatic ecosystems, making it an ideal sentinel species in the evaluation of toxic minerals and EDCs. This is the first report of the presence of EDCs in river otters, and the first step in understanding the occurrence and effects of these stressors in Illinois *L. canadensis*.

78. Coverboard survey at the Watershed Nature Center

Haag, Heidi E. and Walton, Elizabeth. Southern Illinois University Edwardsville, Edwardsville, IL.

The Geography Department and Environmental Sciences Program at Southern Illinois University Edwardsville (SIUE) are working collaboratively with the Watershed Nature Center (WNC) in Edwardsville, IL, to examine species biodiversity at WNC through the continuation of a coverboard survey. The WNC is a reclaimed abandoned sewage lagoon that has been transformed into a natural model of four major local ecosystems: water, wetland, prairie, and forest. Comprised of nearly 40 acres, this location is prime for the continuation of research efforts by SIUE to study the biodiversity of terrestrial species that inhabit WNC. The coverboards are sheets of plywood in varied lengths and widths placed in March 2010 and have been left unchecked since April 2010. Each board is marked and numbered with geographic coordinates recorded .The boards are being flipped three times per week and any species discovered are recorded by photograph and a descriptive written record. Date, time, temperature, sun exposure, wind, canopy type, and any other extraordinary findings are recorded in a field log for each board on every visit. This information is then transferred to a computer log of all findings. The results of this study will provide further information on the biodiversity of the WCN. Preliminary results will be presented.

*** 79. The evaluation of *Sedum* cuttings as an establishment method on Midwestern green roofs**

Krutsinger, Roxane[1], Greeling, Ben[1], Retzlaff, William[1], Morgan, Susan[1], Luckett, Kelly[2] and Jost, Vic.[3] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]St. Louis Metalworks Company, St. Louis, MO. [3]Jost Greenhouses, St. Louis, MO.

Now that the ecological importance of green roof systems has been demonstrated, it is important that research be done to help reduce the cost to make green roofs more affordable. This study evaluates the use of *Sedum* cuttings and 406 plugs as viable establishment methods on a Midwestern green roof located on the Student Success Center at Southern Illinois University Edwardsville. In each of three replicates there are six sections each containing 10 GRB with different treatments. After one growing season, the average coverage of untreated blocks increased from 35% to 70%. The coverage of GRB treated with only cuttings and those treated with 406 plugs and Atlas Soil Lock were greater than the untreated GRBs and all other treatments.

*** 80. The perfect storm: Cause of death of American robins (*Turdus migratorius*) at Millikin University in Decatur, Illinois**

Huschen, Max S., McQuistion, Thomas E. and Horn, David J. Millikin University, Decatur, IL.

In early 2011, a flock of several dozen American robins (*Turdus migratorius*) congregated around a fruiting tree and nearby building on the campus of Millikin University in Decatur, Illinois. From February 8 to 17, after a blizzard passed through central Illinois, 29 robins were found dead around campus buildings. We investigated potential causes for the high number of deaths over a short period of time. We examined the stomach contents and feces of dead birds found for both food eaten and internal parasites, and observations of feeding behavior and social interactions of living birds were also recorded. The birds we collected were under the average weight of wintering robins reported in previous studies, and thus, starvation most likely played a

major role in cause of death. In addition, internal parasites were found, including Acanthocephala, in several birds. The berries from the fruiting tree contain small amounts of cyanide, and the tree is located near a portion of the building for which a large number of bird-window collisions are known to occur. Finally, robins exhibit territoriality in times of low resource availability, and thus social dominance may have limited food access for some birds. We conclude that during this period of low temperatures and snow cover, the robins congregated around one of the few resources available in the area. In doing so, they were subject to starvation, and became more susceptible to other forms of mortality including parasitic infection, social dominance, and bird-window collisions.

*** 81. Evaluating the thermal benefits of living wall systems**

Ostendorf, Mark, Woolbright, Mark, Morgan, Susan, Celik, Serdar and Retzlaff, William. Southern Illinois University Edwardsville, Edwardsville, IL.

Eighteen circular (7-foot diameter) green retaining walls have been located on the SIUE campus. The project is designed to evaluate the thermal performance of green wall systems planted with five *Sedum* species and one unplanted wall on north, south, east, and west aspects. During warmer months, particularly for midday and evening measurements, we have determined that plant surface temperatures are less than wall block surface temperatures while the growing medium (Ameren Bottom Ash) has the greatest surface temperature. North and east wall aspects have the lowest afternoon surface temperatures – up to 25°F lower than west and south aspects. However, all morning measurements taken so far indicate no significant differences for any treatment. Additionally, measurements taken from late fall through winter have also not yielded significant results, perhaps due to *Sedum* dormancy and reduced incoming solar radiation. Nonetheless, based on our evaluations so far, living wall systems have the potential to mitigate the urban heat island effect.

*** 82. A spatially explicit model to predict American robin occurrence on the Department of Energy's Savannah River Site**

Boatright, Kyle D. and Gaines, Karen F. Eastern Illinois University, Charleston, IL.

The goal of this project was to develop a spatially explicit model to predict how American robins (*Turdus migratorius*) use habitat on the Department of Energy's (USDOE) Savannah River Site (SRS). This model will be used conjunction with radiological data in the ecological risk assessment process to determine contamination risk. American robins are excellent receptor species for such questions because they have predictable diets, have high population levels, are found throughout the United States, and can fly in and out of waste sites (thus being a potential contaminant vector). Based on these attributes, the US Environmental Protection Agency uses this species regularly in their ecological risk assessments. The specific approach to this modeling effort has been shown to be effective on the SRS. Specifically, within a GIS environment, habitat preference was categorized using a 1 hectare hexagonal mesh in order to integrate life history at the proper spatial scale (e.g. robin core area for habitat use). Using this knowledge-base in conjunction with highly accurate habitat data, and SRS reports pertaining to robins, the final model produced a highly functional tool for the USDOE. This approach is not unique to the SRS and can be used elsewhere in the ecological risk assessment process.

Division: Microbiology

83. Competition trials between a strain of *E. coli* (MG1655) and its isogenic derivative WRL10

Vu, Christine L. and McCommas, Steve. Southern Illinois University Edwardsville, Edwardsville, IL.

Studies have shown that dietary fiber can decrease an individual's risk of acquiring colorectal cancer. Lectins are digestion-resistant proteins implicated in increasing colon cancer risk. Lectins binding to carbohydrates on the surfaces of cells lining the colon create a protein-sugar interaction. This induces a mitogenic reaction, which could potentially pose a means of cancerous cell proliferation leading to colorectal cancer. Soluble fiber that undergoes fermentation can aid in producing alternative sugars that could be bound by lectins, reducing the risks of colorectal cancer. This research was done using a model system of the gut microbiome, with *E. coli* wild type and mutant strains, MG1655 and WRL10, respectively. WRL10 is a spontaneous, isogenic mutant of MG1655. Hypothesis: when grown together in the same medium the mutant strain will outcompete its parent strain. Both strains were put simultaneously into LB broth, which simulated the standard environment of the gut, and their relative growth rates were compared. In these competition trials, the mutant outnumbered the parent strain, demonstrating that a single spontaneous mutation could give a growth advantage to a new mutant strain over the parent strain.

84. *E. coli* strain MG1655 growth in complete medium supplemented with maltose compared to a mutant strain, KR4

Stehlin, Courtney A. and McCommas, Steven A. Southern Illinois University Edwardsville, Edwardsville, IL.

Previous studies have suggested that consuming a high fiber diet may lower the risk of developing colon cancer. *E. coli*, a very well characterized bacterium that can be found in the human gut, has many mutant strains and some of these may be better at digesting fiber than the wild type. In our study, we are using *E. coli* in place of glycophiles found in the gut because of its model organism qualities. If glycophile mutants in the gut can digest the fiber better than wild types, they might reduce the beneficial effects of fiber. In a previous study, two strains of the wild type, MG1655, and a spontaneous mutant, KR4 - were grown together in a complete medium (Luria-Bertani broth) and then were counted to determine the number of colony forming units of each strain. It was found from these experiments that the wild type and mutant grew at around the same rate in this environment. Having established this, we were ready to introduce a novel carbohydrate source- maltose (representing dietary fiber) - and determine if it is feasible for a mutant to displace its ancestral strain. From the results that have been found, the mutant, KR4, did grow better with the addition of maltose than the wild type in this environment.

* 85. Using polymerase chain reaction to detect nifH and vnfDGK in an acidophilic microbial community

Flowers, Samantha L. and Hung, Kai F. Eastern Illinois University, Charleston, IL.

When the EPA allowed an abandoned pyrite mine in California to be explored, scientists found not only the most acidic waters found naturally (pH -3.6), but also many living organisms. A community composed of a fungus and prokaryotes were isolated from the mine and these

acidophiles can be cultured in laboratory conditions without the addition of nitrogen-containing compounds, suggesting the presence of microbes that can convert nitrogen gas to ammonia via nitrogen fixation. Three forms of nitrogenase, the key enzyme in this process, are differentiated by the metal cofactors required: iron-molybdate (nifH), iron, and vanadium (vnfDGK). Based on unpublished results showing that vanadium promotes growth of this acidophilic community, primers for conserved regions of nifH and vnfDGK will be used on DNA extracted from the acidophilic community in Polymerase Chain Reactions. Agarose gel electrophoresis will be used to purify amplicons of expected sizes so that they can be subcloned. Confirmation of these clones will first be carried out by restriction digestions and then by sequencing. Sequence data will be analyzed using bioinformatics to determine their relatedness to previously identified nitrogenases. Preliminary data showed that the nifH primers yielded an amplicon of expected size. Results of this work can be used not only to further understand the dynamics of the acidophilic community, but also shed light on the process of nitrogen fixation in this extreme environment.

86. MK1 is a new mutant strain of *E. coli* adapted to growth in galactose/glucose medium
Mnyapara, Haron K. and McCommas, Steven A. Southern Illinois University Edwardsville, Edwardsville, IL.

Numerous studies have shown that dietary fiber may help reduce a person's risk of developing colorectal cancer. In our in vitro model system, we compete *E. coli* strain MG1655 against mutant strains derived from it in minimal medium with various sugar sources that substitute for dietary fiber. Over sequential transfers we analyze the ability of one strain to outcompete the other. Previous findings in the lab have shown that when MG1655 is grown together with mutant CH6 in a galactose/glucose medium, the MG1655 grows faster for several transfers but then a mutant strain takes over the culture. An isolate of the eventual winning mutant bacteria was named MK1 on the assumption that it is a new mutant derived from either MG1655 or CH6. Hypothesis: if MK1 is truly a new mutant, it should outcompete MG1655 immediately, rather than several transfers later. MG1655 was grown in galactose/glucose medium together with MK1 through several transfers. For comparison, the same experiment was done with MG1655 and CH6. The results of these experiments support our hypothesis that MK1 is a new mutant that is better adapted for growing in a galactose/glucose medium than either MG1655 or CH6.

87. Sequencing of the galR gene in a spontaneous mutant, CH6, of *E. coli*
McCommas, Steven A., Herbert, Christopher, Harken, Laura, McFarland, Kyle and Snyder, Caleb. Southern Illinois University Edwardsville, Edwardsville, IL.

Dietary fiber may have a protective effect against colon cancer by binding to lectins present in the diet, thus preventing them from binding to epithelial cells and stimulating mitosis. Consumption of fiber by bacteria would thus increase the risk of cancer. We are studying the selection of bacterial strains in the gut for greater ability to digest fiber with a simplified in vitro system in which *E. coli* is the bacterial species and mono- or disaccharides take the place of polysaccharide fiber molecules. To get an isogenic spontaneous mutant that could digest galactose faster than wildtype, we grew strain MG1655 on minimal galactose medium in the presence of inhibitory concentrations of IPTG. We isolated a mutant, CH6, which grew much faster in these conditions than its parent strain. Sequencing its galR gene revealed a single base-pair change, resulting in a nonconservative amino acid substitution. We assume that this

mutation reduces or abolishes the activity of the galactose repressor protein, accounting for the strain's phenotype.

88. Model system of *E. coli* competition for fiber using LB9 and MG1655
Wallace, Atiyayein A. and McCommas, Steven A. Southern Illinois University Edwardsville, Edwardsville, IL.

A model system was used to better understand what might happen during competition for fiber in the colon. In this experiment LB9, the mutant, and MG1655, the parent strain, were the *E. coli* substitutes for the gut microflora that were used. LB9 was found through selection of MG1655 on a galactose medium and should differ by a single mutation from the parent strain. The substitute for polysaccharide fiber in the model system is a disaccharide, maltose. I first wanted to understand the competition process between these two strains with a standard diet (Luria-Bertani medium) before maltose was added. Knowing there is only a single mutation difference between LB9 and the parent strain I hypothesized that there would not be any difference on the LB medium. The results are inconclusive. In four out of eight experiments LB9 produced more colonies than MG1655, but in the other four experiments MG1655 had slightly more colonies. It seems most likely that if LB9 actually has an advantage in this medium it is a very small advantage.

*** 89. Investigating storage conditions to maximize the methionine-gamma-lyase enzyme activity of the acidophilic archaeon "*Ferroplasma acidarmanus*"**
Cavanah, Kylie A., Khan, Mohammed A. and Hung, Kai F. Eastern Illinois University, Charleston, IL.

Most extremophiles that thrive in extraordinary conditions, such as low pH (pH <3), are Archaeal species. Due to their unusual habitats, extremophiles often exhibit interesting biochemical traits. The archaeon "*Ferroplasma acidarmanus*" strain fer1 (fer1) has several interesting characteristics. This organism grows from pH 0 to pH 4. It requires 100 mM sulfate for growth and produces the volatile organic sulfur compound called methanethiol (MeSH). MeSH can be produced by degradation of methionine by the enzyme methionine gamma lyase (encoded by megL). Based on previous bioinformatics predictions, fer1 contains two copies of megL. Storage conditions that can preserve protein activity will be assayed to facilitate the process of determining fer1 MGL activities via in vitro assays. fer1 as well *E. coli* cells expressing fer1 MGL under control of pET21b vector were cultured, and then harvested to obtain cell lysates. Preliminary data showed that storage at –20°C with the addition of 10% glycerol slowed down deterioration of activity. Additional factors that will be examined include: different storage temperatures, duration of storage, and presence of varying concentrations of glycerol. Enzyme activity for MGL will be assayed using dithio-bis-nitrobenzoate (DTNB) assay. Independent trials and statistical analyses will be carried out to determine significance. Results from this research will help make assays for fer1 MGL activity more efficient by identifying protein storage conditions that cause minimal enzymatic activity deterioration.

90. Competition between wild type strain MG1655 and mutant strain WRL2
Lim, Namkun and McCommas, Steven A. Southern Illinois University Edwardsville, Edwardsville, IL.

Humans consume dietary fiber (polysaccharides) in a normal, healthy diet and some bacteria from the gut eat these polysaccharides as their nutrients. These carbohydrates are supposed to protect a human from colon cancer. However, bacteria might produce mutant strains which are better at digesting fiber molecules than their parent strains. If the mutant strains increased their speed of reproduction and displaced the original strains, the risk of colon cancer might become higher. In order to study this proposed scenario, competition experiments were set up with *E. coli* wild type strain MG1655 and its isogenic mutant strain WRL2. They were grown together on a standard diet of Luria-Bertani (LB) broth. After growth in the LB broth overnight, they were counted on MacConkey agar and a small sample was transferred into fresh LB broth and grown another day. This process was repeated for a total of five times for each experiment. The results show that this mutant, WRL2, grows faster as its parent strain, MG1655.

*** 91. Determination of antimicrobial efficacy of a commercial ambulance disinfectant**
Hoppenrath, Jean M. and McCracken, Vance J. Southern Illinois University Edwardsville, Edwardsville, IL.

To prevent the potential spread of pathogens, ambulance services utilize a fogger to disperse disinfectant within the ambulance to ensure that all surfaces are disinfected. The current studies were undertaken to evaluate the antimicrobial effectiveness of the commercially obtained disinfectant used by a local ambulance service against several microbial species: *Acinetobacter lwoffii, Escherichia coli, Pseudomonas aeruginsoa, Salmonella typhimurium*, and *Staphylococcus aureus*. The minimum inhibitory concentrations (MICs) were determined using serial dilutions of the disinfectant in 96-well microplates; each dilution was tested in triplicate, and two trials were performed for each organism. The disinfectant inhibited growth of all the organisms tested at concentrations well below the strength used by the ambulance services. Specifically, growth of *E. coli* and *S. typhimurium* was inhibited by a 1:8 dilution of the disinfectant, *P. aeruginosa* with a 1:16 dilution, *A. lwoffii* was inhibited with a 1:64-to 1:128 dilution, and *S. aureus* with a 1:256 to 1:512 dilution of the disinfectant. Because the local service uses the disinfectant undiluted, these studies confirm that the disinfectant is effective against a wide range of pathogens. Additional studies are planned, including tests incorporating the fogger as well as testing a wider range of pathogens, such as endospore-forming organisms.

*** 92. Evaluation of *Helicobacter canadensis* (Camplylobacteriales; Helicobacteriaceae) colonization of the mouse gastrointestinal tract**
Crabtree, Amy J., Bertels, Brooklyn A. and McCracken, Vance J. Southern Illinois University Edwardsville, Edwardsville, IL.

Various species of the bacterial genus *Helicobacter* are associated with gastrointestinal disease and cancer in humans and other animals. *Helicobacter canadensis* is a recently discovered pathogen frequently found in geese, but which has also been implicated in human gastrointestinal disease. As part of an ongoing project to develop a mouse model of *H. canadensis* disease, the ability of *H. canadensis* to colonize the mouse gastrointestinal tract was assessed. *Helicobacter*-free adult female C57BL/6J mice received three oral doses over the course of one week of 10^8 CFU *H. canadensis* suspended in a mixture of brain-heart infusion broth and glycerol; control,

uninfected mice were dosed with the BHI/glycerol mixture alone. After 18 weeks, small intestine, cecum, and colon were excised and processed for immunohistochemical analysis using a polyclonal anti-*Helicobacter pylori* antibody which has been shown to react with various other *Helicobacter* species. No *Helicobacter* were detected in tissues from uninfected mice, or from the small intestines of *H. canadensis*-infected mice. Small, helical-shaped bacteria were detected primarily in the mucus lining of the cecum, and, to a lesser degree, the colon of *H. canadensis*-infected mice, indicating a successful infection. Additional PCR-based studies are under way to verify that these are indeed *H. canadensis*.

93. Determining the nitrogen requirements of a defined medium for an acidophilic Archeon to enable testing of functional genomics

McClellan, Jared J., Khan, Mohammed A. and Hung, Kai F. Eastern Illinois University, Charleston, IL.

One of the most spectacular facets of life is its variety. Microbes, in particular, exhibit a broad range of metabolic capacities which allow them to thrive in environments hostile to all other lifeforms. "*Ferroplasma acidarmanus*" strain fer1 (fer1) is a species in the Domain Archaea that thrives in environments as acidic as battery acid. This strain is currently cultured in an undefined medium containing yeast extract. Bioinformatic predictions of the amino acid metabolism of fer1 revealed that one of the biosynthetic enzymes for producing histidine is missing. For tyrosine, on the other hand, all the required enzymes are present. In order to test these hypotheses, a defined growth medium must be established. To verify the precise nitrogen requirement for fer1's growth, it will be cultured in media free of yeast extract and other nitrogenous additives. The media will be supplemented by amino acid mixtures from which selected amino acids are omitted. Three serial passages will be conducted to control for carry-over effects. Growth will be monitored by optical density (520 nm). Independent trials and statistical analyses will be conducted to determine significance of these results. A defined medium will be the necessary first step in allowing further research into fer1's metabolic capacities. These results will also enhance our understanding of how extremophiles exist at the boundaries of life as well as contribute to the developing discipline of functional genomics.

*** 94. Vitamin requirements of the bile acid-dehydroxylating intestinal bacterium *Clostridium scindens***

Paul, Oindrila and Daniel, Steve. Eastern Illinois University, Charleston, IL.

The human gastrointestinal tract harbors a complex microbiota compared to the other parts of the body. The impact of the indigenous microbiota on host physiology is most pronounced in the colon, where the primary bile acids chenodeoxycholic acid and cholic acid are converted, via 7α-dehydroxylation, to the toxic secondary bile acids lithocholic acid and deoxycholic acid, respectively, by *Clostridium scindens*, an obligate anaerobe that resides in the human gut. Interestingly, other than bile acid dehydroxylation, little is known about the basic physiology of *C. scindens*. Understanding the metabolism of *C. scindens* will hopefully provide much-needed information as to how this gut bacterium impacts human health and disease. The goal of our study was to determine the vitamin requirements of *C. scindens. C. scindens* VPI 12708 was routinely maintained in anaerobic BHI broth medium at 37°C. When *C. scindens* was transferred from the BHI medium to a defined medium (DM; 25 mM glucose, minerals, metals, bicarbonate, 100% CO_2 gas phase, and cysteine), growth was negligible. Only when DM was supplemented with a vitamin mix (*p*- aminobenzoate, biotin, cyanocobalamin, folate, lipoate, nicotinate,

pantothenate, pyridoxal, riboflavin, and thiamine) and an amino acid mix (alanine, arginine, asparagine, aspartate, cystine, glutamate, glutamine, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine, and valine) was growth observed. The leave-one-out technique was subsequently used to determine the specific vitamin(s) required for growth. With this technique, three vitamins (biotin, riboflavin, and pantothenate) were found to be essential for the growth of *C. scindens*. Growth was also reduced when pyridoxal or lipoate was absent from DM. This approach is now being employed to resolve the amino acid requirements of *C. scindens*.

Division: Science Education

95. Aurora University's STEM-based internship experience in Biological Science
Beck, Hans T., Davis, Jane, Othman, Saib, Eagle, Sherry and de Lacey, Lora. Aurora University, Aurora, IL.

Aurora University's STEM-based internship experience is part of AU's new Master of Art in Teacher Leadership in Biological Science. Internship in Teacher Leadership (TLDR6200) is a 2 semester credit hour course. For this course, each graduate student is expected to participate in a flexible field experience at one of the partner's sites. The goal of this new internship to provide students with an opportunity to either work with a STEM leader on a project or serve in a teacher leader role during this experience. For 2010, students conducted 96-hour internships in five general groups: outdoor nature organizations (forest preserves, parks and recreation districts, arboreta, outdoor education centers), animal-focused organizations (zoos, animal rehabilitation centers, animal hospitals), government and municipal service organizations (fire/forensic departments, police departments, water quality monitoring agencies), and private companies (water quality assessment, pollution monitoring, green architecture). Each teacher participant reported that they had achieved new content knowledge and procedures, and that they felt they could apply these in their science classrooms for the benefit of their students.

96. Summer research experiences for science students and educators: High school students and teachers doing cancer research at Western Illinois University
McConnell, Rose, Wen, Lisa and Vinod, Thottumkara K. Western Illinois University, Macomb, IL.

A unique applied learning project took place in the Department of Chemistry in the College of Arts and Sciences at Western Illinois University (WIU) in 2009-2010, thanks to a grant funded by the National Cancer Institute (NCI) at NIH in 2009 from funds provided by the American Recover and Reinvestment Act (ARRA). The NCI-ARRA supplement was designed to provide summer research experiences for students and science educators for summer 2009 and summer 2010. The goal of the research was to develop inhibitors to slow or stop the activity of cathepsins B, D, and K, which are protease enzymes that promote metastases in tumors found in breast cancer and colorectal cancer. WIU undergraduate students, as well as area high school students and faculty comprised the research team for the project for summers 2009-2010, including three high school teachers, nine high school students, and nine undergraduate students. In addition to the larger benefits of developing compounds to slow the growth of cancer, this project also gave students and faculty from the high schools the opportunity to understand the value of research through real life, hands-on training funded through a national grant. This project trained existing faculty, as well as students who will someday become scientists and engineers. This enhanced

learning experience was designed to inspire human curiosity by instilling in the participants a sense of discovery. While the main project was about the development of new medicines, another outcome was the development of new scientists and new science teachers who will carry the inspiration on in their future classrooms.

Division: Physics, Mathematics & Astronomy

*** 97. Computational study of the thermal properties of nanofluids**
Meadows, Alexander and Zou, Jie. Eastern Illinois University, Charleston, IL.

Nanofluids are composite materials that consist of a base fluid and nanometer-sized suspended, solid particles. Experimental studies have shown that nanofluids have significantly higher thermal conductivity than the base fluid. This property has made nanofluids attractive for thermal management applications. The heat conduction mechanisms in nanofluids are still not well understood, however. In this project, we carried out a computational study of the thermal conductivity of nanofluids, focusing specifically on liquid argon loaded with copper nanoparticles. We ran a molecular dynamics simulation to keep track of the positions and velocities of the argon and copper atoms as the system reached equilibrium, and then computed the thermal conductivity as a function of temperature and the number of nanoparticles using Green-Kubo theory.

Division: Health Sciences

98. Cubicin effects on murine immune response
Adkins, Eric[1], Cerentano, Kari[2], Miles, Samantha[2], Nisbeth, Martel[2], Khazaeli, Sadegh[2] and Kitz, Dennis J.[1] [1]Southern Illinois University Carbondale, Carbondale IL. [2]Southern Illinois University Edwardsville, Edwardsville, IL.

Cubicin (Daptomycin) Cubist Pharmaceuticals is the first FDA-approved drug in the cyclic lipopeptide class. This bacteriocidal drug depolarizes membranes of gram-positive bacteria leading to inhibition of DNA, RNA and protein synthesis and cell death. From our previous work we have seen that many antibiotics affect host immune responses, and therefore we wished to test cubicin in some of our assays. Cubicin significantly enhanced macrophage fungicidal activity, but had no effect on cidal activity by neutrophils. Cubicin also significantly enhanced DTH to the contact sensitizing chemical DNFB. Cubicin is currently approved for treating drug-resistant gram-positive bacteria including MRSA, and perhaps this success in therapy is also partly driven by this immune enhancement. This work was supported in part by the NSF-funded LS-AMP Research Scholar's Program and the Max Baer Heart Fund, Fraternal Order of Eagle's.

99. Some immune responses are enhanced by tigecycline
Morgan, Michelle, Hazelhurst, Ryan, Hendree, Shannan, Khazaeli, Sadegh and Kitz, Dennis J. Southern Illinois University Edwardsville, Edwardsville, IL.

Tigecycline Wyeth is a tetracycline-class antibiotic that targets aerobic and anaerobic, gram-positive and gram-negative bacteria including drug-resistant strains of *Staphylococcus aureus*. Although the parent compound tetracycline does not appear to stimulate murine immune responses, we still wished to test tigecycline in our assay systems. Tigecycline significantly enhanced macrophage fungicidal activity and DTH response to the contact sensitizing chemical

DNFB; while no effect was seen on neutrophil fungicidal activity or candidal clearance from internal organs following iv challenge. These assays show that tigecycline mediates immune enhancement thru T cells and macrophages. However additional study of tigecycline is needed to elucidate any effects on B cells and exactly how the drug interacts with the immune system. This work was supported in part by the NSF-funded LS-AMP Research Scholar's Program and the Max Baer Heart Fund of the Fraternal Order of Eagle's.

100. Glycopeptide antibiotic effects on host immune response

Fulling, Patrick, Hartman, Jason, Hurt, Mariah, Basso, Gina, Khazaeli, Sadegh and Kitz, Dennis J. Southern Illinois University Edwardsville, Edwardsville, IL.

Vancomycin Eli Lilly is a tricyclic glycopeptide antibiotic that expresses bacteriocidal activity thru effects on the cell wall, cell membrane and RNA synthesis. It is often used to treat drug-resistant *Staphylococcus aureus* and pseudomembraneous enterocolitis due to intestinal overgrowth of *Clostridium difficile*. Dalbavancin Vicuron/Pfizer is a lipoglycopeptide used for treating gram-positive skin and soft tissue infections including vancomycin-resistant *Staphylococcus aureus* and enterococci. Vancomycin had little effect on macrophage killing of yeasts, but neutrophil fungicidal activity was slightly enhanced. Dalbavancin slightly enhanced both neutrophil and macrophage fungicidal activity. Both drugs also boosted DTH response to the contact sensitizing molecule DNFB. We plan to examine both drugs effect on organ clearance of yeasts and on B cell function; and to obtain the third commercially available glycopeptide drug teicoplanin for study. Vancomycin and dalbavancin are a last line of defense against certain drug-resistant bacteria, and perhaps their non-specific immune enhancement may contribute to the antimicrobial activity observed, This work was supported in part by the NSF-funded LS-AMP Research Scholar's Program and the Max Baer Heart Fund, Fraternal Order of Eagle's.

101. Ticarcillin effects on host immune response

Miles, Samantha, Cerentano, Kari, Basso, Gina, Hartman, Jason and Kitz, Dennis J. Southern Illinois University Edwardsville, Edwardsville, IL.

Ticarcillin is a carboxypenicillin molecule that is currently available as Timentin GlaxoSmithKline and clinically used as an injectable drug for treating gram-negative bacteria, especially *Pseudomonas aeruginosa*. Its antibiotic activity resides in preventing cross-linking of peptidoglycan in the cell wall. Clavilinic acid, a beta-lactamase inhibitor, is often included in timentin to block drug-resistance. In our assays, Ticarcillin failed to stimulate fungicidal activity in either neutrophils or macrophages, and there was no enhancement of DTH to DNFB. While many antibiotics are found to stimulate immune responses, they usually show activity with bacterial ribosomes and membranes. Ticarcillin has no such antimicrobial activity so it is not surprising it has no effect on the immune cells tested. This work was supported in part by the Max Baer Heart Fund, Fraternal Order of Eagle's.

*** 102. Antagonism of adenosine A1 receptors by 8-cyclopentyl-1,3-dipropylxanthine stimulates respiration in newborn rats**

Marcelin, Alain C. and McGilliard, Kip L. Eastern Illinois University, Charleston, IL.

Neonatal apnea, a temporary cessation of breathing in newborns, is commonly treated by methylxanthines such as caffeine or theophylline. The methylxanthines are known to stimulate

respiration in infants who are at risk of apnea spells, but they also cause unwanted side effects, such as cardiostimulation. A related drug, 8-cyclopentyl-1,3-dipropylxanthine (DPCPX), is highly selective for antagonism of adenosine A1 receptors in the brain. It is proposed that a selective adenosine A1 antagonist can stimulate respiration in newborn rats. The effects of DPCPX on respiration were tested in 4- to 7-day-old rats. Each rat was placed in a heated body plethysmograph, and its respiratory rate and volume were measured using a flow transducer, pneumotachograph, and PowerLab data acquisition system. After a 10-min control period, each rat was given a s.c. dose of DPCPX (80, 160, 320, or 640 ug/kg) or saline. Respiration was then recorded continuously for one hour, and comparisons were made at 5-min intervals. Minute ventilation (VE), tidal volume (VT), respiratory rate, and mean inspiratory flow (MIF) decreased by 15-20% after saline treatment. DPCPX significantly increased VE and MIF in a dose-dependent manner, resulting in nearly a 20% increase by 10 min after the 640 ug/kg dose. The increase in VE appears to be primarily due to an increase in respiratory rate, with no significant change in VT. It is concluded that selective antagonism of adenosine A1 receptors contributes to respiratory stimulation in newborn rats.

*** 103. Antagonism of adenosine A1 receptors by 8-cyclopentyl-1,3-dipropylxanthine stimulates heart rate in neonatal rats**

Cassidy, Daniel P. and McGilliard, Kip L. Eastern Illinois University, Charleston, IL.

Methylxanthines, such as caffeine or theophylline, are used in the treatment of neonatal apnea due to their ability to stimulate respiration. This beneficial effect is accompanied by irritability and increased heart rate. The xanthine analog, 8-cyclopentyl-1,3-dipropylxanthine (DPCPX), has a high affinity for adenosine A1 receptors in the brain. It is proposed that this selective adenosine A1 antagonist can stimulate respiration in neonates without some of the unwanted side effects, such as markedly increased heart rate, caused by methylxanthines. The effects of DPCPX on heart rate were tested in unanesthetized 4- to 7-day-old rats. Heart rates were determined by recording the electrocardiogram (ECG) using skin surface mini-electrodes on gently restrained rats. After a 10-min control period, each rat was given a s.c. dose of DPCPX (80, 160, or 320 ug/kg) or saline. The ECG was recorded continuously for the next hour and measurements were made at 5-min intervals. Control heart rates averaged 325 + 5 beats/min. While saline injection produced no change in heart rate, DPCPX caused a dose-dependent increase in heart rate. All doses peaked at approximately 40 min, creating statistically significant changes in heart rate equal to 16%, 26%, and 36% for doses of 80, 160, and 320ug/kg, respectively. It is concluded that DPCPX acts as a potent cardiostimulant in neonatal rats at approximately the same doses that stimulate respiration.

*** 104. *Helicobacter canadensis* (Camplylobacteriales; Helicobacteriaceae) induces interleukin-6 expression in a mouse intestinal epithelial cell line**

Daniels, Abbey L. and McCracken, Vance J. Southern Illinois University Edwardsville, Edwardsville, IL.

The bacterium *Helicobacter canadensis* colonizes the gastrointestinal tracts of many avian and mammalian populations. In areas with large goose populations, such as the Southern Illinois University Campus, contact with *H. canadensis* may be a potential source of disease. Previous studies by our lab have shown that Canada geese on the SIUE campus harbor intestinal Helicobacters and, further, that expression of the proinflammatory cytokine IL-8 is upregulated in human epithelial cells infected with *H. canadensis*. As part of an ongoing project to develop a

mouse model of *H. canadensis* infection, we have evaluated the response of Mode K cells, a mouse colonic epithelial cell line, to *H. canadensis*. Mode K cells were counted and OD readings were taken from the bacteria to determine a multiplicity of infection (MOI) of 100. Mode K cells were infected with *H. canadensis* or treated with TNF-α at 10 ng/ml (positive control for proinflammatory cytokines) and incubated for 3 hours; negative control wells received cell culture medium alone. mRNA expression of IL-6 was increased 2.1 fold ($p<0.05$) in *H. canadensis*-treated Mode K cells relative to untreated cells, as determined using RT-PCR. Expression of CXCL2, a chemokine that recruits T cells in response to infection, was also evaluated. However, *H. canadensis* did not upregulate mRNA expression of CXCL2 in the Mode K cells. These studies indicate that Mode K cells recognize *H. canadensis* and respond by inducing an inflammatory response, including IL-6 expression.

*** 105. A mouse model of infection by the emerging pathogen *Helicobacter canadensis* (Campylobacteriales; Helicobacteriaceae)**

Bertels, Brooklyn A. and McCracken, Vance J. Southern Illinois University Edwardsville, Edwardsville, IL.

Helicobacter is a genus of Gram-negative bacteria that reside in the lining of the gastrointestinal tract of most mammals and some avian species and that cause gastric, intestinal, and hepatic disease. The focus of this study was the development of a mouse model of disease for the novel species *Helicobacter canadensis*, a member of a group of *Helicobacter* called enterohepatic *Helicobacter* species, that can infect both the intestine and the liver. *H. canadensis* has previously been isolated from the feces of diarrheic humans and is associated with acute diarrheal disease and possibly inflammatory bowel disease. This study is the initial step to understanding the mechanisms by which *H. canadensis* induces disease. Female C57BL/6J mice were infected 3 times over a one-week period with 10^8 CFU of *H. canadensis* resuspended in a mixture of brain heart infusion broth and glycerol; control, uninfected mice received the BHI/glycerol mixture alone. Mice were weighed weekly and monitored daily for signs of diarrhea, illness behavior associated with intestinal disease (avoidance, piloerection, hunching), and perianal inflammation. Eighteen weeks after the initial infection, small intestine, cecum, and colon were harvested for histologic analysis. Although immunohistochemical analysis revealed that the cecum and large intestine of *H. canadensis*-infected mice were colonized by *Helicobacter* there was no evidence of microscopic inflammation in the tissues. No diarrhea, weight loss, illness behavior, or perianal inflammation was observed in infected or uninfected mice.

Division: Cell, Molecular & Developmental Biology

*** 106. Putative neurotransmitter modulation of *Lumbricus terrestris* (Lumbricidae) body wall contractions**

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

The effects of neurotransmitters on the body wall mechanical activity of *L. terrestris* have yet to be shown. Furthermore a protocol regarding the measurement of body wall contractions has not been established. It has been suggested that neurotransmitters modulate spontaneous body wall contraction due to neuromuscular junction studies. To investigate body wall modulation, a dorsal strip of 10 segments anterior to the clitellum was removed from the animal and placed in a tissue

bath. Contractions were measured with a force transducer, and analyzed with LabScribe. The tissue was exposed to increasing concentrations of the neurotransmitter of choice, and the resulting changes in contractions were used to create log-dose response curves. 5-hydroxytryptamine increased contraction frequency and decreased contraction amplitude at a threshold of 10 nM. Acetylcholine decreased contraction frequency and increased contraction amplitude at a threshold of 10 nM. Octopamine had no significant biological effect on contraction frequency and amplitude. Epinephrine decreased contraction frequency and increased contraction amplitude at a threshold concentration of 1.0 nM. Norepinephrine increased contraction frequency and amplitude at a threshold concentration of 0.1 to 1.0 μM and 1.0 to 10 mM. GABA decreased contraction frequency at a threshold of 1.0 nM. GABA did not significantly change contraction amplitude. FMRFamide increased both contraction frequency and amplitude at a threshold of 0.1 μM. We are currently exploring the effects of dopamine on the body wall.

*** 107. Effect of PKC activation on cell motility in EB1 knock-down mouse melanoma cells**
Cain, Janine M. and Schober, Joseph M. Southern Illinois University Edwardsville, Edwardsville, IL.

Introduction: Activation of PKC with phorbol esters can cause increased cell motility. The EB1 protein is a microtubule binding protein that is also involved in cell motility. The signaling cascade involved with EB1 protein binding and function has not yet been elucidated. In this study we tested whether activation of PKC can increase cell movement in cells devoid of the EB1 protein. Method: Cell movement over 18 hours was studied in EB1 knockdown and control B16F10 mouse melanoma cells with and without 100nM of the phorbol ester, PMA. Results: Control B16F10 cells treated with PMA travel significantly further and faster than control cells not treated with PMA. No significant difference in cell velocity or distance traveled was found between EB1 knock-down cells, whether treated with PMA or not treated with PMA. Control cells have increased rate of movement and increased distance traveled compared to EB1 knock-down cells. Conclusion: Although PMA exposure does increase rate and distance of cell translocation in control B16F10 cells, it does not have a significant effect on EB1 knock down cells suggesting EB1 protein is required for normal PKC activity.

*** 108. Chromosomal mapping of genes silenced in rodent cell hybrids**
Lopez, Andrew G., Roe, Allixandra L. and Bulla, Gary. Eastern Illinois University, Charleston, IL.

Differential gene expression is a hallmark of cellular differentiation in higher eukaryotes that directs tissue-type and requires both gene activation and silencing. Mechanisms responsible for gene silencing in eukaryotic cells are not understood. Although transcription factor availability is known to play a key role, heterochromatic spreading (a phenomenon whereby a gene is repressed due its close proximity to another silenced gene) may also contribute to silencing. Mammalian cell hybrids are a model system that exhibit extensive gene silencing of tissue-specific genes. The purpose of this study was to determine if gene silencing in cell hybrids occurs in clusters, indicative of potential heterochromatic spreading.
Whole genome expression profiles were done using Affymetrix microarrays using RNA derived from rat hepatoma (FTO2B), rat fibroblast (RAT1) and FTO2B x RAT1 hybrid (termed FR) cells. Genes that were silenced (>5-fold repression) in cell hybrids were identified (~300 in each cell type) and chromosomal locations mapped using e!Ensembl, a genome database website.

Initial analyses identified a large number of clusters. However, subsequent editing of duplicated targets present in the microarray reduced the number of identified silenced gene clusters in the hybrid cells to five clusters of hepatoma-specific genes and only one cluster of fibroblast-specific genes. We conclude that it is unlikely that heterochromatic spreading plays a large role in the gene silencing phenotype observed in mammalian cell hybrids.

109. Competing a mutant *E. coli* strain, RDF3, with wild-type strain, MG1655 in a rich medium

Cain, Kimber and McCommas, Steven. Southern Illinois University Edwardsville, Edwardsville, IL.

Dietary fiber promotes health by reducing the risk of colon cancer and levels of cholesterol. There are two types of fiber: soluble and insoluble. They cannot be digested and are therefore not taken into the bloodstream. Instead insoluble fiber can head through the intestines, while soluble fiber attaches to fatty acids. Soluble fibers are large complex carbohydrates (polysaccharides); mitogenic lectins that bind to soluble fiber molecules cannot bind to epithelial cells, which may substantially reduce colon cancer risk. Our gut contains a few thousand different types of bacteria. In our experiment, we took the Reductionist approach where we chose to use a model organism (*E. coli*) that could digest a variety of carbohydrates and create an isogenic mutant that makes it better at utilizing galactose. I have been working with wild type (MG1655) and mutant (RDF3), letting them grow in a complete medium, LB Broth with a sugar, maltose. My goal is to compete the two strains in this rich medium, without galactose, and see which one grows faster. Thus far, my mutant strain has proven to be better than the wild type in this environment, suggesting that our hypothesis is correct that a single, point mutation could give a new strain a real advantage over its ancestor.

110. The action of decamethonium on the gut of the earthworm, *Lumbricus terrestris* (Lumbricidae)

Krajniak, Kevin G. and Kuo, Chien. Southern Illinois University Edwardsville, Edwardsville, IL.

Spontaneous motility of the digestive tract in the earthworm, *Lumbricus terrestris* is modulated by acetylcholine (ACh). In mammalian motor endplate, decamethonium binds to cholinergic receptors, causes depolarization, and blocks the effects of ACh. The goal of this project was to determine whether decamethonium had a similar effect on earthworm gut smooth muscle. A gizzard ring was removed from the worm, placed in a tissue bath, and attached to a force transducer. Contractions were recorded on a computer using an Iworx Systems A –D converter. To determine the effects of ACh, increasing concentrations were added to the tissue bath and the responses were used to construct a log-concentration curve. Other rings were treated to increasing concentrations of decamethonium followed by 10-4M ACh. The isolated gizzard ring responded to Ach, with increases in amplitude and frequency (threshold 1 μM). Decamethonium induced larger responses than those induced by 1 μM Ach. The contraction frequency increased as the decamethonium concentration increased with a maximum at 1 μM and then decreased slightly at 10 μM. The same effect was seen with contraction amplitude in which decamethonium initially caused an increase with a maximum at 0.01 μM and then a decrease. Thus it appears decamethonium mimics the action of ACh, but does not block the receptor as in the mammalian motor endplate.

*** 111. Apoptosis induction by hygromycin B in human cancer cells**

Hanson, Katie F.[1], Marten, Andrew[1], Santander, Javier[2] and Wanda, Paul E.[1] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]Arizona State University Tempe, Tempe, AZ.

Hygromycin B (Invitrogen) is an aminoglycoside antibiotic that induces apoptosis after attaching to the ribosome and interfering with protein synthesis in sensitive mammalian cells. It has been reported to function in certain cell lines independently of the p53 protein [1]. It is unclear whether this chemical triggers apoptosis by the extrinsic or intrinsic pathway. In order to begin investigating this we treated HeLa INT 407 cells with 500 μg/ml of hygromycin B for varying lengths of times. Apoptosis was assessed using the trypan blue exclusion test, DAPI staining, and phase contrast microscopy. As early as 8 hours post-treatment morphological changes were detected. Membrane blebbing was observed by phase contrast microscopy and chromatin condensation, visible as a decrease in nuclear volume, was revealed in treated cells by fluorescent microscopy. Preliminary data suggests the mechanism of apoptosis was through the intrinsic pathway. We gratefully acknowledge support from the Fraternal Order of Eagles-Granite City Aerie 1126. [1] Chen, G., Branton P. E., and Shore G. C. (1995). Induction of p53-independent apoptosis by hygromycin B: suppression by Bcl-2 and adenovirus E1B 19-kDa protein. Experimental Cell Research. 221, 55-59.

*** 112. Investigations of a putative G-protein coupled receptor in *Schizophyllum commune* (Aphyllophorales)**

Dorchincez, Kate M. and Fowler, Thomas J. Southern Illinois University Edwardsville, Edwardsville, IL.

Schizophyllum commune is a mushroom-forming fungus that has a history as a genetic model for mating-type. *S. commune* strains recognize compatible mates with the guidance of pheromones and their seven-transmembrane receptors that are coded in a mating type locus, matB. Recent analysis of the *S. commune* genome (Ohm et al., 2010) documented four additional transcribed pheromone receptor-like genes located outside the proposed boundaries of *matB*. These receptor-like genes do not produce any mating response in a *matB* sterile mutant (Dorchincez et al., unpublished observations). A fifth pheromone receptor-like gene was identified in a strain different from the one used for *S. commune* genome sequencing, and was the first pheromone receptor-like gene to be closely investigated (Banerjee, Ph.D thesis). This gene, *pheromone-receptor-like 1* (*prl1*), appears to be constitutively transcribed at high levels. A disrupted *prl1* gene in the *S. commune* strain HK28 appears to prevent formation of hyphal aggregations such as mounds and fruiting bodies. Further molecular analysis of *prl1* shows that many key amino acid residues found in related receptors are also present in *in silico* translated *prl1*, although the splicing pattern of *prl1* in comparison to related genes is still under scrutiny and appears that it may be different. The truncated C-terminus of the predicted protein appears to have been the result of a crossover between *prl1* or its precursor and another mating pheromone gene, resulting in introduction of a stop codon that shortens the predicted intracellular C-terminus.

*** 113. Phase shift temperature as a marker for membrane fluidity increases during UV-induced apoptosis**

Robb, Dustin, Diecker, Garrett, Shaw, Michael and Wanda, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

UV-Induced apoptosis involves a reorganization of membrane surface proteins facilitated by an increase in membrane fluidity. This fluidity increase has previously been documented in several labs, including our own. Future and concurrent experiments should help elucidate this pathway. Our current experiment utilizes a Bruker Electron Spin Resonance Spectroscopy (ESR) to measure the tumbling rate of a nitroxide spin label integrated into Human Leukemia, HL60 cells. The tumbling rate was measured over a range of temperatures to determine the phase shift, or gel-liquid transition, temperature of the membrane. Induction of apoptosis in these cells appears to cause a marked decrease in phase shift temperature denoting an increase in membrane fluidity. We gratefully acknowledge support from the Fraternal Order of Eagles –Granite City Aerie 1126.

*** 114. Staining *Schizophyllum commune* (Aphyllophorales) with DAPI and Pontamine Fast Scarlet 4B to visualize a dikaryon to diploid transition**

Bridges, Brandy L. and Fowler, Thomas J. Southern Illinois University Edwardsville, Edwardsville, IL.

Wild-type *S. commune* has two distinct and long-lived phases, the haploid monokaryon and the dikaryon. The dikaryon is competent to form fertile fruiting bodies (mushrooms). A third phase, a monokaryotic diploid, occurs only in basidial cells on the fruiting body and is very brief. A dominant mutant of *S. commune*, called *Dik-* (dikaryonless, Gladstone 1972), undergoes premature karyogamy that results in diploid hyphal cells soon after mating and well prior to formation of fruiting structures and basidia. The stereotypical clamp connections made at each septum by the *S. commune* dikaryon are not made by the diploid, a clear landmark for the transition. The goal of the project was to visualize the transition from dikaryon to diploid in this mutant strain by staining cell walls and nuclei after a mating with *Dik-*. Earlier reports suggested the transition occurs within a few cell generations following dikaryon establishment by compatible mates. In order to visualize the cell walls and nuclei, the DNA stain DAPI was used in combination with a recently published cell wall stain, Pontamine Fast Scarlet 4B (S4B). Genetic tests of hyphae were used to distinguish haploid from diploid monokaryons. The S4B stain has a small range of useful concentrations on live *S. commune*. Calcofluor was also used to stain cell walls and served as a control to clearly identify hyphal structures.

*** 115. FMRFamide receptors in *Lumbricus terrestris* (Lumbricidae) gizzard and intestine**

Miller, Tyler M. and Krajniak, Kevin. Southern Illinois University Edwardsville, Edwardsville, IL.

FMRFamide receptors are located in the gizzard and intestine of the earthworm, *Lumbricus terrestris*. FMRFamide has been shown to stimulate contractions in these organs. The focus of this project was to generate a structure-activity relationship (SAR) using isolated gizzard-rings and intestines in tissue baths. We applied increasing concentrations of neuropeptides to these tissues, recorded the mechanical activity, and constructed log-concentration response curves. The tissues were challenged with FMRFamide, D-FMRFamide, F-D-MRFamide, FM-D-RFamide, FMR-D-Famide, and FMRF. The results showed that natural positioning of each amino acid in

the neuropeptide (meaning the L configuration and not the D configuration) on the N-terminus of the FMRFamide neuropeptide is more critical for the receptor to recognize and bind to the neuropeptide, than the positioning on the C-terminus in the intestine. FMRFamide caused an elloincrease in the rate of contractions of the intestine with a threshold between 0.1 to 1 nM. When challenged with D-FMRFamide there was a drastic increase in potency to 0.01 nM. When the methionine, arginine, and the C-terminal phenylalanine were changed to the D-conformation there was no response from the intestine to concentrations as high as 10 µM. Preliminary results for gizzard-rings indicate FMRFamide and D-FMRFamide are recognized by the receptor. FMRFamide caused an increase in contraction rate with a threshold of 1nM. The same threshold value (1nM) was seen for D-FMRFamide. The remaining neuropeptide configurations are currently being investigated.

*** 116. Pheromone receptor-like gene *prl1* is unlinked to the *matB* locus in *Schizophyllum commune* (Aphyllophorales)**

Babyak, Meagan L. and Fowler, Thomas J. Southern Illinois University Edwardsville, Edwardsville, IL.

The pheromone receptor-like gene *prl1* of *Schizophyllum commune* has been associated with multicellular development because a strain altered at *prl1* is unable to produce fruiting structures or abnormal multicellular growths called mounds (G. Banerjee, Ph.D. dissertation). The *prl1* gene appears to be strain specific and is not found in the nearly complete *S. commune* genome sequence. The predicted protein for *prl1* is a seven-transmembrane domain receptor protein that has the greatest amino acid identity with *S. commune* mating pheromone receptors and pheromone receptors of other mushroom fungi. Unlike these other receptors, Prl1 is predicted to have almost no carboxy-terminal cytoplasmic tail. Southern hybridization using a portion of *prl1* as a probe suggested that *prl1* is found in strains with one particular *matB* version, *B-alpha 9*. To test whether *prl1* might be part of *B-alpha 9*, crosses were made to test for linkage between *B-alpha 9* and *prl1*. These tests support independent assortment of the two loci. We conclude that the association with *B-alpha 9* is likely recent, and that *prl1* was introduced into the uncommon *B-alpha 9* strain background as part of strain development in the laboratory. Tests continue to identify genetic markers that are linked to *prl1* to determine its location.

*** 117. Difference in phenotypic expression between two transformed constitutive receptors is not due simply to copy number of the introduced gene**

Bauza, Joel T. and Fowler, Thomas J. Southern Illinois University Edwardsville, Edwardsville, IL.

Two constitutive mutant pheromone receptors, Bbr1L205P and Bbr1L213P, were constructed previously to look at the effects of constitutive pheromone receptors on *Schizophyllum commune* and to develop a means to dissect pheromone signaling. Many independent transformants containing the activity of one of these two receptors were generated. Bbr1L213P transformants consistently produced the expected phenotype for constitutive pheromone signaling. Bbr1L205P transformants that appeared to have constitutive activity were found to have less consistent mutant phenotypes and a shift between wild-type and mutant appearance would apparently be accentuated with environmental changes (temperature/light). These phenotypic differences may be due to real differences between the two receptors because of their mutations. However, it might also be for other reasons, such as the number of receptor genes in each transformant. We hypothesized that the expression of the phenotypes of these two constitutive mutants may be

related to the number of copies of the transgene that was introduced, with stronger constitutive expression positively correlated with more integrated copies. Southern hybridization was used to test this hypothesis. While some transgenic strains integrated many copies, there was not a clear relationship between copy number and the strength of the constitutive phenotypes. Surprisingly large numbers of integrated copies of the transgene appear in some transformants for which the reason is not clear at this time.

*** 118. UV-A and UV-B induction of lysosomal membrane permeabilization in human HL-60 leukemia cells**

Martens, Andrew J., Bishop, Nick, Worthington, Ronald and Wanda, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

Recent data suggests that lysosomal alterations sensitize cancer cells to a cell death pathway involving lysosomal membrane permeabilization (LMP) and the release of cathepsins into the cytosol. This LMP cell death pathway circumvents the traditional signaling routes of apoptosis, although the exact mechanisms and inducers of this phenomenon remain unknown. In this study, we explored UV light as a possible inducer of apoptosis. HL-60 cells were induced by UV-A or UV-B irradiation and caspase activity was simultaneously quantified and inhibited at various time intervals with a fluorescent caspase inhibitor Vybrant FAM poly caspases assay kit (Molecular Probes). Propidium iodide staining was used in all groups to indicate cell death. Fluorescence was detected on an Accuri C6 flow cytometer. Preliminary data indicates early inhibition of caspase activity after UV-A and –B exposure leads to a significant amount of cell death (up to 25%), suggesting a caspase-independent route of cell death has occurred. It is hypothesized that LMP is a major contributor to this death route. We gratefully acknowledge support from the Fraternal Order of Eagles – Granite City Aerie 1126.

*** 119. Analysis of the gravity persistent signal in the gps5 mutant**

Egan, Matthew J. and Luesse, Darron R. Southern Illinois University Edwardsville, Edwardsville, IL.

Plants can sense changes in their environment and alter their growth accordingly. Gravitropism is the process of a plant altering its growth in response to gravity. This response is achieved by the plant perceiving the gravity signal, changing that information into a biochemical signal, and enhancing cell elongation on one side of the plant, leading to differential growth. Although gravity sensing and differential growth are fairly well understood, the steps involved in signal transduction remain mostly unknown. The goal of this research is to identify the components of the signal cascade in gravitropism. To study the effects of gravitropism, the Luesse lab employs the use of the model plant *Arabidopsis thaliana*. We are studying a mutant of *Arabidopsis*, gravity persistent signal 5 (gps5) that has a hypergravitropic phenotype after a cold gravity treatment. PCR analysis has indicated that GPS5 is an E3 ubiquitin ligase, likely acting as part of the cellular machinery that marks proteins for degradation. While the mechanism is understood, the target(s) of GPS5 remain unknown. Our hypothesis is that in wild-type plants, GPS5 down-regulates growth factors, but in gps5 mutants, these proteins are still active, leading to increased growth. A microarray was performed between wild type and gps5 plants and the results were analyzed to identify any genes involved in the gravity response further downstream of GPS5.

120. GABA's effect on the crop-gizzard of the earthworm *Lumbricus terrestris* (Lumbricidae)

Stassi, Kory. Southern Illinois University Edwardsville, Edwardsville, IL.

Gamma amino butyric acid, most commonly known as GABA, is an inhibitory neurotransmitter that is essential for proper brain functioning. However, it is also present in the nerves of the earthworm digestive tract. We have been studying the contractions of the crop-gizzard in the earthworm, *Lumbricus terrestris*, and we have decided to examine what effects GABA has on contractility. In the experiment, the crop-gizzard of the worm was removed and placed into a bath filled with worm saline. All movements of the crop-gizzard were recorded with a Grass force transducer and were displayed by Iworx Labscribe 2 on a computer. Increasing concentrations of GABA were added to the bath and adequate time was allowed for it to take effect. The resulting changes in contractions were used to create log-concentration response curves. GABA caused a biphasic change in contraction amplitude. Amplitude increased with a threshold around 10^{-10} M and decreased with a threshold of 10^{-9} M. Frequency slightly decreased with a threshold of 10^{-6} M. From this data, it appears that GABA may be involved in crop-gizzard regulation in *L. terrestris*.

ORAL PRESENTATION ABSTRACTS

An asterisk (*) indicates the presenters eligible for a Student Presentation Award.

Division: Botany

*** 1. The understory flora of Duck Creek Nature Trail at Silver Springs State Park, Kendall County, Illinois**

Mestek, Gerry and Beck, Hans T. Aurora University, Aurora, IL.

The understory flora at Silver Springs State Park was surveyed during the growing season of 2010. Silver Springs State Park was first established in 1969, when the State of Illinois purchased 1,250 acres. Since that time an additional 100 acres has been added, which includes a 30-acre prairie restoration site. The wooded areas are bordered by 6.4 km of the Fox River, which winds its way through the park. This study was conducted at three transect locations within the Duck Creek Nature Trail section of Silver Springs Park. These transect locations included an Upland Forest, Bottomland Forest and Prairie location. A total of 113 taxa, representing 44 families, were identified in or immediately adjacent to the trail. Sixty-eight percent of the taxa observed were native to Illinois. The quality of this natural site was assessed by using the National Wetland category as described by Swink and Wilhelm using quantitative methods based upon floral composition and diversity. The site was found to have a mean C value of 4.47, a modal of 5, and a floristic quality index (I) rating of 40.47. These results indicate that Silver Springs State Park is a site adequate in natural floristic quality to be worthy of protection and preservation.

2. Phenological niche separation from native species increases reproductive success of an invasive species: *Alliaria petiolata* (Brassicaceae)

Timpe, Megan J. and Anderson, Roger C. Illinois State University, Normal, IL.

Successful biological invasion requires correspondence between invader functional traits and their adaptability in novel environments. We focused on phenological and ecophysiological characteristics of *Alliaria petiolata*, related to its successful invasion of deciduous forests in eastern North American. We tested for phenological separation between the biennial *A. petiolata* and native groundlayer species during spring of its 2nd year and assessed importance of availability of high irradiance before tree canopy closure on growth and reproductive output. We experimentally shaded plants *in situ* during 3 intervals: (1) before native groundlayer was well developed (March 3 - April 20), (2) after April 20 to tree canopy closure (May 18), and (3) after canopy closure to May 29. We measured maximum photosynthetic rates (A_{max}) in early (April 13-14) and late (May 22-26) spring. *Alliaria petiolata* reached maximum cover earlier than most native species. Shading effect on plant growth and resource allocation to vegetative growth and reproduction varied depending upon timing and duration of shading. Comparison of treatments differing by being shaded or unshaded in only one of the 3 intervals showed that unshaded plants consistently had significantly higher production than shaded plants only during the 1st interval. Greatest A_{max} occurred in early spring, when groundlayer irradiance was high. Success of *A. petiolata* in invading this community is likely related to phenological niche separation and temporal availability of resources unavailable to most native species in early spring.

*** 3. Pre-contact plant use at the Gehring Site: Synergy between culture and environment**
Guthrie, Johanna M., Holt, Julie Z., Vogel, Gregory and Brugam, Richard B. Southern Illinois University Edwardsville, Edwardsville, IL.

Beneath the developed highways and suburban sprawl of the St. Louis metro east, the American Bottom (the Mississippi River floodplain) contains a wealth of archaeological information. This area was home to a thriving population of Native Americans for thousands of years and, at one point, to the largest city north of Mexico. These Native Americans domesticated several native plant species, and also adopted maize agriculture. The evolution of plant species and the emergence of agriculture is a topic of great interest and study among both ecologists and archaeologists, particularly in the American Bottom and surrounding areas, given that it is a center for independent invention of agriculture. The continued excavation of the Gehring archaeological site (11MS99), located on the SIUE campus, allows for recovery of plant remains left during important cultural time periods of the Native Americans who once occupied the area. The goal of this study is to use the plant remains recovered to reconstruct the plant usage of the individuals who occupied the Gehring site. This will give insight into the ecological evolution of the local environment and cultural evolution of subsistence practices of the humans who inhabited it.

*** 4. Evidence for hybridization between *Schoenoplectus hallii* and *S. saximontanus* (Cyperaceae) using ISSR markers**
Stapay, Tara[1], Smith, Marian[1], McKenzie, Paul[2] and Esselman, Elizabeth.[1] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]U.S. Fish and Wildlife Service, Columbia, MO.

Schoenoplectus hallii, or Hall's bulrush, belongs to *Schoenoplectus* section *Supini* (Cherm.) J. Raynal in the family Cyperaceae. This annual species is confined to wetland habitats with variable water levels. The species is of conservation concern wherever it occurs, partially due to its vast population losses over the past 25 years. A contributing factor to its decline could be the hybridization with a closely related species, *S. saximontanus*. These two species differ in their ranges and chromosome numbers; however, past morphological studies suggest that hybridization is possible. This study provided molecular evidence of hybridization using inter-simple sequence repeat (ISSR) DNA markers. A total of 260 plants were examined from 17 populations across 4 states. Seven species-specific markers were found for *S. saximontanus*, and 4 were found for *S. hallii*. All of these markers were found in the proposed hybrids, supporting the hypothesis that hybridization is occurring. The ISSR data was also used to examine the genetic diversity within and among populations. The lowest levels of diversity were found in Missouri and Illinois, and the highest levels were found in Oklahoma where the two species co-occur. Higher diversity in plants at this site could be due to hybridization between the species. The isolated sites in the Midwest are valuable since they are hybrid free. However, poor reporting and habitat degradation due to agricultural development threatens *S. hallii*'s continued survival. Conservation efforts are needed to preserve the extant populations.

*** 5. Reproductive biology of *Minuartia patula* (Caryophyllaceae) in northeastern Illinois**
Pearion, Michelle L.[1] and Molano-Flores, Brenda.[2] [1]University of Illinois Champaign-Urbana, Champaign, IL. [2]Illinois Natural History Survey, Champaign, IL.

Minuartia patula, slender sandwort (Caryophyllaceae) is a winter annual found in Illinois dolomite prairies. This species is threatened in Illinois and found in only five counties. *Minuartia*

patula population size can fluctuate significantly from year to year. Though population surveys have been conducted for this species, little is known about how *Minuartia* population size affects reproductive output. For five populations of *M. patula* in Northeastern Illinois, fruit set, seed set, and seed germination were investigated in 2010. Flower phenology, pollinator identity, and breeding system were studied at Midewin National Tallgrass Prairie. Percent fruit set ranged from 62 to 89 and differences were found among populations. Percent seed set ranged from 46 to 70 and percent seed germination from 42 to 61 was observed. No correlation was found between population size and reproductive output. Preliminary investigation of breeding system showed *M. patula* has the ability to self. These results suggest that population size is not playing a major role in the reproductive success of *Minuartia patula*.

6. Preliminary results of the reassessment of INAI Category I natural areas

Schennum, Wayne E.[1], Vogel, Randy L.[1], Wibbenmeyer, Joshua A.[1], Cellini, Jarrett B.[1] and Wilker, John R.[2] [1]Applied Ecological Services, West Dundee, IL. [2]Illinois Department of Natural Resources, Springfield, IL.

The University of Illinois hired several ecologists to explore Illinois for remnant natural areas in the late 1970's. This "Illinois Natural Areas Inventory (INAI)" found 689 sites whose vegetation resembled that 200 years ago. In 2008 Applied Ecological Services, as part of an INAI update for the Illinois Department of Natural Resources, began reevaluating these sites, comparing present conditions with those previously recorded. 313 sites, containing 455 natural communities, were examined from 2008 to 2010 (caves, railroad prairies and aquatics were excluded from analysis.) Both qualitative and quantitative data were collected including plant lists, species frequency, ecological assessment of quality, and community mapping, all in digital format. 322 remnant natural communities increased or retained their diversity and structure; 58 communities decreased slightly in natural quality; and 65 decreased significantly. The cultural and natural factors resulting in quality changes were identified for each site. Owner recognition of their property's natural value; prescribed burning; brush and exotic plant removal; stable or naturally cyclical water tables; and lack of impacts by adjacent suburban development are all major factors in the retention or increase in quality. Quality declines were the result of factors opposite of those listed for retention. 2011 is the final project year, and data from additional regions and sites will complete the study.

7. Replicated field trial of two methods used for the control of invasive shrub honeysuckles (Caprifoliaceae: *Lonicera* spp.)

Schulz, Kurt, Wright, Jessica and Ashbaker, Sabrina. Southern Illinois University Edwardsville, Edwardsville, IL.

Forest invasion by Asiatic shrub honeysuckles has reached crises proportions in many parts of the Northeast and Midwest. Invaded forests suffer reductions in herb species richness and cover, impaired tree reproduction, and damage to wildlife habitat. Once a forest is heavily infested, natural processes seem inadequate to diminish the species abundance in a reasonable time frame. Intervention is required. A popular approach to kill honeysuckle is to cut the stems at the base and paint the surface with 20% glyphosate. This technique works well, but it is less suited to private landowners because it employs significant quantities of high concentration herbicide. We have shown that cutting honeysuckle immediately after leaf expansion, then spraying regrowth uses less herbicide and can give comparable results to that cited in the only known published study. We conducted a replicated study comparing cutting and herbicide stump painting to

cutting followed by spraying regrowth at different times of the year. Overall, cutting and stump painting was superior, killing > 75% of individuals in spring and early summer, and > 95% in late summer, fall, and winter. Cutting followed by regrowth spraying was most successful in spring (> 55% killed), and much poorer the rest of the year (20-40%). Increasing shrub size did not affect the rate of kill for the cut and paint treatment, but reduced it for the cutting and regrowth spraying. Clearly, when conditions are appropriate, stem cutting followed by herbicide painting is the most effective method.

*** 8. An analysis of the history of development of three oak-hickory forest fragments in southwestern Illinois as a predictor of current patterns of biodiversity**

Fritzgerald, Adam S., Minchin, Peter R. and Walton, Elizabeth M. Southern Illinois University Edwardsville, Edwardsville, IL.

The course of forest fragmentation is not always unidirectional. Reforestation of surrounding areas may not only increase the area of forest but also change the edge-to-area ratio and lead to a complex mosaic of land use histories within a forest that can influence current biodiversity patterns. We examined the development of three oak-hickory forest fragments in southwestern Illinois: Bohm Woods Nature Reserve, which has been relatively undisturbed since 1850, and two more-disturbed forests on the campus of Southern Illinois University Edwardsville, Sweet William Woods and Bluebell Woods. Using ArcGIS, eight sets of aerial photographs from 1941 to 2010 were georectified, overlaid and analyzed to reconstruct the history of clearing and reforestation and determine Age (years since forested) and mean distance from forest edge (DE) for 130 permanent plots distributed randomly throughout the forests. Using existing vegetation data, we calculated native species richness (S), antilog of Shannon diversity (N1), and Floristic Quality Index (FQI) for tree, shrub and ground layers on each plot. We hypothesized that all three biodiversity indicators would increase with Age and DE. Analysis by generalized linear modeling showed that S for the ground layer increased with both Age and DE. FQI increased with both Age and DE for all three layers. These results show the benefits to biodiversity of reforestation of areas adjacent to forest fragments. The approach we developed should be useful in studies of fragmentation effects in other ecosystems.

*** 9. *Ex vitro* soil establishment, and re-introduction of the Federally endangered Hawaiian endemic, *Platanthera holochila* (Orchidaceae)**

Wood, Erin M.[1], Moller-Jacobs, Lillian L.[1], Fugate, Tegan[1], David, Shanna E.[1], Zettler, Lawrence W.[1] and Perlman, Steve.[2] [1]Illinois College, Jacksonville, IL. [2]National Tropical Botanical Garden, Kalaheo, Kauai, HI.

Known for its natural beauty, Hawaii is a state that harbors a distinctive flora and fauna found nowhere else on Earth. Of its 1,159 native plant species, 9% are now extinct and ca. 53% are at risk of extinction. Three orchid species are native to the archipelago, one of which (*Platanthera holochila*; syn = *Peristylus holochila*) is Federally-listed as endangered. In 2002, the Orchid Recovery Program at Illinois College began a collaborative effort with the National Tropical Botanical Garden in Hawaii to cultivate *P. holochila*, from seed. Fewer than 50 individual plants are thought to remain in small populations scattered on three islands (Kauai, Maui, Molokai). Only one specimen persists on Kauai, and this individual plant is now in decline. Various techniques have been tested over the years to germinate seeds *in vitro*, with and without mycorrhizal fungi. The use of asymbiotic medium P723 (PhytoTechnology Laboratories) has been most reliable at prompting leaf-bearing seedlings. Of the 24,940 seeds initially sown on

agar, a sizeable number (200+) of seedlings were obtained *in vitro*. The largest seedlings were deflasked and placed on a pre-sterilized soil mix containing a mixture of peat, sand and bark chips. Thus far, 47 seedlings have been successfully transferred from agar to soil, some of which originated from seeds acquired from the Kauai plant. In March 2011, these plants will be reintroduced onto Kauai and Molokai to augment the existing populations.

*** 10. Protocorms of an epiphytic orchid (*Epidendrum amphistomum*) recovered *in situ*, and identification of associated mycorrhizal fungi using molecular markers**

Moller-Jacobs, Lillian L.[1], Ross, April Y.[1], Corey, Laura L.[1], Zettler, Lawrence W.[1] and Richardson, Larry W.[2] [1]Illinois College, Jacksonville, IL. [2]Florida Panther National Wildlife Refuge, Naples, FL.

Epiphytic orchids have received considerable study, yet little has been published on their germination requirements *in situ* involving mycorrhizal fungi. Such research has been hampered by the small, dust-like size of seeds and leafless seedlings (protocorms) which are difficult to pinpoint on natural substrates, especially those on arboreal substrates (tree limbs). We report a novel seed sowing and retrieval method, modified from one applied to terrestrial orchids, used in the acquisition of epiphytic orchid protocorms from the Florida Panther National Wildlife Refuge. Seeds from two epiphytic orchid species (*Epidendrum amphistomum* A Richard, *E. nocturnum* Jacquin) were placed in separate nylon mesh packets secured within 35 mm plastic slide mounts, and affixed to tree bark using gutter mesh and a staple gun. To confirm that the embryos were viable, some seeds were also sown on asymbiotic media in the laboratory which subsequently germinated after 52 days incubation. Of 60 packets distributed among 18 tree limb sites, one packet - harboring seeds of *E. amphistomum* affixed to pop ash (*Fraxinus caroliniana* Mill.) on a moss substrate - harbored protocorms after 267 days. Using molecular markers, a fungus assignable to the anamorphic genus *Ceratorhiza* Moore, appears to be the mycorrhizal associate of these protocorms suggesting that this fungus may have triggered the germination process *in situ*.

*** 11. Incidence of pestiferous scales (Hemiptera: Asterolecaniidae, Coccidae, Diaspididae) on epiphytic orchids in the Florida Panther National Wildlife Refuge**

Fugate, Tegan[1], Furness, Amber N.[1], Zettler, Jennifer A.[2], Zettler, Lawrence W.[1] and Richardson, Larry W.[3] [1]Illinois College, Jacksonville, IL. [2]Armstrong Atlantic State University, Savannah, GA. [3]Florida Panther National Wildlife Refuge, Naples, FL.

In 2009, in a natural habitat surrounded by urban development in Naples, FL, pestiferous scale insects (Coccidae) and mealybugs (Pseudococcidae) were discovered on inflorescences of the Ghost Orchid, *Dendrophylax lindenii*. Given the potential for these insects to inflict harm on this and other rare orchid species in the region, a follow-up study was initiated within the Florida Panther National Wildlife Refuge (FPNWR) the following year. Encompassing 26,400 acres in rural north-central Collier Co., the FPNWR harbors 27 orchid species in 17 genera, several of which are listed as endangered (e.g., *D. lindenii*). During June 2010, the epiphytic orchids within two different hardwood hammocks (McBride's Pond, Cochran Lake) were inspected for pestiferous insects. Infestations were discovered on six orchid taxa: *Epidendrum amphistomum*, *E. nocturnum*, *E. rigidum*, *Polystachya concreta*, and *Prosthechea cochleata* var. *triandra*. Heavy infestations were noted on *P. concreta* and *P. cochleata* var. *triandra* spanning all three plant growth stages (seedlings, juvenile, mature). The insects were identified as *Coccus hesperidum* (Coccidae), *Asterolecanium epidendri* (Asterolecaniidae), and *Diaspis boisduvalii*

(Diaspididae). Although *A. epidendri* is not considered a serious pest, the other two have a well-known and problematic track record, especially on plants in cultivation (e.g., in greenhouses). What is most troublesome is that these pests were acquired from plants in remote habitats, suggesting that these insects have infiltrated our natural areas. If true, this would place an additional burden on south Florida's epiphytic orchids, even those that are afforded legal protection in reserves.

*** 12. Viability assessment of orchid mycorrhizal fungi in prolonged cool (4-6 C) storage to benefit conservation**

Furness, Amber N., Fortney, Jenifer and Zettler, Lawrence W. Illinois College, Jacksonville, IL.

All members of the Orchidaceae have an absolute requirement for mycorrhizal fungi as a carbon source (mycotrophy) to complete their life cycles *in situ*. In the wake of ongoing habitat destruction worldwide coupled with climate change, reserves alone will not be enough to safeguard plants in peril this century. This is especially true for orchids which depend heavily on co-associating organisms for survival (e.g., mycorrhizal fungi). To augment orchid conservation, a blend of different approaches will be needed including the recovery and long-term storage of mycorrhizal fungi for the purposes of artificial propagation (e.g., symbiotic seed germination). Cryopreservation is often used to preserve important strains of orchid mycorrhizal fungi in a viable state indefinitely and is preferable to continuous subculturing and/or cool storage (i.e., refrigeration). For some researchers, however, cryopreservation may not be an immediate or practical option. In this study, we assessed the survival of 132 strains of orchid mycorrhizal fungi that were stored 4-6 years in refrigeration. The majority of the fungi were assignable to two ubiquitous anamorphic genera of orchids worldwide: *Ceratorhiza* and *Epulorhiza* Moore. Using agar slants within screw-cap tubes, cultures were maintained on a variety of different media (e.g., oat meal agar, malt agar), with and without subsequent addition of mineral oil. More than half (36/55 or 65.5%) of the *Epulorhiza* strains were successfully restarted on potato dextrose agar (PDA) after prolonged storage, whereas less than half (24/56 or 42.9%) of the *Ceratorhiza* strains had survived. In general, immersing cultures in mineral oil resulted in lower viability especially for *Ceratorhiza* strains.

*** 13. Predictors of the diversity and quality of the summer herbaceous community in fragmented oak-hickory forests**

Laquet, Jennifer L. and Minchin, Peter R. Southern Illinois University Edwardsville, Edwardsville, IL.

Understory herbaceous communities, a distinctive component of oak-hickory forests in the Midwest, have been degraded or lost due to forest fragmentation. We aim to identify predictors of the diversity and quality of the understory community in forest fragments. Here we present an analysis of existing data for the summer herbaceous community in 130 plots randomly located throughout Bohm Woods State Nature Reserve, which has been relatively undisturbed since 1850, and two more-disturbed forests on the campus of Southern Illinois University Edwardsville, Sweet William Woods and Bluebell Woods. Native species richness (S), antilog of Shannon diversity (N1) and Floristic Quality Index (FQI) were computed from cover data for herbaceous species collected in June 2008. Forest maturity was expressed as the 90th percentile of tree diameter (D90), distance to edge (DE) was measured from 2010 aerial photographs and total density of exotic shrubs (ExS) and total cover of exotic herbaceous species (ExH) were calculated from existing data. . We hypothesized that S, N1 and FQI would increase with D90

and DE but decrease with ExS and ExH. Preliminary analyses using multiple regression models showed that S and N1 are negatively related to ExS and that FQI is negatively related to both ExS and ExH, supporting our hypothesis. S and FQI showed no relationship to D90 and DE, but N1 decreased with D90, contrary to our hypothesis. The lower diversity of the summer herbaceous community in areas of more mature forest may result from competitive exclusion by a few species of shade tolerant forbs.

*** 14. Using hand-crosses and field observation to investigate pollen flow between American (*Celastrus scandens*) and Oriental bittersweet (*C. orbiculatus*)**

Zaya, David N.[1], Leicht-Young, Stacey A.[2], Pavlovic, Noel B.[2] and Ashley, Mary V.[1]
[1]University of Illinois at Chicago, Chicago, IL. [2]United States Geological Survey, Porter, IN.

The threat that invasive plant species pose to native biodiversity through competition and habitat alteration is widely recognized, but the threat of hybridization with native congeners has only recently gained attention. Hybridization is especially detrimental when asymmetric pollen flow occurs, meaning that more pollen flows from the invasive species to the native than vice versa. Genetic data from our previous research has demonstrated that the native American bittersweet (*Celastrus scandens*) and the invasive oriental bittersweet (*C. orbiculatus*) are hybridizing in the wild. In order to determine the rate of hybridization and directionality of pollen flow, we conducted manipulative hand-crosses in the field and observations of flower fate on both vines. Results from manipulative hand-crosses demonstrated that American bittersweet is significantly more likely to accept pollen from oriental bittersweet than vice versa. The observational study and germination trials demonstrated that American bittersweet pistillate plants have lower flower fertilization rate and a greater hybridization rate, likely due in part to the interaction with staminate congeners. Asymmetry in pollen flow is likely due to differences in recognition and rejection of interspecific pollen, and a large advantage of oriental bittersweet in terms of male fitness. This work demonstrates the importance of eradicating oriental bittersweet at the early stages of invasion, before hybridization can threaten the genetic identity of American bittersweet populations.

15. Woody composition and structure of upland forest at Carpenter Park Nature Preserve: Implications for management

Ting, Tih-Fen. Department of Environmental Studies, University of Illinois at Springfield, Springfield, IL.

Sitting nearly in the geographical center of the state of Illinois and along the north bank of Sangamon River, Carpenter Park Nature Preserve has one of the largest contiguous swaths of high quality old-growth, oak-hickory forests in central Illinois. Every fall from 2004 to 2010, the upland forest of Carpenter Park was sampled by using the point-quarter method. While *Quercus alba*, *Q. velutina*, and *Q. rubra* still dominate the canopy layer according to their respective importance values throughout the 7-year sampling period, they were almost non-existent at the subcanopy level. Although they had lower importance values than oaks, *Sassafras albidum*, *Carya cordiformis*, and *Celtis occidentalis* were relatively common at the canopy level. *Sassafras albidum* was the dominant species in the subcanopy layer while other subcanopy species of significance included *C. cordiformis*, *C. occidentalis*, *Prunus serotina*, *Ulmus americana*, and *Asimina triloba*. *Asimina triloba* shows growing dominance in the subcanopy level during the sampling period, which almost rivals *S. albidum*. The increasingly highly shaded environment in the subcanopy level creates difficult conditions for oak regeneration. Prescribed

burns, coupling with selective thinning, have been considered necessary to restore the quality of upland forest of Carpenter Park by improving the lighting conditions conducive to oak recruitments. Burning alone can lead to re-sprouting of *A. triloba*, and hence its growing dominance. The sampling results from the past 7 years suggest that selective thinning is critical for a successful restoration of upland forest of Carpenter Park.

Division: Cell, Molecular & Developmental Biology

*** 1. Analysis of protein expression and cytotoxicity differences in MCF7 and MDA MB 231 breast cancer and U2OS osteosarcoma cells due to pesticide exposure**

Rich, Jessica D. and Schultz-Norton, Jennifer R. Millikin University, Decatur, IL.

Having one of the richest soil deposits in the world, central Illinois is a target area for agricultural advancements looking to increase overall crop yield. One of the methods used to alleviate detrimental effects to this yield is the application of pesticide compounds containing chemicals such as acetochlor and chlorpyrifos. These compounds, while beneficial to the agriculture industry, are potentially harmful to humans. The EPA classifies acetochlor as highly toxic, although it is not currently confirmed as a human carcinogen. Incomplete evaluations of chlorpyrifos have found it to not be teratogenic, mutagenic, carcinogenic, or to have adverse reproductive effects. However, harmful effects to humans have been established in other studies. While beginning to clarify the detrimental effects of the chemicals, research has yet to entirely expose the carcinogenic effects of the herbicides, one of the most concerning effects for residents in areas primarily using them. The purpose of this study is to better determine the cytotoxic effects of acetochlor and chlorpyrifos, as well as elucidate effects of the chemicals on gene expression in three different human cancer cell lines.

*** 2. Real-time analysis of Ddah1 predicts that increased concentrations increase susceptibility to myocardial infarction**

Ahuja, Anita N.[1], Pettus, Janette[2], Mennie, Amanda[2] and Kwitek, Anne E.[2] [1]Knox College, Galesburg, IL. [2]University of Iowa, Iowa City, IA.

Heart disease is the leading cause of death in the United States, leading to the prevalence of myocardial infarction (MI). Hypertension is a complex disease, involving both genetic and environmental factors, and is a significant risk factor for MI. To analyze the genetic aspects of hypertension and MI, previous studies have examined two strains of *Rattus norvegicus* which demonstrate different susceptibilities to ischemic reperfusion (IR) injury in the heart. In Langendorff experiments of IR injury, the Dahl salt-sensitive (SS) rat experiences an infarct size covering 28% of the left ventricle, compared with only 4% in the Brown Norway (BN) strain. In chromosome substitution studies it was discovered that BN chromosome 2 significantly protected an SS background from IR injury. Microarray and previous qPCR studies identified several candidate genes based on differential expression and their location on chromosome 2. Congenic strains were derived from the SS-2BN to further investigate the differences and to identify the genetic factors involved in IR injury. These studies revealed that SS-2BNF animals were significantly more susceptible and SS-2BNA animals were significantly protected from IR injury. Real-time PCR analysis supports previous results that the gene Ddah1 (dimethylarginine dimethylaminohydrolase 1) is down regulated in the SS-2BNA and up regulated in the SS-2BNF strain when compared to SS animals. Ddah1 participates in the nitric oxide synthase pathway, and therefore may have a causative role in genetic protection from myocardial infarction.

*** 3. Identification and characterization of small non-coding RNAs in *Dictyostelium***
Lu, Ya-Lin and Jones-Rhoades, Matthew W. Knox College, Galesburg, IL.

MicroRNAs (miRNAs) and short interfering RNAs (siRNAs) are 18-24nt small non-coding RNAs that regulate expression of endogenous and exogenous genes through RNA interference (RNAi). These non-coding RNAs contribute to temporal gene expressions at various developmental stages in animals and plants. We are analyzing populations of small RNAs expressed in social amoebas of the genus *Dictyostelium*. RNA samples were extracted from different stages of morphogenesis and then size-fractionated and reverse transcribed to generate libraries of small cDNAs suitable for sequencing analysis. Our data indicate that *Dictyostelium* express diverse types of small RNAs. Our goal is to compare small RNA expression between two *Dictyostelium* species, to compare *Dictyostelium* small RNAs to those in plants and animals, and attempt to infer the biological roles of small RNAs in *Dictyostelium*.

*** 4. Type 2 diabetes mellitus: The role of excess nutrients in β-cell defects**
Vernier, Stephanie B., Wanda, Paul E., Schober, Joseph, Neumann, Bill, Brenegan, Teryn and Kwon, Guim. Southern Illinois University Edwardsville, Edwardsville, IL.

Obesity is one of the leading causes of type 2 diabetes mellitus (T2DM). The elevated levels of nutrients in obesity have been associated with insulin resistance and insulin-secreting β-cell defects. The specific mechanisms how high nutrients cause β-cell defects, however, are unknown. To this end, we studied lipid droplet formation and its role in β-cell function and growth in response to nutrient overload in rat islets. Treatments of rat islet cells with elevated glucose and free fatty acids resulted in increases in the size and number of lipid droplets in β-cells in a time- and dose-dependent manner. The role of the nutrient sensor, mammalian target of rapamycin complex 1 (mTORC1), and the enzyme involved in neutral lipid triglyceride biosynthesis, acyl CoA: diacylglycerol transferase 1(DGAT1), on the process and effects of lipid droplet formation were assessed. Under conditions of nutrient overload, lipid droplet formation, distortion of the islet architecture, reduction in insulin content, and significant islet cell expansion were observed. Rapamcyin and BN99, inhibitors of mTORC1 and DGAT1, respectively, blocked lipid droplet formation. Of note, rapamycin also blocked islet cell expansion. In conclusion, both mTORC1 and DGAT1 are essential in lipid droplet formation and mTORC1 plays a pivotal role in islet cell expansion. We gratefully acknowledge support from the Fraternal Order of Eagles-Granite City Aerie 1126.

*** 5. Water stress in insect cells**
Anderson, John M.[1], Hand, Steve C.[2], Menze, Michael A.[1] [1]Eastern Illinois University, Charleston, IL. [2]Louisiana State University, Baton Rouge, LA.

Organisms that can tolerate severe water stress include larvae of *Polypedilum vanderplanki* and embryos of *Artemia franciscana*. The disaccharide trehalose and various Late Embryogenesis Abundant (LEA) proteins accumulate during water stress in these animals. Both compounds are known to stabilize biomolecules during water stress. We investigated whether the combination of the LEA protein WL1.3 (ACX81198) and trehalose can significantly increase osmotic stress tolerance in *Drosophila melanogaster* cells (Kc167). We supplemented standard culture medium with increasing concentrations of trehalose or sucrose (0, 50, 100, and 200 mM) and monitored cellular proliferation and viability. Untransfected Kc167 cells and WL1.3 transfected cells

(Kc167-WL13) were employed for these experiments. After 48 h of incubation with 200 mM of either sugar Kc167-WL1.3 cells showed 20 ± 3% more viable cells compared to control (untransfected) cells (n = 12, $P<0.05$). Kc167 control cells showed significantly more viable cells when incubated over 48 h with 200 mM trehalose (10 ± 3%) as compared to 200 mM sucrose (n = 12, $P<0.05$). No significant differences were found between 200 mM trehalose and 200 mM sucrose treatments in Kc167-WL1.3 transfected cells (n = 12, $P>0.05$). This latter result suggests that protection by WL1.3 protein does not depend on the sugar used. Work is currently being done to increase the intracellular trehalose concentration by transfection with trehalose transporters. (Support: CFR Grant (EIU) to M.A.M., NSF grant IOS-0920254 to S.C.H. and M.A.M., Creativity Award (EIU) to J.A.).

*** 6. The effects of excess nutrients on B-cell regenerative processes and its role in B-cell function**

Brenegan, Teryn V., Wanda, Paul E., Vernier, Stephanie B. and Kwon, Guim.
Southern Illinois University Edwardsville, Edwardsville, IL.

Type 2 diabetes mellitus (T2DM) has become an epidemic in the developed countries around the world. Obesity is a leading cause of T2DM. Persistently high levels of glucose and free fatty acids (FFAs) in obesity have been associated with both insulin resistance (abnormal insulin action) and B-cell defects (insulin deficiency). Under chronic nutrient overload, B-cell mass becomes enlarged initially but undergoes a progressive deterioration in its function and mass, leading to overt T2DM. The molecular mechanisms involved in this process, however, is unknown. Thus, we elected to study the effects of excess nutrients on B-cell growth and proliferation and its association with B-cell function using isolated rat islets. Exposure of rat islets to a combination of elevated glucose (25 mM) and FFAs (500 microM, oleate: palimiate=1:1 v/v) for 4 days markedly increased [3H]thymidine incorporation and islet size compared to elevated glucose or FFAs alone. Nutrient activation of mammalian target of rapamycin complex 1 (mTORC1) played a pivotal role in this process shown by the complete inhibition of b-cell regenerative processes by rapamycin, a potent inhibitor of mTORC1. Under these conditions, however, a significant loss of insulin secretion and content was observed. Importantly, we, for the first time, also provide microscopic evidence for primary B-cell growth under chronic nutrient overload and the role of mTORC1 in B-cell growth. We gratefully acknowledge support from the Fraternal Order of Eagles- Granite City Aerie 1126.

*** 7. Intersectin (itsn1) is critical for successful *Xenopus laevis* gastrulation**

Coatney, Caroline G. and Thorn, Judy M. Knox College, Galesburg, IL.

Intersectin (itsn1) plays an important role in endocytosis, exocytosis and cell division regulation. It is also a protein-protein interaction facilitator. While it is highly evolutionarily conserved, itsn1 has not been studied in a developmental context in any organism. Here, using DNA antisense oligos, we have knocked out intersectin (itsn1) in *Xenopus laevis* oocytes and subsequently followed itsn1-deficient embryos through early development in order to better understand the function of itsn1 during embryonic development. The resulting mutant phenotype was variable, though predominantly mutant embryos ceased developing at stage 10 when the blastopore lip and yolk plug were forming, and eventually died. The fraction of embryos that developed past gastrulation exhibited inconsistent dorsoanterior abnormalities. *In situ* hybridization studies on wildtype stage 10 embryos showed itsn1 expression ranging from the edge of the yolk plug to the equator of the embryo. The wildtype position of itsn1 at stage 10 and

the failed gastrulation of itsn1 depleted embryos implicate the protein in contributing to successful early gastrulation. Specifically, itsn1 may influence bottle cell functioning since the primary mutant phenotype, preceding death, included blastopore formation but excluded proper involution of marginal zone mesoderm.

Division: Chemistry

*** 1. Selectivity observed in the iodine atom economic co-iodination of dienes using elemental iodine and (diacetoxyiodo)benzene**

Kistammagiri Nalla, Madhumitha R. and Vinod, Thottumkara K. Western Illinois University, Macomb, IL.

Co-halogenation, the simultaneous introduction of a halogen atom and a suitable nucleophile across carbon-carbon double bonds, is a useful reaction that rapidly generates valuable synthetic intermediates bearing regio- and stereoselectively introduced vicinal functionalities for further synthetic elaborations. Bromination or chlorination of alkenes carried out in presence of nucleophilic solvents such as water, alcohols or carboxylic acids provide ready access to halohydrins, haloethers and halocarboxylates, three synthetically versatile intermediates. Unlike chlorination and bromination, iodination of alkenes is a considerably slower reaction due to the low electrophilicity of iodine. Activation of elemental iodine, I_2, for addition to alkenes by modifying its electrophilicity has been achieved using a variety of oxidants. In keeping with the green trends in organic synthesis, environmentally benign and readily available I(III) and I(V) hypervalent iodine oxidants have also been employed for the facile oxidation of I_2 to *in-situ* generate I^+ for iodohydrin synthesis in aqueous solvent mixtures. We recently demonstrated the oxidation of I_2 with (diacetoxyiodo)benzene (DAIB) to generate two equivalents of acetylhypoiodite, CH_3CO_2I, enhancing the iodine atom economy of the iodo co-functionalization reactions in presence of a variety of nucleophiles. Recent results describing the selectivity observed during the iodo co-functionalization of multi-alkene substrates will be discussed.

*** 2. Selective introduction of alpha-beta-unsaturation in diketones**

Saichek, Nicholas and Vinod, Thottumkara K. Western Illinois University, Macomb, IL.

Currently available methods for the introduction of alpha, beta- unsaturation on carbonyl compounds involve the use of either toxic and foul-smelling chalcogen reagents or expensive palladium catalysts. The development of a reliable and convenient protocol for the introduction alpha, beta-unsaturation in carbonyl compounds is thus a worthwhile research objective. A successful development of a procedure capable of selective introduction of alpha, beta-unsaturation in dicarbonyl compounds will be even more useful for synthetic chemists. Our continued interest in oxidative transformations using water-soluble hypervalent iodine reagents have identified the feasibility of selective introduction of alpha-beta unsaturation to ketones that enolize to place an abstractable hydrogen atom vicinal to the enolic OH group. We believe that the selective abstraction of such a hydrogen atom stems from the favorable (low) bond dissection energy of the C-H bond involved. Synthesis of several dicarbonyl substrates and the selective introduction of the desired alpha, beta-unsaturation using water-soluble IBX derivatives will be discussed. Solvent effects on this reaction will also be discussed.

*** 3. Nanoencapsulation of vitamin K into a multi-polymer system using power ultrasound**
Gogieni,Vara Lashmi, Jagarlamudi, Pratyusha, Boley, Mark and Kouassi, Gilles. Western Illinois University, Macomb, IL.

Particles of Vitamin K were encapsulated into solutions of cyclodextrin, whey protein concentrates (WPC) and chitosan, using power ultrasound. The turbidity and the ionic strength of the mixtures were measured at basic pH to monitor the interactions between the coating biopolymers. The sizes of the nanocapsules were determined using atomic force microscopy (AFM) and dynamic light scattering (DLS), and the stability of the nanocapsules was investigated by measuring the degree of syneresis as a function of time. AFM images and DLS results showed that the sizes of the capsules were between 85-130 nm and the encapsulation efficiency was 78%. It was also found that the stability of the particles increased with the ionic strength above pH 7. This indicates that in basic solutions, the coating of vitamin K was the result of electrostatic interactions between whey protein and the cationic chitosan. The model used in this study can be applied for nanoscale coating of essential lipophilic ingredients and nutraceuticals.

Division: Computer Science

*** 1. An API towards usable secure authentication**
Nareguda, Shashivardhan Reddy and George, Binto. Western Illinois University, Macomb, IL.

Since Ajax is not very programmer friendly, object oriented tools such as Google Web Development Toolkit (GWT) have been popular over the past few years for the purpose of developing interactive web applications. UPassAPI is an attempt to create a usable secure authentication API for web applications. UPassAPI is designed such that there is a core server side password template validation component that is responsible for user authentication and a client side GUI component for accessing the validation component. An RPC communication module routes messages from the compliant GUI to the corresponding server side password template validation component. This architecture helps the user authentication logic and User Interface to be developed separately and easily integrated. A user may thus be authenticated by different methods such as by using passwords, cognitive passwords, passfaces or clickpoints depending on the specified authentication rules. Further, the architecture allows new authentication schemes to be developed and plugged in. We will present the architecture and demonstrate the use of API for developing web applications. This work is in part supported by the Grant No. 0736643 from National Science Foundation.

*** 2. An algorithm for multi-core query processing**
Jebeli, Misagh and Maskarinec, Martin. Western Illinois University, Macomb, IL.

Over the past few decades, computer hardware has been undergoing revolutionary changes. Since the development of multi-core processors, the concentration has shifted from increasing the clock speed to increasing the number of cores per CPU. This poses a new challenge for software development: how to design and implement algorithms that best fit a multi-core environment? Throughout this paper, a new join algorithm for RDBMSs is presented that divides the process into threads and runs them simultaneously. The algorithm is designed to be able to deliver partial results while the join is still working on data. Thus, other processes that are

waiting for the result of the join can carry on their process without being idle. Moreover, the overall time for executing a join is reduced for tables that have large amounts of data.

Division: Environmental Science

*** 1. Identification of invasive weeds and evaluation of three weeding treatments on a Midwestern green roof**

Greeling, Benjamin A.[1], Krutsinger, Roxane[1], Morgan, Susan[1], Retzlaff, William[1], Luckett, Kelly[2] and Jost, Vic.[3] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]Green Roof Blocks, St. Louis, MO. [3]Jost Greenhouses, Des Peres, MO.

My project goal was to identify the weed species that were found on a green roof after it was installed and to determine if weeding impacts green roof plant establishment. A 16,000 ft² green roof was planted in April 2009 with 5 *Sedum* species and installed on the SIUE Student Success Center in August 2009. Three replicate test plots were selected in different locations on the roof – an east, a west, and a center plot. Each plot consists of four sections of 10 Green Roof Blocks each based on their clipping cycle; either clipping at 2, 4, or 6 weeks or no clipping. Above ground weed biomass and vegetative roof coverage was recorded for each treatment. Thus far, approximately twenty-five different weed species have been identified. Weed biomass was found to be different between test plots at the 8/19/10 and 9/17/10 clip dates.

*** 2. Using bone collagen isotopic composition to differentiate catfish foraging sites in the Illinois River**

Little, Kayla L., Brugam, Richard B., Vogel, Gregory, Kohn, Luci and Holt, Julie Z. Southern Illinois University Edwardsville, Edwardsville, IL.

Using the stable isotopes ^{15}N and ^{13}C, we tested the hypothesis that different species of catfish forage in different environments. The goal is to show that by analyzing these stable isotopes, you can analyze a fish's environment and apply it to archeological samples in order to reconstruct past environments. Because many archeological sites in Illinois contain fish bones, we measured fish bone collagen in our samples. The stable isotopes were analyzed by extracting bone collagen from channel catfish (*Ictalurus punctatus*) and blue catfish (*Ictalurus furcatus*) using S.H. Ambrose's method. The source of bone was a commercial fisherman in Grafton, Illinois. The muscles from each fish was prepared by drying and pulverizing. The bone collagen and muscle samples were sent to Cornell Isotope Lab to be analyzed. Average channel catfish muscle $\delta^{13}C$ was -26.73 ‰ and $\delta^{15}N$ was 15.99‰. Average channel catfish collagen $\delta^{13}C$ was -23.38 ‰ and $\delta^{15}N$ was 14.49‰. Average blue catfish muscle $\delta^{13}C$ was -23.11 ‰ and $\delta^{15}N$ was 14.18‰. Average blue catfish collagen $\delta^{13}C$ was -19.55 ‰ and $\delta^{15}N$ was 15.49‰. The $\delta^{13}C$ of channel catfish was lower for both muscle and collagen samples, suggesting that they forage in different areas of the river than the blue catfish. The $\delta^{15}N$ values for all fish samples were higher than expected.

*** 3. Selenium accumulation and tolerance in white button and baby bella mushrooms**

Haddad, Sam[1], Kelly, Charlie[2] and Lin, Zhi-Qing.[1] [1]Southern Illinois University Edwardsville, Edwardsville, IL. [2]Monterey Mushrooms, Inc., Watsonville, CA.

Selenium (Se) is an essential nutrient for humans and animals. Selenium deficiency has caused serious human health problems worldwide. Development of Se-enriched agricultural products

(such as edible mushrooms) provides a sustainable biofortification approach to overcome Se-related nutrition malfunction. The objectives of this study were to determine the accumulation of Se in white button and baby bella (crimini) mushrooms – two varieties of *Agaricus bisporus* common in the US market. The mushroom mycelium was grown in the substrate treated with sodium selenate (Na_2SeO_4) at concentrations of 1, 5, 10, 20, 50, 100, 300, and 400 mg/kg. Preliminary results showed that the concentration of Se in the mushroom tissues of the two varieties increased with increasing Se concentrations in the substrate. Baby bella mushrooms accumulated over 74% more Se in the fruiting bodies in all Se treatments, compared with white button mushroom. The highest Se concentration of 215 mg/kg was observed in baby bella mushroom at the Se treatment of 100 mg/kg.

*** 4. Fate of [^{14}C] Metolachlor in different soil types under anaerobic and aerobic environmental conditions**

Kanissery, Ramdas[1] and Sims, Gerald.[2] [1]University of Illinois at Urbana-Champaign, Urbana, IL. [2]USDA - ARS, Urbana, IL.

The focus of this research work was to investigate the microbial bioavailability of the herbicide [^{14}C] Metolachlor in Illinois soils like Flanagan, Catlin and Drummer incubated under anaerobic and aerobic soil environmental conditions. All of these soils exhibited a lag period before starting a significant mineralization of the herbicide which could be attributed to the microbial acclimation phase. Anaerobiosis induced more mineralization and greater dissipation of the herbicide from the soils. Also significant amount of the herbicide was persisted as bound residue in both soil environments and become immune to the microbial attack. The nitrate and ferrous flux in these soils during the degradation of [^{14}C] Metolachlor was also monitored throughout the experiment. The observations from the present study may be utilized for perceiving the role of limiting nutrient in the microbial degradation of [^{14}C] Metolachlor, which in turn may be used for framing a bio-stimulation (addition of nutrient or electron acceptors to stimulate the indigenous microorganism) strategy for the rapid cleanup of the herbicide from the contaminated soils.

Division: Health Sciences

*** 1. The backhand frisbee throw: Experience vs. accuracy**

Kurian, David T. Knox College, Galesburg, IL.

This study investigates the factors that enable an athlete to produce consistently accurate backhand frisbee throws. Subjects (N=19) were given discs and asked to throw them a distance of 15 m at a square target using a backhand throwing motion. The target measured 1.5 m on a side with markers placed every 0.75m away from the target for reference. Each participant was allowed five throws. Each throw was recorded on video from directly above the thrower for biomechanical analysis. All participants were asked to provide specific information such as: height, weight, wingspan, gender, and Ultimate Frisbee experience. Subjects who reported having some competitive Ultimate Frisbee experience averaged hits within 1.4 m of the target. Participants who described themselves as complete novices (no competitive Ultimate Frisbee experience) were significantly less accurate ($p<0.05$), averaging hits within 2.2 m of the target. This suggests that the mechanics of the throw gain consistency and/or refinement with frequent throwing. Further study will focus on how specific aspects of arm mechanics involved in the backhand throw relate to accuracy.

2. An examination of the long-term effects of administering chronic treatment of paroxetine to juvenile rats
Nellett, Kathryn C. Knox College, Galesburg, IL.

The long-term effects of selective serotonin reuptake inhibitors (SSRIs) on children and adolescents have not been studied. Because of a fear of increased suicidal thoughts and other side effects, children and adolescents are rarely prescribed antidepressants. Since SSRIs may be acting through the learning and memory structures of the brain, including the hippocampus, it is important to confirm that the SSRIs do not damage these structures in a growing brain. Long-term potentiation (LTP), the molecular correlate of learning and memory, and behavioral learning and memory tests such as the Morris water maze (MWM) have been used to study the short-term side effects of antidepressants in adults. SSRIs have been shown to decrease LTP and spatial learning in the MWM in adult rats. Both LTP in the hippocampus and MWM were used to evaluate young adult rats after they had received paroxetine, an SSRI, at two doses a day for a week at an age considered to represent children and adolescents in previous pediatric depression rat model research. Paroxetine did not significantly affect LTP compared to the control. Results from the MWM will be discussed. It is important to know not only the long-term side effects of SSRI in the pediatric rat model, but also the efficacy of the second time the same antidepressant is used because depression has a high reoccurrence rate. The force-swim test (FST) was used to determine drug efficacy. Results of a comparison of the first time exposure to paroxetine to that of exposure after chronic juvenile treatment will be discussed.

3. Contact lens compliance and care of a college-aged population
Bugajski, Christopher J. Knox College, Galesburg, IL.

Contact lens compliance, the measures that ensure proper care for the lenses, is of concern among optometrists. Compliance has been investigated in the past; however, compliance of a typical, young contact lens wearer has not been studied. This is a crucial part of the population of lens wearers, as these individuals have not worn lens for as long as many adults. In order to investigate this population, a survey of compliant behaviors was given to students on the Knox College campus (N=35) in Galesburg, IL. We have determined that 54% of the population wears contact lens. We are now assessing compliant perception as well as actual compliant behaviors amongst the population.

Division: Microbiology

*** 1. Assessing Dictyostelid diversity through culture-dependent and culture-independent assays**
DeMaria, Sara F. and Jones-Rhoades, Matthew W. Knox College, Galesburg, IL.

Culture-independent approaches to assessing microbe diversity have been applied to samples from many environments, but the Dictyostelids have not been well represented in such studies. In an attempt to apply a culture-independent approach to this set of organisms, novel Dictyostelid-specific primers were developed and used to amplify rDNA sequences from soil samples taken from Knox College's Green Oaks Biological Field Station (the site in question includes restored prairie, edge habitat, and forest). Clones from these soil samples are being sequenced and compared to known rDNA sequences in order to identify what species were retrieved using this

approach. These results will be compared to data obtained using traditional culture-dependent techniques in an attempt to assess overall Dictyostelid species diversity at the Green Oaks site.

*** 2. *In vivo* expression of cloned *Saccharomyces cerevisiae* S-adenosyl-L-methionine (SAM) permease (SAM3 gene) facilitates uptake of SAM by *Escherichia coli***
Markwell, Blake P. and Hughes, Jeffrey A. Millikin University, Decatur, IL.

Studies of the ubiquitous nucleotide S-adenosyl-L-methionine (SAM) are complicated by its inability to cross cell membranes. Consequently, research on SAM metabolism in *Escherichia coli* is limited to the use of cell extracts, toxic methionine analogs and imperfect mutant strains to block or modify its synthesis. The yeast *Saccharomyces cerevisiae* produces a transmembrane SAM permease encoded by the SAM3 gene that facilitates the import of exogenous SAM. To test the potential of *in vivo* SAM3 expression for allowing SAM uptake in *E. coli*, the SAM3 gene was cloned into the expression vector pUC18 to produce pSAP1. *E. coli* K-12 strain GW2558, a SAM-deficient strain with a constitutively expressed metF::lacZ reporter gene normally repressed by SAM, was then transformed with pSAP1 and incubated with SAM to assess SAM-dependent repression of the metF reporter. While the presence of pSAP1 itself repressed metF expression to some level when compared to pUC18-transformed controls, it also produced a significant dose-dependent reduction in reporter expression over a 1mM – 10mM SAM concentration range. These significant effects were dependent on both the presence of pSAP ($F_{1,40} = 873.3$; $p<0.001$) and the dosage of SAM ($F_{4,40} = 19.13$; $p<0.001$). Additionally, SAM dosage effects depended on the presence or absence of pSAP ($F_{4,40} = 3.762$; $p<0.05$). Future studies will attempt to verify the results with more direct measures, while examining the apparent pSAP-dependent reduction in metF expression.

*** 3. Biochemistry of two putative methionine-gamma-lyases in the degradation of L-methionine by an acidophilic Archaeon "*Ferroplasma acidarmanus*"**
Khan, Mohammed A. and Hung, Kai F. Eastern Illinois University, Charleston, IL.

"*Ferroplasma acidarmanus*" strain fer1 (fer1) requires pH1 and unusually high sulfate (350mM) for optimum growth. Previous evidence showed that fer1 assimilates sulfate into proteins and releases methanethiol (CH3SH), a volatile organic sulfur compound. One possible source for methanethiol is the degradation of L-methionine by the enzyme methionine-gamma-lyase (MGL). Firstly, DTNB (5, 5'-dithiobis-(2-nitrobenzoic acid) was used to detect compounds containing thiol (-SH) group, such as methanethiol. The second assay uses MBTH (3-methyl-2-benzothiazolinone) to detect the presence of alpha-keto acids. In DTNB assays, fer1 lysate caused the production of thiol-containing compounds in a time-temperature dependent reaction ($N=3$, $p<0.05$). Heat-treated lysate controls showed no activity ($N=3$, $p<0.05$). Moreover, these activities were dependent on both pyridoxal phosphate, a coenzyme of previously reported MGLs from other sources, and on the addition of L-methionine as substrate ($N=3$, $p<0.05$). Results from MBTH assays suggested that fer1 catalyzes alpha-, gamma-elimination of L-methionine, which is a reaction carried out by MGLs. In MBTH assays, the highest specific activity (0.11μmol/mg/min, $N=1$) was detected at pH 4 and the value decreased with increasing pH. In fer1 genome, there are two candidates for MGL based on protein sequence homology compared to known MGLs. Two independent enzymatic assays both showed evidence of MGL-like activities in cell lysate of fer1, suggesting that the bioinformatics predictions of the presence of MGL analogs warrant experimental confirmation.

Division: Physics, Mathematics & Astronomy

*** 1. Modeling the pulsation rate of cepheid variable stars as a function of mass**
Kersten, Bill and Watson, Casey R. Millikin University, Decatur, IL.

By considering the observed relationships between the pulsation periods, luminosities, radii, and densities of Cepheid Variable stars (CVs) in conjunction with theoretical constraints based on: i) Stephan's Law of blackbody radiation, ii) the Heat Equation, and iii) the Lagrangian density for the pulsation of mass elements at the surfaces of CVs, we derive a self-consistent model of CV radial oscillations. Our model reproduces the observed range of CV pulsation periods: 1 – 50 days for 3 – 9 solar mass CVs, and reveals the radial dependence of their surface temperature, sound speed, and pressure.

*** 2. Chandra X-ray constraints on sterile neutrino warm dark matter**
Polley, Nick and Watson, Casey R. Millikin University, Decatur, IL.

We use the Chandra unresolved X-ray spectrum of a 12'-28' (2.8-6.4 kpc) annular region of the Andromeda galaxy to constrain the radiative decay of sterile neutrino warm dark matter. By excising the most baryon-dominated, central 2.8 kpc of the galaxy, we reduce the uncertainties in our estimate of the dark matter mass within the field of view and improve the signal-to-noise ratio of the prospective sterile neutrino decay signatures relative to hot gas and unresolved stellar emission. Our findings impose the most stringent limit on the sterile neutrino mass in the context of the Dodelson-Widrow model, $m_s < 2.3$ keV (95% C.L.). Our results also constrain alternative sterile neutrino production scenarios at very small active-sterile neutrino mixing angles.

Division: Science Education

~~1. Analysis of most frequently cited papers on science teaching strategies relative to best practices~~ CANCELLED
Wise, Kevin. Southern Illinois University, Carbondale, IL.

The purpose of this presentation is to identify, describe and analyze the descriptions of science teaching strategies found in the most cited published papers on the topic. What published papers on instructional methods in science have been most frequently cited, how do they describe science-teaching strategies and to what extent do these strategies align with best practice? This investigation will take the novel approach of using a popular search engine to identify the most cited papers on science teaching strategies. This approach to a literature search is intended to replicate the approach now most frequently used first by graduate students to survey the literature. The frames of reference for analyzing the science teaching strategies located will be best practice elements contained in the National Science Education Standards, Project 2061, and other related prominent national documents.

2. Aurora University's IMSP program impact
Beck, Hans, Davis, Jane, Othman, Saib, Eagle, Sherry, Patel, Chetna and de Lacey, Lora. Aurora University, Aurora, IL.

The impact of Aurora University's IMSP (Illinois Mathematics and Science Partnership) grants extends throughout the campus, community partners, and high needs school districts. The four

Masters programs focusing on Teacher Leadership in mathematics and science and the three summer workshop/institutes have enabled over 130 teachers and their 11,000 students to show significant gains in content knowledge, and have laid the foundation for sustainable improvements in mathematics and science education. Goals for the overall program are to improve teacher content knowledge in mathematics and science, improve teacher leadership skills to improve mathematics and science instruction throughout the districts, and improve student mathematics and science knowledge.

3. Supporting student learning in science through content management and research guides

Jackson-Beck, Lauren and Beck, Hans. Aurora University, Aurora, IL.

Phillips Library uses the content management program LibGuides to organize research information by subject. Begun in April 2009, there are now 48 published guides. These guides have received over 55,000 hits on our web page. Through LibGuides, librarians can organize information by subject regardless of format. Each guide contains basic information on new books, reference materials, images, videos, and links to professional organizations, authoritative databases, citation styles, RSS feeds, and access to our book catalog. LibGuides have changed the way librarians teach bibliographic instruction to students. Now integral to instruction sessions, each guide contains information tailor-made to the particular subject. Further improvements in bibliographic instruction using these guides are leading librarians toward "embedded librarianship." AU science faculty have begun to use this in Biology of Cells, Biology of Organisms, Comparative Botany, and Conservation Biology to support student academic success.

*** 4. Assessing the teaching methods within the anatomy and physiology laboratory**

Jabs, Ashley and Barry, Kelly. Southern Illinois University Edwardsville, Edwardsville, IL.

Anatomy and Physiology has been perceived to be one of the most difficult courses within the undergraduate curriculum. It has even been noted as being a source of student "anxiety and great difficulty". Learning anatomy and physiology usually involves multiple learning styles; most commonly, the lecture, practical learning, and tutorials (Meehan-Andrews, 2009). Research has shown that lectures are moderately effective but rarely stimulating (Cannon, 1992). Tutorials are effective if students actively participate and practical learning is the most effective strategy but can be expensive (Ramsden, 2003). We developed variations of prelab instruction for three lab sections of Anatomy and Physiology at SIUE in order to assess the effectiveness of illustration and video tutorial teaching strategies. One lab section received the traditional prelab lecture, one section viewed video supplements in addition to the lecture, and the third section received illustration supplements along with the lecture. All lab sections received the same lab practical learning experience. We measured learning gains through analysis of pre and post test scores and class quiz grades. We also evaluated free responses obtained on the post test to assess student attitudes to the lab material.

Division: Zoology

*** 1. Phenotypic plasticity in the freshwater snail *Elimia potosiensis* (Gastropoda: Pleuroceridae) in response to hydrodynamic gradients**

Miller, Stephanie J. and Brunkow, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

Due to the significance of snails in streams and rivers both in terms of numbers and function, it is important to understand the ecological energetics of snails. Freshwater snails not only utilize one of the most energetically expensive forms of locomotion but are also critical components to the food chain. In lotic ecosystems, snails are constantly under hydrodynamic strain, the cost of which could affect energetic relationships with the rest of the ecosystem. Shell shape could affect hydrodynamic drag, and plasticity in shell shape has been documented in a number of freshwater gastropods. For this study, collections of *Elimia potosiensis* were made from five sites along the Meramec River to quantify variation in both shell morphology and foot size along a hydrodynamic gradient. Overall, there was a significant relationship between shell shape and size: as snails increased in size, shell shape changed from relatively squat and rotund to more narrow and streamlined. There was also a positive relationship between foot area and shell size, however, not between foot size and shell shape. When compared between different sites, snails became more streamlined further upstream and foot size decreased. Results from this study indicate morphological plasticity in both shell and foot shape and size in response to variable hydrological environments. This study will be expanded to include analysis of hydrodynamic drag for each snail, as measured with a terminal velocity assay.

*** 2. Physics versus phylogeny in North American sunfishes (Centrarchidae)**

Astroth, Katherine, Hubbs, Melissa and Brunkow, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

Diversification in fishes has been mainly driven by changes in mouth functional morphology. A well-studied example of such diversification is found in the family Centrarchidae, with most studies focusing on comparing bluegill (*Lepomis macrochirus*) and largemouth bass (*Micropterus salmoides*). Differences seen between these two species are reflected in the morphology of their lever elements responsible for opening and closing the lower jaw. However, species in the genus *Lepomis* are much more diverse morphologically and ecologically compared to those in *Micropterus*. We have expanded jaw morphological analysis across Centrarchidae to include rock bass (*Ambloplites rupestris*), green sunfish (*L. cyanellus*), warmouth (*L. gulosus*), longear sunfish (*L. megalotis*), redear sunfish (*L. microlophus*), redspotted sunfish (*L. miniatus*), smallmouth bass (*M. dolomieu*), and black crappie (*Pomoxis nigromaculatus*). The experimental design used allowed *in situ* viewing of the lower jaw bones required to measure the opening and closing lever ratios. All species analyzed were found to have closing lever ratios intermediate between bluegill and largemouth bass. However, only rock bass, warmouth, and smallmouth bass had intermediate opening lever ratios between bluegill and largemouth bass. Black crappie and redear sunfish had lower opening lever ratios than largemouth bass. Green sunfish, longear sunfish, and redspotted sunfish had higher opening lever ratios than bluegill. Our results suggest that mouth functional morphology in Centrarchidae is more diverse than previously assumed.

*** 3. Functional morphology of the craniofacial complex in four Mustelidae**
Harding, Morgan and Kohn, Luci. Southern Illinois University Edwardsville, Edwardsville, IL.

The complexity of the growth of mammalian cranium as well as the multiplicity of its various functions, allow it to be an excellent source for cranial morphological studies. It is not uncommon to find members of the same Family having vast differences when observing the shape and size of the crania and face due to functional differences. The maxilla, one of the largest facial bones, is a key tool in being able to capture, kill and process its prey while fulfilling dietary demands. The maxilla and crania are composed of multiple functional units. Several studies support the notion that a strong relationship exists between the diet of species and their craniofacial morphology. This study examines dimensions of the craniofacial complex of four Mustelids: American mink (*Mustela vison*), long-tailed weasel (*Mustela frenata*), river otter (*Lontra canadensis*) and American badger (*Taxidea taxus*). We test whether Mustelids that share a primarily flesh eating diet are more similar to each other than are those who consume a tougher diet. The results support this hypothesis and indicate that a tougher diet requires more powerful muscles of mastication, increased cranial and facial dimensions and a shorter, broader maxilla. This supports previous findings of a relationship between diet and mandible form of these Mustelids.

~~4. Fossil mammals and ice age temperatures in Illinois~~ CANCELLED
Ruez, Jr., Dennis R. University of Illinois at Springfield, Springfield, IL.

One traditional strength of Quaternary paleoecology is the ability to reference modern biota. Taking advantage of that, I established correlations, using ecoregion maps and published distribution data, between taxonomic diversity of modern mammals and climatic variables. The predictive equations from the significant correlations can then be used to produce estimates of paleoclimate. These methods can provide more than gestalt interpretations; quantitative predictive equations may be generated from these data. Based on previous uses of these predictive equations, temperature estimates appear to be more reliable than those for precipitation; therefore, only temperature values were generated in this study. I examined published lists of fossil mammals for more than 200 Pleistocene and Holocene localities in Illinois. Some of these are superimposed sites (many archaeological); some are isolated specimens. Because the correlations based on modern biodiversity have better resolving power with more diverse paleoassemblages, only Illinois localities with fossil rodents were included in this analysis. This eliminated slightly more than half of the sites. Taken collectively, the more speciose localities produced estimated temperature trends expected for faunas before, during, and after the last glacial maximum. However, a broader geographic perspective would better show any patterns.

*** 5. Demographics of a commercially exploited population of flathead catfish in the Wabash River**
Moody, Cassi and Colombo, Robert. Eastern Illinois University, Charleston, IL.

In the lower 322 km of the Wabash River, flathead catfish are commercially harvested by Illinois and Indiana fishers. Illinois and Indiana have minimum size limits of 381 and 254 mm respectively. Indiana is in the process of changing their minimum size limit to 381 mm and allowing only one fish over 889 mm to be harvested. Our project will assess the current status of flathead catfish in the Wabash River to inform potential management options for the state of

Illinois. We sampled flathead catfish using AC and DC electrofishing during the summer of 2010. To estimate age, we removed pectoral spines from all fish greater than 200 mm. During summer 2010, we conducted 10 hours of AC electrofishing and about 3 hours of DC electrofishing. Catch per unit effort (CPUE) was higher for DC electrofishing (41.3 fish/hr) compared to AC electrofishing (1.6 fish/hr); however, AC electrofishing sampled larger fish (AC: mean=350.5 mm, DC: mean= 267.4 mm). We aged 68 flathead catfish. Mean age and length of the flathead catfish was 2.9 years and 363.49 mm. DC electrofishing seems to be a more effective way to sample flathead catfish than AC electrofishing. To represent the size structure of the population more accurately, we will increase our sampling effort to include trotlines, hoopnets, and gill nets in the summer of 2011.

*** 6. A comparative examination of enemy release in invasive carp of the Wabash River**
Wilcox, Justin and Laursen, Jeff. Eastern Illinois University, Charleston, IL.

Although invasive species can represent a highly destructive form of biological pollution, the factors that contribute to invasion success by many species are often poorly understood. Pathogens may play an important role in determining the invasion success of non-native species, particularly if invasive species are able to escape natural pathogens during the invasion process and fail to pick up pathogens from the introduced range. This study examines the potential for this type of "enemy release" in invasive cyprinids of the Wabash River. Non-native silver carp (*Hypopthalmichthys molix*) and common carp (*Cyprinus carpio*) were collected by boat electro-shocking and dissected for digestive tract helminths. Native trophic competitors and phylogenic relatives of these carp were also collected and dissected for parasites to ascertain the potential for host switching and determine if the invasive carp had experienced a release from pathogens relative to similar native fish. Preliminary data suggest that both the silver and common carp have fewer than their native counterparts.

*** 7. Preliminary survey of the class Insecta at Starhill Forest Arboretum (Menard Co., IL).**
Ray, Haleigh A.[1], Zettler, Lawrence W.[1] and Sternberg, Guy.[2] [1]Illinois College, Jacksonville, IL. [2]Starhill Forest Arboretum, Petersburg, IL.

Starhill Forest Arboretum, located on 48 acres in Menard Co., IL, comprises a living reference collection of 700 oaks (quercetum) and other woody plants spanning ca. 150 genera. Some of the trees represent one-of-a-kind selections found nowhere else in the world, contributing to its recognition as a member institution of the North American Plant Collections Consortium on Quercus. Also present is a native prairie garden, a pond, and a conifer plantation nestled among open fields, streams and wooded areas. Collectively, these areas serve as habitats for many different life forms such as non-vascular plants, vertebrates and invertebrates, among others. Given the importance of this site, coupled with recent concerns of encroachment by exotic (invasive) species in the region (e.g., emerald ash tree borer), a long-term inventory of the Class Insecta was initiated during March-August 2010. Various methods were used to collect insects, namely a black light, hand net, and malaise trap. After capture, noteworthy specimens were identified to genus and/or family level, and preserved using standard entomological protocols. All specimens were subsequently deposited into the Illinois College Insect Museum in Jacksonville for future reference. A total of 75 insect families within 17 orders were acquired. Examples include: Two-lined Spittlebug (*Prosapia bicincta*, Cercopidae), hangingfly (Bittacidae), two genera of carrion beetles (Silphidae), ensign wasp (Evaniidae), and Large

Caddisfly (*Ptilostomis* sp., Phryganeidae). Most serious pests include the pine bark beetle (Scolytidae).

*** 8. A parasitological survey of pen-raised bobwhite quail (*Colinus virginianus*) in Illinois**
Rolfsen, Bryan P. K. and Laursen, Jeff. Eastern Illinois University, Charleston, IL.

This survey of intestinal parasites of bobwhite quail (*Colinus virginianus*) was conducted in Casey, IL between the months of May and November 2009. Parasites were sampled from a total of 43 pen-raised quail using necropsies, fecal examinations, and blood smear analyses. Litter egg burdens were also estimated. Three endoparasites, including two nematodes (*Heterakis* sp., *Capillaria* sp.) and one protozoan (*Eimeria* sp.) were recovered. *Eimeria* sp. occurred in young birds, but those that survived developed immunity. *Capillaria* sp. was present in older birds, and high intensity infections caused fatalities. *Heterakis* sp. occurred periodically at low levels throughout the study. Potential management techniques meant to lower parasite levels are discussed – vigilant sanitation ranks as the number one priority in prevention.

*** 9. Innate predator recognition and cultural transmission of predator recognition in the zebra finch (*Taeniopygia guttata*)**
Wiggen, Kelly E. and Templeton, Jennifer J. Knox College, Galesburg, IL.

Cultural transmission is a process that involves the transfer of fitness-enhancing information from one individual to another via social learning and it can be naturally or artificially induced. In the wild, it is a way for young to learn what foods to eat or what predators to avoid. In a situation like an endangered species captive breeding program, cultural transmission is especially important in helping animals learn to survive in the wild, and recognizing predators is one of the most important lessons. Using domesticated Zebra Finches (*Taeniopygia guttata*) as a model species, we first determined whether they had innate predator recognition. We presented a familiar non-predator (a Zebra Finch), two unfamiliar non-predators (a Black-capped Chickadee, *Parus atricapillus*, and a Cockatiel, *Nymphicus hollandicus*), and two unfamiliar predators (an American Kestrel, *Falco sparverius*, and a small rubber snake), and recorded the latency to land and feed at spinach (a treat) and total time spent feeding at the spinach for each model, and compared this to baseline measurements where there was no model present. According to preliminary data, zebra finches do not have innate predator recognition; instead, they appear to be wary of all novel objects, with wariness increasing as the size of the object presented also increases. The cultural transmission portion of the research entails presenting birds with a model snake concurrently with one of four playbacks: silence, background noise, wild Zebra Finch social calls, or wild alarm calls. We predict that pairing the playback of a finch alarm call with the presentation of a snake model will enhance the birds' learning to recognize the snake as a predator, with reduced habituation rates in that treatment group over time.

*** 10. Heterospecific eavesdropping in Kirk's dik-dik (*Madoqua kirkii*)**
Sapp, Scott. Knox College, Galesburg, IL.

It has been held that social behavior in a species is required for its ability to detect the alarm call of a heterospecific, in which its vocalizations warns conspecifics of an approaching predator. However, recent research involving Guenther's dik-dik (*Madoqua guentheri*) shows this prerequisite is not always present, as the dik-dik is non-social, monogamous, and territorial, but responded vigilantly to recordings of the alarm call of the white-bellied go-away bird

(*Corythaixoides leucogaster*). Because Guenther's dik-diks were not present at our study site, Tarangire National Park, the research subject was Kirk's dik-dik (*Madoqua kirkii*), a sister species of *M. guentheri* very similar in morphology and especially behavior. Results showed more of a vigilant response to the alarm call of *C. leucogaster* than to recordings of vocalizations of other birds from the area, thus suggesting *Madoqua kirkii* has the same abilities as its sister species *M. guentheri* in heterospecific eavesdropping, or the ability to hear and correctly interpret communication from other species that is not intended for the dik-dik. These findings contribute to other research that shows sociality is not a prerequisite for heterospecific eavesdropping.

*** 11. The effect of host to parasite egg ratio on cowbird egg ejection by American robins**
Lang, Allison Karlien and Bollinger, Eric K. Eastern Illinois University, Charleston, IL.

The Brown-headed Cowbirds' (*Molothrus ater*) nesting behavior known as “nest parasitism” refers to the practice of laying eggs in the nests of other birds rather than in a nest they build themselves. This system has been studied extensively, and many species of host birds have been categorized as either Cowbird egg-ejectors or egg-acceptors. American Robins (*Turdus migratorius*) have been repeatedly categorized as
Cowbird egg-ejectors: when parasitized by a Cowbird, a Robin will remove the foreign egg from its nest. This study addresses the mechanism by which American Robins recognize which egg(s) to eject. Varying host-to-parasite egg ratios were created in naturally occurring Robin nests by adding artificial Cowbird eggs or removing American Robin eggs. In 32 nests sampled, Robins ejected all artificial Cowbird eggs, excluding 4 nests in which Robin eggs hatched prior to ejection. On average, ejection took place within one day of manipulation and the host-to-parasite egg ratio had no significant effect on the latency to ejection. This suggests that American Robins can recognize their own eggs and successfully eject eggs they determine to be foreign. Future directions include the use of a remote video recording system to observe details of the egg ejection behavior of American Robins.

*** 12. Multivariate habitat models for neotropical migrant songbirds in fragmented oak-hickory forest in southwestern Illinois**
French, Zachary L., Minchin, Peter R. and Essner, Jr., Richard L. Southern Illinois University Edwardsville, Edwardsville, IL.

Habitat loss and fragmentation are directly tied to population declines and extinctions of many Neotropical migrant songbirds. Our objective was to assess avian populations in oak-hickory forest fragments in southwestern Illinois, in order to characterize existing habitat as well as to inform future land use decisions. Surveys were conducted at 130 randomized plots in two forest patches on the campus of Southern Illinois University Edwardsville and in the adjacent Bohm Woods State Nature Reserve. Fixed-distance point-counts and audio recordings (25 m radius; 10 minutes) were taken 8-10 times per plot in May-July, 2008 and May-August, 2010. Habitat variables included counts of standing dead trees and fallen logs, canopy height, canopy openness, distance to forest edge, mean tree DBH, topographic position, understory cover, and forest composition (summarized as the three axes of a NMDS ordination). Density estimates, species richness and Shannon diversity were calculated for each forest patch. Indicator species analysis was used to determine which bird species best characterized each forest. This study identified a total of 94 species, including the state threatened Cerulean Warbler, Bell's Vireo and Northern Harrier. Habitat models were constructed for each bird species using logistic regression to model

the probability of occurrence of the species as a function of habitat variables and a contouring program was used to map the predictions from these models in each forest fragment. The baseline data and habitat models from our research can be used to guide management.

DRIVING DIRECTIONS TO EASTERN ILLINOIS UNIVERSITY

Eastern Illinois University, 600 Lincoln Avenue, Charleston, IL 61920

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The conference will take place in University Union (see map), with the exception of the Poster Session, which will take place in the Doudna Fine Arts Center. Please come to the registration table located on the third floor, east wing of the University Union. Posters can be set up after noon on Friday

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Conference Buildings

University Union: Registration, Oral Presentations, Banquet/Keynote Address and Division Meetings

Doudna Fine Arts Center: Poster Session

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May 2010 - May 2011
(As of March 2011)

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FUTURE MEETINGS

April 2012: Knox College, Galesburg, IL

FELLOWS OF THE ILLINOIS STATE ACADEMY OF SCIENCE

Year	Fellow	Area
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1984	Donald R. Dickerson	Geology
1984	Norman R. Farnsworth	Pharmacology
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
1984	Robert H. Mohlenbrock	Botany
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
1988	John E. Ebinger	Botany
1990	Amrik Dhaliwal	Biology
1990	Leon Gershbein	Chemistry
1990	John W. Reeves	Biology
1991	Geoffrey A. Cordell	Chemistry
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 Developmental Biology
2001	Ralph Troll	Biology
2002	Walter J. Sundberg	Botany
2003	Laurence E. Crofutt	Bacteriology
2003	Nektal M. Made Gowda	Chemistry
2004	James Rastorfer	Environmental Science
2005	William McClain	Botany
2008	Janice M. Coons	Botany
2008	Richard B. Brugam	Environmental Science
2010	Andrew S. Methven	Botany

ACKNOWLEDGMENTS

Planning for the Annual Meeting of the Illinois State Academy of Science requires the assistance of a very large number of individuals who spend countless hours preparing for what we hope will be a successful event. The 103rd Annual Meeting at Eastern Illinois University was no exception, and we would like to thank everyone for their assistance. We would especially like to thank the President of the ISAS, Ed DeWalt, and the Executive Secretary, Robyn Myers, for their assistance in all phases of planning the meeting. We would also like to thank the ISAS Division Chairs for their efforts in putting together the scientific program and for judging the poster and oral presentations given by a very talented group of students. Dozens of individuals at Eastern Illinois University from facilities and catering to faculty and administration have worked tirelessly in preparation for the meeting. To the students, staff, and faculty of Eastern: Thank you. Finally, and most importantly, we thank the attendees, presenters, as well as our keynote and symposium speakers.

Sincerely,
Gary Bulla and Barbara Carlsward
Vice Presidents, 2011 Annual Meeting

AUTHOR INDEX