

TRANSACTIONS OF THE ILLINOIS STATE ACADEMY OF SCIENCE

Supplement to Volume 108



**107th Annual Meeting
April 10-11, 2015**

**Western Illinois University
Macomb, Illinois**

Illinois State Academy of Science

Founded 1907

**Affiliated with the Illinois State Museum
Springfield, IL**

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107th ISAS Annual Meeting

April 10-11, 2015

Western Illinois University

Host: Jim McQuillan

MEETING SCHEDULE

Friday, April 10th

- 12noon – 2pm, ISAS Board of Directors Meeting (Multicultural Center Board Room)
- 1-5:30pm Registration (Multicultural Center Lobby)
- 1:00-2:15pm Poster setup
- 2:15-3:30pm Poster Session A (Multicultural Center)
- 3:30-3:45pm change posters
- 3:45-5:00pm Poster Session B (Multicultural Center)
- 6-7:30pm, Dinner Banquet (Heritage Room, University Union)
- 7:30-9:00pm, Keynote Address – Dr. C. Victor Jongeneel (Heritage Room, University Union)

Saturday, April 11th

- 7:00-8:00am Breakfast (Multicultural Center Lobby)
- 7:30am-12noon Registration (Multicultural Center Lobby)
- 8:00am-12noon Oral Presentations (Knoblauch Hall)
- 12:30-1:30pm Lunch and Awards (Heritage Room, University Union)

Parking: Visitors attending the ISAS Annual Meeting may park at no cost in any non-metered parking lot on campus during the Annual Meeting except:

- Do not park in a spot denoted by a sign with a specific permit number
- Do not park in a handicapped spot unless you have a handicap hangtag or license plate
- Do not park in a tow-away zone, loading area, or space denoted for 30 minutes only

Note: If you opt to park in a spot with a meter, you must feed the meter

POSTER PRESENTATION SCHEDULE – MULTICULTURAL CENTER

Session A 2:15-3:30pm				Session B 3:45-5:00pm			
1	Botany	55	Environmental Science	2	Botany	56	Environmental Science
3	Botany	57	Environmental Science	4	Botany	58	Environmental Science
5	Botany	59	Environmental Science	6	Botany	60	Environmental Science
7	Cellular Biology	61	Environmental Science	8	Cellular Biology	62	Health Science
9	Cellular Biology	63	Health Science	10	Cellular Biology	64	Microbiology
11	Cellular Biology	65	Microbiology	12	Cellular Biology	66	Microbiology
13	Cellular Biology	67	Microbiology	14	Cellular Biology	68	Microbiology
15	Cellular Biology	69	Microbiology	16	Cellular Biology	70	Microbiology
17	Cellular Biology	71	Microbiology	18	Cellular Biology	72	Microbiology
19	Chemistry	73	Microbiology	20	Chemistry	74	Microbiology
21	Chemistry	75	Microbiology	22	Chemistry	76	Physics & Astronomy
23	Chemistry	77	Physics & Astronomy	24	Chemistry	78	Physics & Astronomy
25	Chemistry	79	Physics & Astronomy	26	Chemistry	80	Physics & Astronomy
27	Chemistry	81	Physics & Astronomy	28	Chemistry	82	Science & Tech Ed
29	Chemistry	83	Science & Tech Ed	30	Chemistry	84	Science & Tech Ed
31	Chemistry	85	Science & Tech Ed	32	Chemistry	86	Science & Tech Ed
33	Chemistry	87	Science & Tech Ed	34	Chemistry	88	Zoology
35	Chemistry	89	Zoology	36	Chemistry	90	Zoology
37	Chemistry	91	Zoology	38	Chemistry	92	Zoology
39	Chemistry	93	Zoology	40	Chemistry	94	Zoology
41	Chemistry	95	Zoology	42	Chemistry	96	Zoology
43	Chemistry	97	Zoology	44	Chemistry	98	Zoology
45	Chemistry	99	Zoology	46	Chemistry	100	Zoology
47	Environmental Science	101	Zoology	48	Environmental Science	102	Zoology
49	Environmental Science	103	Zoology	50	Environmental Science	104	Zoology
51	Environmental Science	105	Zoology	52	Environmental Science	106	Botany – added poster
53	Environmental Science			54	Environmental Science		

Division Abbreviations

Cellular Biology	Cellular, Molecular, & Developmental Biology
Engineering Tech	Engineering & Technology
Physics & Astronomy	Physics, Astronomy, & Mathematics
Science & Tech Ed	Science, Mathematics, & Technology

Participant Abbreviations

Grad	Graduate Student
UG	Undergraduate Student
None	Regular/Faculty Member

School Abbreviations

Aurora	Aurora University	Millikin	Millikin University
Bradley	Bradley University	Missouri	University of Missouri St. Louis
CSU	Chicago State University	Moraine	Moraine Valley Community College
DePaul	DePaul University	SIUE	Southern Illinois University Edwardsville
EIU	Eastern Illinois University	UIC	University of Illinois Chicago
Greenville	Greenville College	UIS	University of Illinois Springfield
GSU	Governors State University	UIUC	University of Illinois Urbana-Champaign
IC	Illinois College	WIU	Western Illinois University
Joliet	Joliet Junior College	WIUQC	Western Illinois University Quad Cities

POSTER PRESENTATIONS – MULTICULTURAL CENTER

#	Presenter	Title of Presentation
Botany		
1	Andrew Blomberg (UG UIUC)	Identifying the Purpose of Winter Marcescence in <i>Quercus Imbricaria</i>
2	Elizabeth Esselman (SIUE)	Identification of an Unknown Missouri Glade Aster Species
3	Jenelle Mathias (UG, SIUE)	Gerberellic Acid Eliminates the Cold Stratification Requirement in <i>Stanleya pinnata</i>
4	Grant Morton (Grad, SIUE)	Isolating Orchid Mycorrhizal Fungi from <i>Spiranthes vernalis</i> for Subsequent Seed Germination and Reintroduction
5	Kurt Schulz (SIUE)	Understory Light Levels Needed to Promote the Growth of Invasive <i>Lonicera maackii</i> (Caprifoliaceae) Seedlings
6	Savanna Stabenow (UG, SIUE)	Quantifying the Abundance and Distribution of Woody Vines (<i>Lianas</i>) in Oak-Hickory Forest
106	Diya Majumdar (UG, UIC)	Seed Selection in Avian Granivores: A Role for Plant Secondary Metabolites?
Cellular, Molecular, & Developmental Biology		
7	Meshack Afithhile (WIU)	The TOC132-TOC120 Heterozygote Mutant of <i>Arabidopsis thaliana</i> Accumulates Reduced Levels of Hexadecatrienoic Acid
8	Meshack Afithhile (WIU)	The TOC159 Mutant of <i>Arabidopsis thaliana</i> Accumulates Reduced Levels of Polyunsaturated Fatty Acids
9	Jill LaRue (Grad, SIUE)	Genome Analysis and Knock-out Plasmid Construction for Two Dicer Genes in <i>Schizophyllum commune</i> (Schizophyllaceae)
10	Spencer Jacquet (UG, Greenville)	Effect of Kava Extract on Mechanosensory Function in <i>C. elegans</i>
11	Michael Mengarelli (UG, Greenville)	Paralysis and Epileptic-like Convulsions Induced by Kava Extract in <i>C. elegans</i>
12	Marshall Moyer (UG, Bradley)	Sequencing the AMP-Activated Protein Kinase gene for an Aquatic Invasive Invertebrate
13	Tania Ray (Grad, EIU)	Impact of Transcription Factors on Fibroblast Specific Gene Silencing in Somatic Cell Hybrids: A Whole Genome Approach
14	Juli Phillips (UG, Greenville)	Potential Role of Kava Extract in Cholinergic Transmission at the <i>C. elegans</i> Neuromuscular Junction
15	Toria Trost (UG, SIUE)	Examining the Role of the SWI/SNF Chromatin Remodeling Complex in Planarian Regeneration and Stem Cell Function
16	Anit Shah (Grad, EIU)	The Role of CREG1 as a Master Regulator of Liver Function
17	Olivia Waszczuk (UG, Millikin)	Assessment of Nanoparticle Safety for Use in Breast Cancer Treatments
18	Emily Soltis (UG, Bradley)	The Effects of Environmental Stress on Channel Catfish: Detection of Cellular Stress Proteins during High Temperature and Hypoxic Stress
Chemistry		
19	Ajith Poladi (Grad, WIU)	Structural Elucidation of Humic Acids by Carbon-13 NMR Spectroscopy
20	Alexis Jones (UG, WIU)	The Role of Environmental Conditions on Forensic Soil Comparisons: HPLC, Conductivity, and Settling Rate Analyses
21	Shelby Crawford (Grad, WIU)	Analysis of Local Water Contents by Direct Analysis in Real Time, DART, and Mass Spectrometry
22	Rachel Austin (UG, WIU)	High Performance Liquid Chromatography of Fenuron

#	Presenter	Title of Presentation
23	Jasmine Gentry (UG, WIU)	Comparative Evaluation of GC-FID, Density Gradient, and ORP Protocols for Forensic Soil Analysis
24	Joshua Diaz (UG, WIU)	Primers Design for Amplification of Putative Secondary Alcohol Dehydrogenase Gene from <i>Nocardia cholesterolicum</i> NRRL5767
25	Abigail Gibson (Grad, WIU)	Determination of Trace Amounts of Drugs and Pesticides in Local Water Samples Using High Performance Liquid Chromatography and Mass Spectrometry
26	Brittany Donovan (UG, WIU)	Forensic Soil Comparisons Using HPLC, ORP, and Microscopic Analysis
27	Ashley Hardt (UG, WIU)	Comparison of Protocols for FTIR, Density Gradient, and Conductivity Testing of Forensic Soil Samples
28	Amanda Ellison (Grad, WIU)	Evaluation of Synthetic Thiosemicarbazone Containing Compounds as Inhibitor of Cathepsin K
29	Shan Mei Jones (UG, WIU)	Evaluating Microscopic, GC-FID, and Conductivity Methods for Forensic Soil Comparisons
30	Chelsie Forrest (Grad, WIU)	Synthesis of Palladium Diphosphine Complexes for X-Ray Absorption Spectroscopy Analysis
31	Adam Koe (Grad, WIU)	Copper-Catalyzed One-Pot Tandem Synthesis of Unsymmetrical Diaryl Chalcogenides
32	Ashley Hillenburg (UG, WIU)	Soil Fingerprinting via FTIR, pH, and Microscopic Analyses
33	Deepa Rekulapally (Grad, WIU)	Determination of Functional Groups of Humic Acids by Infrared Spectroscopy
34	Kamala Keerthy Kola (Grad, WIU)	Microwave-Assisted Three-Component Click Reaction in Water
35	Jacqueline Richardson (UG, WIU)	Comparison of Soil Analysis Methods for HPLC, pH and Soil Density
36	Mahati Lolla (Grad, WIU)	Synthesis of Unsymmetrical Biaryls Through Palladium-Catalyzed Cross-Coupling of Diaryl Tellurides with Organoboronic Acid
37	Mattea Scanlan (UG, WIU)	Chalcogenide Synthesis
38	Drake Mellott (UG, Millikin)	Site Specific N-Methylation of Arginine Residues within Arginine and Tryptophan Rich Peptides
39	Elizabeth Sharp (UG, WIU)	Analysis of Trace Amounts of Penicillin in Lake Water Using High Performance Liquid Chromatography
40	Shashidhar Poreddy (UG, WIU)	Oxidative Transformations of 1,3-Dicarbonyl Compounds Using o-Iodoxybenzoic Acid (IBX) and its Derivatives
41	Tiffany Tyson (UG, WIU)	Evaluating the Importance of Soil Storage Conditions Using FTIR, ORP, and Soil Settling Rate
42	Ryan Wojdyla (UG, WIU)	Weathering and Storage of Forensic Soil Samples: Effects on GC-FID, Settling Rate, and pH Characterization
43	David Vanderway (Grad, WIU)	Evaluation of Potential Cathepsin D Inhibitors
44	Chang-chi Yen (Grad, WIU)	Synthesis of macrocyclic aromatic tellurides
45	Souseelya Vedula (Grad, WIU)	A New Method to Synthesize Biaryl Compounds
46	Praveen Reddy Yeredla (Grad, WIU)	Synthesis of Phenyl Substituted o-Iodoxybenzoic Acid (IBX) Derivatives for Probing Hypervalent Iodine Twist

Environmental Science

47	Meeta Chavan (Grad, SIUE)	The Study of the Permeability Effects of Bifenthrin on the Tight Junctions of the Blood-Brain Barrier
48	Mary Christensen (UG, SIUE)	Evaluating Long-Term <i>Sedum</i> Green Wall Coverage
49	Allyssa Decker (Grad, SIUE)	Evaluating Native Plant Performance on a Mid-Western Green Roof
50	Keith Flaughner (Grad, WIU)	An Investigation of the Mechanism of Pyrethroids across the Human Brain Microvascular Endothelial Cells and Its Application in Health Risk Assessment

#	Presenter	Title of Presentation
51	Eric Haaksma (UG, WIU)	Native Bee Diversity in Illinois Restored Prairies and Sand Prairies
52	Lisa Hebenstreit (Grad, SIUE)	Population Demography of the Illinois Chorus Frog, <i>Pseudacris illinoensis</i> , in Southwestern Illinois
53	Amanda Henderson (UG, SIUE)	Long-Term Evaluation of <i>Sedum</i> Cuttings as an Establishment Method on Mid-Western Green Roofs
54	Stephanie Matthew (Grad, SIUE)	The Relationship between Sediment Genotoxicity and Oxidative Stress Responses in Blue Gill Sunfish (<i>Lepomis macrochirus</i>) and Mosquitofish (<i>Gambusia affinis</i>)
55	Scott McConnell (WIU)	Assessing the Soil Nitrate-Nitrogen and Extractable Soil Phosphorus Status of the Spring Lake Watershed
56	Kenneth McCravy (WIU)	Orchid Bees of Cusuco National Park, Honduras
57	Morgan Rakers (Grad, SIUE)	Establishing <i>Schmidtea mediterranea</i> as a Model to Study Nanoparticle Toxicity in Freshwater Systems
58	Kayla Tatum (UG, WIU)	Long Term Effects of Weeding Green Roof Systems
59	Jun Wang (Grad, SIUE)	Biogenic Volatilization of Selenium from Nanoselenium-Treated Soil- <i>Stanleya pinnata</i> System
60	Christopher Theodorakis (SIUE)	Effect of Thyroid Hormones and Arsenite on Expression of Glutathione-Metabolizing Genes in Zebrafish
61	Sahar Zeinali (Grad, SIUE)	Partitioning of Nanoselenium Particles in the Soil-Winter Wheat System

Health Science

62	Callie Mincy (UG, SIUE)	Expression of Runt Related Transcription Factor 2 in Salivary Gland Cancer
63	Branden Bennett (Grad, SIUE)	Electromyogram (EMG) Amplitude Analysis of Masticatory Muscles during Mastication versus Brux-Like/Thegosis Activity

Microbiology

64	Avery Allen (UG, EIU)	Fermentation Potentials of the Bile Acid-Dehydroxylating Anaerobe <i>Clostridium scindens</i>
65	Hilary Browning (UG, Millikin)	Classification of Soil Microbes that Produce Antimicrobial Activity using A DNA-Based Identification System
66	Alyssa King (UG, Bradley)	Regulation of AhpA by AbrB in <i>Bacillus subtilis</i> under Oxidative Stress and during Sporulation
67	Alexa Heumann (UG, EIU)	Analyzing <i>Escherichia coli</i> Strains from Untreated Surface Waters using Multiplex PCR for Pathogenic Loci
68	Ryan Momenteller (UG, SIUE)	Optimization of Culture Conditions for <i>Schizophyllum umbrinum</i>
69	Katelyn Logan (Grad, SIUE)	A Study of the Interactions between <i>Verbesina negrensensis</i> Derived Extractions and <i>Helicobacter pylori</i>
70	Eliese Potocek (UG, WIU)	Resistance of <i>Trichoderma koningiopsis</i> to Heavy Metals and its Effects on Plant Growth
71	Lindsay Pushala (UG, EIU)	Diversity of <i>Escherichia coli</i> in Rural Illinois Creek Waters: Potential Impact on Public Health?
72	Teresa Sartore (Grad, WIU)	Enhanced Electrotransformation of <i>Leuconostoc</i> (Genus) <i>citreum</i> (species)
73	Karen Shaw (Grad, EIU)	Diversity of the Beneficial Bacterium <i>Oxalobacter formigenes</i> Isolated from the Human Gut
74	Rosa Schulz (UG, SIUE)	The Effect of <i>Helicobacter canadensis</i> on Gastrointestinal Epithelia in Humans
75	Kaleb Thornhill (UG, EIU)	Assessing Methanogen Diversity at Landfill-Impacted Site Utilizing 16S rDNA Sequence

Physics, Astronomy, & Mathematics

76	Benjamin Grober (UG, WIU)	Optical Properties of Lead Boro-Tellurate Glasses Doped with Fe and Co Ions
77	Justin Gonzales (UG, WIU)	Measuring Material Properties with Parts-Per-Billion Sensitivity by Utilizing a Tunnel Diode Resonator Circuit
78	Hio Giap Ooi (Grad, WIU)	Dysprosium Fluorescence and Optical Absorption in Lead and Bismuth Borate Glasses

#	Presenter	Title of Presentation
79	Mohammad Mohammadpour Aghdam (Grad, WIU)	Probing the Shape of High Dimensional Data
80	Nicole Szabo (UG, WIU)	Optical Properties of Bismuth Borate Glasses Doped with Mn and Ni Ions
81	Mitchell Riley (UG, WIUQC)	Stochastic Population Modeling: Effects of Parameter Variation on Standard Deviation
Science, Math, & Technology Education		
82	Brooke Kottkamp (UG, SIUE)	Perceptions and Misconceptions about Climate Change: Teacher Approach
83	Rosa Schulz (UG, SIUE)	Internship in Science Education in Informal Settings
84	John Kriz (Joliet)	Understanding Statistics: A Clay Modeling Activity for Statistics Classes
85	Raneen Taha (UG, SIUE)	Student Misconceptions on Climate Change
86	Jessica Krim (SIUE)	Noyce Science Scholarship Program at SIUE
87	Brenna McIlvoy (UG, SIUE)	The Effect of Combustible Dust Concentration and Identity on Explosion Size
Zoology		
88	Justin Church (Grad, SIUE)	Sequence Comparisons of Growth Hormone Receptor Genes in Closely Related Anolis (Sauria, Iguanidae) Lizards of Differing Body Size
89	Jade Becker (UG, Millikin)	Effects of Testosterone on Development and Locomotor Performance in Western Chorus Frogs (<i>Pseudacris triseriata</i>)
90	Andrea Hauk (UG, WIU)	A Survey of Terrestrial Gastropods of the Alice L. Kibbe Life Science Station in West-Central Illinois
91	Ashley Fulk (UG, Millikin)	Effects of Stress during Development on Skin Antioxidant Capacity in Western Chorus Frogs and Cuban Tree Frogs
92	Spencer Hudson (UG, Millikin)	Effects of Social Habituation on Coloration and Stress in Male Green Anoles, <i>Anolis carolinensis</i> (Squamata: Polychrotidae)
93	Anthony Garcy (CSU)	Venomous Sea Anemones Presumed to be <i>Triactis producta</i> , Klunzinger, 1877 were Photographed in the Coastal Waters of Kona, Hawaii
94	Kristi Johnson (UG, SIUE)	Analysis of Lateral Jaw Muscle Development During Late Tadpole Stages of Gray Tree Frogs (<i>Hyla versicolor</i> / <i>Hyla chrysoscelis</i> : Anura, Hylidae)
95	Seth Griffis (Grad, SIUE)	Sequence Comparisons of Insulin-Like Growth Factor Axis Genes in Closely Related Anolis Lizards of Differing Body Size
96	Candice Johnson (Grad, SIUE)	Comparing Feeding and Jumping Behavior in Northern Leopard Frogs, <i>Lithobates pipiens</i>
97	Morgan Kincheloe (UG, Millikin)	Hematological Metrics Associated with Injury, Disease, and Recovery in Birds of Prey Admitted to the Illinois Raptor Center
98	Rachel Kindred (UG, Millikin)	Visual Learning in the Common House Cricket, <i>Acheta domesticus</i> (Orthoptera: Gryllidae)
99	Jamila McClinton (UG, SIUE)	Development of Ventral Jaw Muscles in Tadpoles of Gray Tree Frogs <i>Hyla versicolor</i> and <i>Hyla chrysoscelis</i> (Anura: Hylidae)
100	Jessica Loethen (Grad, SIUE)	Intraspecific Variation in Tail Geometry in Three Cyprinid Fishes Covaries with Stream Position
101	Alycia Sorensen (Grad, SIUE)	Analysis of Intraspecific Morphological Variation in Cyprinids (Cypriniformes: Cyprinidae) along a Stream Gradient in East-Central Missouri
102	Corrinne O'Brien (Grad, SIUE)	Population Demography of the Eastern Narrow-mouthed Toad, <i>Gastrophryne carolinensis</i> , in Southwestern Illinois
103	Katie Stoltz (Grad, SIUE)	Behavioral Responses of Plains Leopard Frog (<i>Lithobates blairi</i>) Tadpoles to Cues from Predators and Conspecifics
104	Kendra Peterson (UG, Millikin)	Learning Behavior using Route Selection in the Jumping Spider <i>Phidippus audax</i> (Araneae: Salticidae)

#	Presenter	Title of Presentation
105	Lucas Winebaugh (UG, SIUE)	Developing a New Technique for Measuring Hydrodynamic Drag and Lift on Benthic Organisms
<i>Botany – added poster</i>		
106	Diya Majumdar (UG, UIC)	Seed Selection in Avian Granivores: A Role for Plant Secondary Metabolites?

ORAL PRESENTATION ROOM SCHEDULE – KNOBLAUCH HALL

	KH103	KH105	KH106	KH152	KH305	KH306	KH308	KH330
8:15am		Physics & Astronomy		Environmental Science	Zoology			Botany
8:30am	Science & Tech Ed	Physics & Astronomy	Cellular Biology	Environmental Science	Zoology		Engineering Tech	Botany
8:45am	Science & Tech Ed	Physics & Astronomy	Cellular Biology	Environmental Science	Zoology		Engineering Tech	Botany
9:00am	Science & Tech Ed	Physics & Astronomy	Cellular Biology	Environmental Science	Zoology		Engineering Tech	Botany
9:15am	Break	Physics & Astronomy	Cellular Biology	Environmental Science	Zoology		Engineering Tech	Botany
9:30am	Health Science	Physics & Astronomy	Cellular Biology	Break	Zoology		Break	Botany
9:45am	Health Science	Physics & Astronomy	Break	Environmental Science	Zoology		Computer Science	Break
10:00am	Health Science	Break	Microbiology	Environmental Science	Break		Computer Science	Botany
10:15am		Chemistry	Microbiology	Environmental Science	Zoology	Zoology	Computer Science	Botany
10:30am		Chemistry	Microbiology	Environmental Science	Zoology	Zoology	Computer Science	Botany
10:45			Microbiology	Environmental Science	Zoology	Zoology	Computer Science	Botany
11:00am				Environmental Science	Zoology	Zoology		
11:15am						Zoology		
11:30am	Available for Division Meeting and Student Award Determinations							

Division Abbreviations

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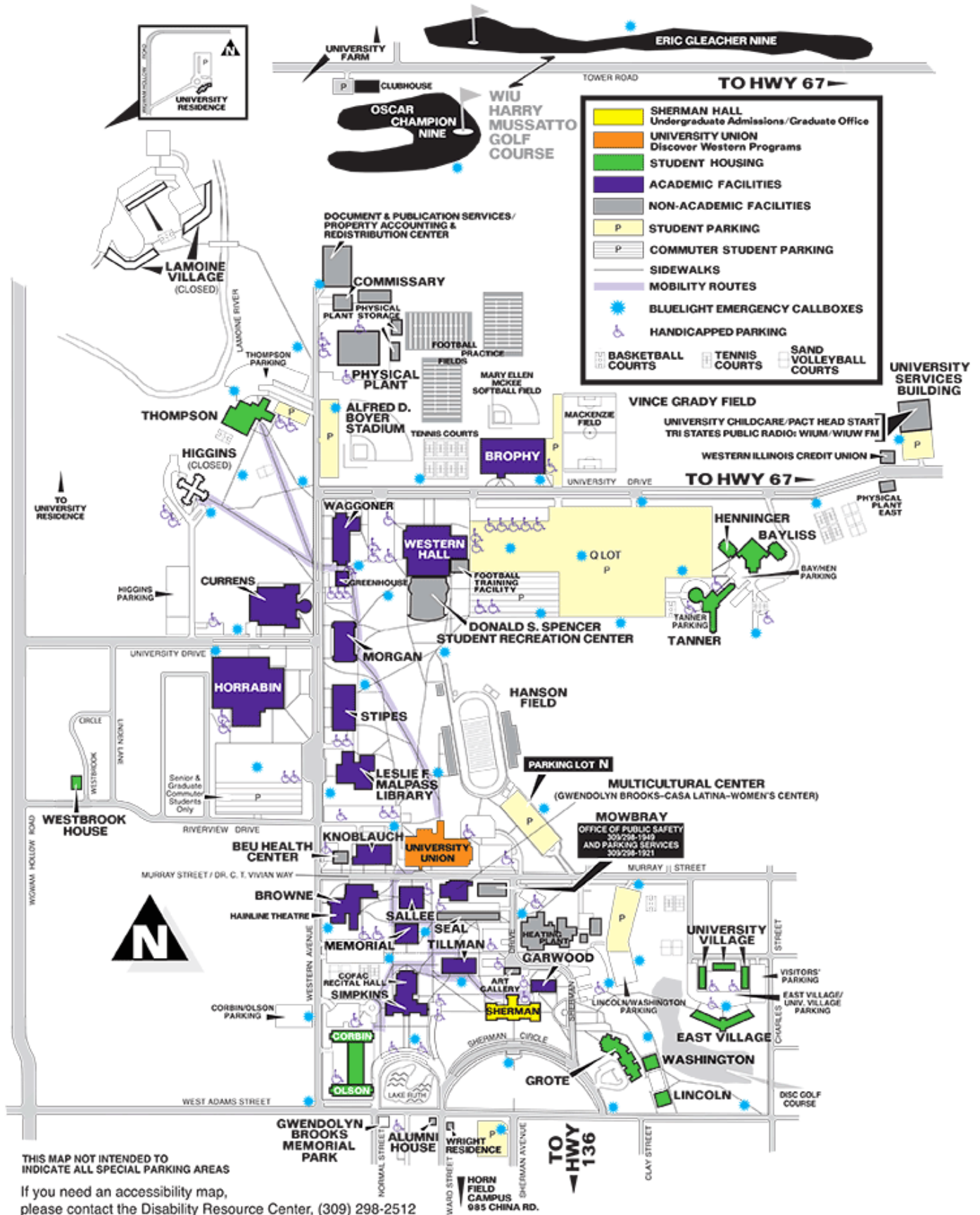
ORAL PRESENTATIONS – KNOBLAUCH HALL

Time	Room	Presenter	Title of Presentation
Botany			
8:15	KH330	Hunter Bryant (UG, IC)	Initial Efficacy Testing of Mycorrhizal Fungi Acquired from Orchids Native to the Central Highlands of Madagascar, Through Symbiotic Seed Germination
8:30	KH330	Jon Clark (Grad, SIUE)	Screening for Allelopathic Potential in Japanese Hops (<i>Humulus japonicus</i> , Cannabaceae)
8:45	KH330	Noah Dell (UG, SIUE)	Quantifying Oak-Hickory Forest Succession in the SIUE Nature Preserve
9:00	KH330	Break	Original presentation moved to poster session
9:15	KH330	Peter Minchin (SIUE)	Perspectives on the Evaluation of Ordination Techniques
9:30	KH330	Kendra Peterson (UG, Millikin)	Effect of Herbivory of Painted Lady Caterpillars, <i>Vanessa cardui</i> , on Photosynthetic Rates and Chloroplast Levels of Soybean (<i>Glycine max</i>) Plants of Different Ages
10:00	KH330	Samuel Porter (UG, IC)	Preliminary Evidence for Fungal Specificity among Terrestrial and Epiphytic Orchids in the Florida Panther National Wildlife Refuge.
10:15	KH330	Ellen Radcliffe (UG, IC)	Mycorrhizal Fungi from Mature Epiphytic Orchids and Seedlings Native to South Florida, and a Technique for Pinpointing Pelotons in Roots
10:30	KH330	David Shepard (Moraine)	Southern Forest Species and Associates of Cook County Tinley Creek Woods
10:45	KH330	Shannon Skarha (UG, IC)	Mycorrhizal Fungi from Diverse Orchids in the Central Highlands of Madagascar: Preliminary Findings
Cellular, Molecular, & Developmental Biology			
8:30	KH106	Sudip Paudel (Grad, EIU)	Effect of mitoNEET on Aging
8:45	KH106	Emily Dimick (Grad, SIUE)	A Comparative Study on Pheromone Communication between <i>Schizophyllum</i> species
9:00	KH106	Trisha Bailey (Grad, EIU)	The Protective Effects of Solutes in the Cryopreservation of Neuroblastoma Cells
9:15	KH106	Matthew Murphy (UG, IC)	Measuring Genetic Diversity of an Underutilized Tropical Fruit Tree Crop: <i>Artocarpus odoratissimus</i>
9:30	KH106	Katie Dumbell (Grad, SIUE)	Overexpression of Dentin Matrix Protein 1 in Salivary Gland Cells
Chemistry			
10:15	KH105	Archana Pasupulety (Grad, WIU)	Synthesis and Oxidative Properties of a o-Iodoxybenzoic Acid (IBX) Derivative with a Pentafluorosulfanyl Group
10:30	KH105	Hannah Drake (UG, WIU)	Synthesis of a Series of First Row Transition Metal Complexes Containing a Tetradentate Ligand
Computer Science			
9:45	KH308	In Lee (WIU)	An Economic Model of Cloud Capacity Planning: A Service Provider's Perspective
10:00	KH308	Sai Avensh Boggavarapu (Grad, WIU)	Feature Location using Visualization Techniques
10:15	KH308	Salman Mohammed (UG, WIU)	Measuring Irrational Status Quo Bias in Online Video Games
10:30	KH308	Laurence Leff (WIU)	Simulating Strategic Voting Genetic Algorithms Participatory Budgeting
10:45	KH308	Anna Valeva (WIU)	Bayesian Networks Based Usable Access Control
Engineering & Technology			
8:30	KH308	Bryce Brewer (UG, WIUQC)	Defect Detection through Computer Vision
8:45	KH308	Il-Seop Shin (WIUQC)	Self-Verification Algorithm for Boundary Detection System
9:00	KH308	Kyle Slovak (UG, WIUQC)	Design and Construction of Direct Metal Laser 3D Printer (Phase 1)
9:15	KH308	Khaled Zbeeb (WIUQC)	Effects of Fuel Injector Reynolds Number and Syngas Fuel Heat of Combustion on the Performance and Emissions of a Two-After-Body Trapped Vortex Combustor

Time	Room	Presenter	Title of Presentation
Environmental Science			
8:15	KH152	Kaitlin Hollenbeck (Grad, UIS)	Associations between Microcystin Production and Predictor Variables for the Proliferation of Microcystin Variants in Inland Illinois Lakes
8:30	KH152	Kevin Huizenga (Grad, GSU)	Pre-settlement Land Survey Data as a Tool for Forest Restoration, Succession and Forest Structure
8:45	KH152	Ashley Keely (Grad, SIUE)	Development of an In Vitro Blood-Brain Barrier Model to Measure the Transendothelial Electrical Resistance of Tight Junctions due to Exposure to Pyrethroids
9:00	KH152	Jessica Kerr (UG, Millikin)	Effects of a Living Roof Ecosystem on the Stress and Success of a Variety of Illinois Native Plant Species and Benefits on the Environment
9:15	KH152	Michael Lordon (UG, DePaul)	Arthropods in Urban Green Spaces Near Chicago, IL: Evaluating Assemblage Response to Habitat Factors
9:45	KH152	Kattie Morris (Grad, DePaul)	Analysis of Present and Historical Impacts of Non-Native Cavity Nesters on Red-Headed Woodpeckers
10:00	KH152	Iyabode Ogunkuade (Grad, SIUE)	A Preliminary Survey of the Migration of Bisphenol A from Plastic Baby Bottles and Babies' Feeding Teats in the U.S. Market
10:15	KH152	Mohammad Mamunur Rashid (Grad, SIUE)	Fractionation and Speciation of Nanoselenium in Soil
10:30	KH152	Rachel Schuchman (Grad, SIUE)	Roof Coverage by Native and <i>Sedum</i> Plants in Green Roof Systems at Various Media Depths
10:45	KH152	Kelsey Townsend (Grad, UIS)	Comparison of Small Mammal Metrics at Reclaimed and Non-Reclaimed Landfill Sites in Central Illinois, USA
11:00	KH152	Ryan Wenkus (Grad, DePaul)	Linking Predator Life History Trade-Offs to Levels of Stability in Predator-Prey Dynamics Using A <i>Daphnia</i> -Algae Model System
Health Science			
9:30	KH103	Kathryn Carter (Grad, SIUE)	Influence of Cancer Secretome on Proliferation and Migration of Human Salivary Gland Cells
9:45	KH103	Samantha Hamilton (Grad, SIUE)	Influence of Cancer Secretome on Bone Sialoprotein and Dentin Sialophosphoprotein
10:00	KH103	Jennifer Yu (Grad, SIUE)	Endothelial Cell Matrix-Driven Differentiation of Human Mesenchymal Stem Cells
Microbiology			
10:00	KH106	Alyssa Balding (UG, EIU)	Comparing Culture-Dependent and Culture-Independent Methods in Revealing 16S rDNA Variations in Methanogens from Landfill-Impacted Site
10:15	KH106	Cedric Ndinga Muniania (Grad, WIU)	Distribution of Fungi in Arid Microenvironments and their Potential Role on Plant Growth
10:30	KH106	Terry Torres Cruz (Grad, WIU)	Isolation and Molecular Characterization of Heavy Metal Tolerant Fungi from Duke Forest Soil and its Potential Use in Mycoremediation
10:45	KH106	Paris Hamm (UG, WIU)	Keratinophilic Fungi: Diversity and Abundance in an Arid Grassland in Utah
Physics, Astronomy, & Mathematics			
8:15	KH105	Jacob Correa (UG, WIU)	Towards a General Computational Algorithm for Solving Sudoku
8:30	KH105	Amanda Meiners (Grad, WIU)	Illinois Student Achievement in Mathematics on Standardized Exams from 2000-2014
8:45	KH105	Zachary Abbott (UG, WIU)	Investigating Variability of Zeeman Pair Candidates in a Sample of Hydroxyl Masers
9:00	KH105	Nicholas Breslin (UG, WIU)	Study of Optical Band Gap in Lead Borate Glasses Containing CdSe Nanoparticles
9:15	KH105	Timothy Woodworth (Grad, WIU)	Quantum Error Correction via Weak Measurements
9:30	KH105	Jerold Young (Grad, WIU)	Tunnel Diode Resonator Studies of the Ferromagnetic Superconductor Y ₉ Co ₇
9:45	KH105	William Heidorn (Grad, WIU)	Optical Properties of Sm ³⁺ Er ³⁺ and Ho ³⁺ Doped Lead Borate Glasses

Time	Room	Presenter	Title of Presentation
Science, Math, & Technology Education			
8:30	KH103	Anna Valeva (WIU)	A Change Long Overdue: Moving the Statistics Curriculum from a Classical Frequentist to a Bayesian Approach
8:45	KH103	John Lloyd (Aurora)	Mu Sigma Pi, Pre-Health Professional Club/Organization Engaging Students with Seniors and Special Needs Individuals
9:00	KH103	Jessica Krim (SIUE)	Progress report for the Robert Noyce Scholarship Program at Southern Illinois University Edwardsville
Zoology	Note that there are 2 rooms of concurrent presentations		
8:15	KH305	Katie LaMagdeleine (Grad, WIU)	Evaluating Ground Beetle Species Richness and Community Composition across a Chronosequence of Restored Prairies at Nachusa Grasslands in Northern Illinois
8:30	KH305	Michelle Golz (Grad, WIU)	A Taxonomic Investigation of a Southern Illinois Cave-Snail of the Family Physidae
8:45	KH305	Spencer Hudson (UG, Millikin)	Thermally-Dependent Color Change and Stress Physiology in Green Anoles (<i>Anolis carolinensis</i>)
9:00	KH305	Taylor Inboden (Grad, EIU)	Structure and Position of Male Genitalia Morphology during Copulation in <i>Anastrepha suspensa</i> (Diptera: Tephritidae)
9:15	KH305	Lawrence Werner (Grad, SIUE)	Overwintering Strategies of the Mountain Tailed Frog, <i>Ascaphus montanus</i>
9:30	KH305	Eric Westhafer (Grad, SIUE)	Genome Wide SNP Analysis and Morphometric Analysis of the Black Spotted Topminnow across the River Continuum
9:45	KH305	April Simnor (Grad, UIS)	A Nationwide Evaluation of the Hacking Technique for Ospreys
10:15	KH305	Jennifer Jost (Bradley)	Activation of AMP-activated Protein Kinase in Response to Temperature Elevation Shows Seasonal Variation in the Zebra Mussel, <i>Dreissena polymorpha</i>
10:15	KH306	Stephanie Mafra-Mills (UG, Missouri)	Fecundity and Growth Rates of <i>Physa acuta</i> (Gastropoda) Under Cave and Surface Conditions
10:30	KH305	Melissa Breyer (Grad, UIS)	Assessing Presence and Local Habitat Connectivity of Franklin's Ground Squirrels (<i>Poliocitellus franklinii</i>) with Track Tubes and Camera Traps in Central Illinois
10:30	KH306	Richard Essner (SIUE)	Conquering the World in Leaps and Bounds: Hopping Locomotion in Toads is Actually Bounding
10:45	KH305	Christopher Theodorakis (SIUE)	Thyroid Hormone Status Affects Arsenite-Induced Oxidative Stress in Zebrafish
10:45	KH306	Dennis Ruez (UIS)	Building a Better Bunny: Plio-Pleistocene Evolutionary History of the Marsh Rabbit
11:00	KH305	Aaron Alexander (UG, SIUE)	Estimation of the White-Tailed Deer Population on SIUE Campus using Three Different Census Methods
11:00	KH306	Jalene LaMontagne (DePaul)	Tree Cavity Availability in a Highly Urban Area
11:15	KH306	Jennifer Pendleton (Grad, UIS)	Dispersal and Survival of Franklin's Ground Squirrels (<i>Poliocitellus franklinii</i>) along Linear Habitats

WIU CAMPUS MAP



KEYNOTE ADDRESS - DR. C. VICTOR JONGENEEL

(Friday, April 10th at 7:30pm Heritage Room, University Union)

Biology Meets Big Data: High-Throughput Computing for Genomics and Beyond

Victor Jongeneel is a Senior Research Scientist at the National Center for Supercomputing Applications, Director of Bioinformatics at the Institute for Genomic Biology, and the Director of the High-Performance Biological Computing, all at the University of Illinois at Urbana-Champaign, which he joined in 2010

Dr. Jongeneel's career spans multiple domains of science. He was trained as a biochemist at the University of Lausanne (Switzerland); worked on mechanisms of viral DNA replication and transcription as a graduate student and post-doctoral fellow; participated in the testing of the first effective antiviral drug (acyclovir); then became interested in the structure, genetics and regulation of the tumor necrosis factor loci involving cancer research. Dr Jongeneel also has a life-long interest in the application of computational techniques to biological research, in 1997 becoming a full-time computational biologist.

Since joining the University of Illinois, Dr. Jongeneel has been active in building bridges between campus computational scientists and biologists and forging partnerships in computational genomics.

For more on Dr. Jongeneel, visit <http://hpcbio.illinois.edu/content/people>



POSTER PRESENTATION ABSTRACTS

2:15-3:30pm or 3:45-5:00pm, Friday, April 10, 2015, in the Multicultural Center

*presenter, [school] with differences noted by superscript, UG = undergraduate, Grad = graduate student, others are faculty/regular

BOTANY

- 1 2:15 UG Identifying the Purpose of Winter Marcescence in *Quercus imbricaria***
 *Andrew Blomberg [University of Illinois Urbana-Champaign]
 Retaining leaves (marcescence) over winter is a phenomenon not fully understood. We have proposed a number of different hypotheses to try and answer using *Quercus imbricaria* (shingle oak), a species that tends to show a high level of marcescence, as the test species. A comparative study between other species of oaks, a genus especially synonymous with marcescence, and found that not only do most species retain leaves, they retain them closer to the ground. We also performed a petiole-strength survey to see if different trees have a stronger “grip” on leaves, and since there seems to be no correlation, it seems marcescence is adaptive. If it is an adaptation for herbivory, we hypothesize that there will be a difference in herbivory, from both vertebrates and invertebrates, between trees that lost all their leaves and those that did not. Trees that retained their leaves and trees that had all their leaves stripped off by hand were tested for observed herbivory. Herbivory seems to happen most often on branches without leaves, which suggests it could be a maladaptive trait. If it is a maladaptive trait, we also hypothesize that trees that retained leaves will experience more ice and snow loading during the winter.
- 2 3:45 Identification of an Unknown Missouri Glade Aster Species**
 *Elizabeth Esselman, Kimia Kabjaf [Southern Illinois University Edwardsville]
 The genus *Symphyotrichum* (Asteraceae) contains species that are found throughout North America. Over forty-seven species occur in Missouri. *Symphyotrichum pilosum* is among the most widespread and weediest of our native asters while *S. parviceps* is less common and mainly occurs as scattered populations in the eastern half of the state. The purpose of this study is to identify an unknown *Symphyotrichum* species found in a glade near Steelville, MO. It has been argued that the aster is a hexaploid variant of *S. parviceps*, another cytotype of *S. pilosum* or a new unknown species. Chromosome counts have revealed the aster is a hexaploid (n=48). This number is larger than the all known numbers for *S. pilosum* (n=16, 20,24) and *S. parviceps* (n= 16,24,32) in the state of Missouri. ITS sequence data was not able to resolve relationships among these taxa. Microsatellite markers are currently being developed to determine the relationships among these taxa.
- 3 2:15 UG Gerberellic Acid Eliminates the Cold Stratification Requirement in *Stanleya pinnata***
 *Jenelle Mathias, Kelly Barry [Southern Illinois University Edwardsville]
Stanleya pinnata (Brassicaceae) displays several desirable traits making it an ideal candidate for phytoremediation. These include tolerance to heat, boron, salinity, and nutritionally poor soil. Additionally, *S. pinnata* is capable of volatilizing selenium and selenium uptake is an active area of research. However, researchers stress the need for a greater and constant biomass to improve reliability of results. Tissue culture propagation provides a means of identifying volatilization specifically by *S. pinnata* rather than soil microbes. *S. pinnata* has a cold moist stratification period of 30-90 days for germination. We investigated the ability of gibberellic acid (GA) to reduce the stratification as a preliminary step to tissue culture cultivation. Seeds were soaked overnight in 0, 250, 500, and 1000 mg/L prior to surface sterilization and incubation on ½ MS culture media or sterilized potting soil. GA at a concentration of 250 mg/L eliminated the cold stratification requirement.
- 4 3:45 Grad Isolating Orchid Mycorrhizal Fungi from *Spiranthes vernalis* for Subsequent Seed Germination and Reintroduction**
 *Grant Morton, ¹L. Zettler, E. Esselman [Southern Illinois University Edwardsville, ¹Illinois College]
 The Spring Ladies’ Tresses orchid’s (*Spiranthes vernalis*) range extends widely throughout eastern North

America. Although the distribution of the taxa is reportedly widespread the species is considered threatened or endangered in many areas throughout its range. One goal for any conservation program is to successfully increase population numbers, possibly by re-introduction of plants into existing populations. It is commonly known that orchids form unique relationships with mycorrhizal fungi and the association is often essential for orchid seed germination and enhanced seedling survival and growth rates. The intent of this study is to isolate and identify mycorrhizal fungi associated with at least one established adult spring ladies' tresses orchid, although others may be sampled as well, from a southern Illinois population. To date (September 2014), fungi assignable to the ubiquitous genera *Ceratophora* and *Epulophora* have been isolated from pelotons in a mature plant, and efforts are now underway to further identify these strains using genome and transcriptome sequencing. Identification and isolation of the fungi will allow in vitro germination experiments and possibly the subsequent reintroduction of seedlings to aid in the conservation of the species.

5 2:15

Understory Light Levels Needed to Promote the Growth of Invasive *Lonicera maackii* (Caprifoliaceae) Seedlings

*Kurt Schulz, Jessica Wright [Southern Illinois University Edwardsville]

Lonicera maackii (Amur honeysuckle) has become one of the most common invasives to plague the upland hardwood forests of Illinois. *L. maackii* seems to hold a competitive advantage over some natives due to high seed production, rapid growth rates, branching plasticity, early season leaf-out, and persistence of fruits into winter, when other bird foods are scarce. This woody shrub ostensibly prefers the high-light environments of old fields, forest edges and canopy gaps. Nonetheless, *L. maackii* can also be found under a closed canopy, occurring across a range of population densities. Our previous work has shown that forest interior individuals produce about 1/5th of the seed than is produced by similarly sized shrubs in a high light environments. There has been little published work which evaluates seedling growth in shaded environments. We transplanted seedlings into an array of forest canopy types to evaluate the effects of light availability on seedling growth rate and establishment. Preliminary data show that *L. maackii* requires a minimum of 4.2 mol m⁻² d⁻¹ PAR for a seedling to persist with no appreciable vertical growth, and 16.6 mol m⁻² d⁻¹ to achieve approximately 10cm growth in 100 days. 16.6 mol m⁻² d⁻¹ is comparable to a canopy that is ca. 16% open - indicating that *L. maackii* requires a relatively high amount of light in order to achieve nominal growth rates. This information is valuable in understanding the biology of this species as well as informing forest managers that restoration efforts ought to be prioritized for removal of *L. maackii* from high light environments and encouraging canopy closure to inhibit the success of recruits within the forest interior.

6 3:45 UG

Quantifying the Abundance and Distribution of Woody Vines (*Lianas*) in Oak-Hickory Forest

*Savanna Stabenow, Elizabeth Esselman, Peter Minchin [Southern Illinois University Edwardsville]

Many studies in tropical forest have demonstrated that lianas (woody vines) are increasing in abundance because rising atmospheric CO₂ levels enhance liana growth and increase their competitive advantage over trees. The few existing studies of lianas in temperate forests have suggested that increases in liana abundance are occurring, however this is not due to elevated CO₂ but to increases in habitat fragmentation, with higher light levels at forest edges favoring liana growth. This study quantifies liana abundance in oak-hickory forest within the SIUE Nature Preserve and tests the hypotheses that liana abundance increases with proximity to the forest edge and decreases with forest age. In forest of three ages (35 yr, 60 yr, > 100 yr) three pairs of 0.1-ha edge plots (immediately adjacent to the forest edge) and corresponding interior plots (more than 100 m from the edge) were established. Edge plots were 33.33 x 30 m and divided into five 6-m wide belts paralleling the forest edge. This design allows fine-scale examination of changes in liana abundance with distance from edge. Interior plots were circular (radius 17.84 m). Each liana rooted within a plot was identified, tagged, and its diameter was measured 1.4 m from the rooting point. Data collection is not complete but initial results suggest the hypotheses will be supported: liana abundance increases towards the edge and decreases with forest age. The results of this research will add to our knowledge of global patterns of liana abundance in temperate forest and future studies will be able to utilize the tagged lianas to examine growth and changes in abundance.

106 3:45 UG

Seed Selection in Avian Granivores - A Role for Plant Secondary Metabolites?

*Diya Majumdar, Amy Hank, Andrea Iorgovan, Joel Brown, Chun-Tao Che, Ming Zhao, ¹Christopher Whelan [University of Illinois Chicago, ¹Illinois Natural History Survey]

Plant secondary metabolites (PSMs), found virtually universally throughout the plant kingdom, function in myriad ways, including defense against enemies, attraction of pollinators, communication between plants, and protection against various abiotic stressors. Extensive research has examined how PSMs mediate interactions between plants and herbivores and plant and frugivores. In contrast, little research has investigated their potential role in defense against granivores. In two seed selection experiments, we quantified seed preference of house sparrows and native granivores, respectively, when offered each of 10 native seeds and proso millet, a commercial bird seed. House sparrows and native granivores greatly preferred millet over all offered native seeds. House sparrows largely rejected seeds of all five wildflower species, but native granivores preferred three of the five wildflowers. House sparrows readily consumed seeds of all five native grass species, but native granivores rejected Canada rye. House sparrows and native granivores both rejected seeds of Illinois bundle flower. Although seed preferences in the non-native house sparrow and native granivores differed significantly, we have found no consistent relationship between seed selection and presence or absence of classes of plant secondary metabolites.

CELLULAR, MOLECULAR, & DEVELOPMENTAL BIOLOGY

- 7 2:15 **The TOC132-TOC120 Heterozygote Mutant of *Arabidopsis thaliana* Accumulates Reduced Levels of Hexadecatrienoic Acid**
 *Meshack Afithile [Western Illinois University]
 A mutant of *Arabidopsis thaliana* that is null and heterozygous for TOC132 and TOC120 genes accumulates increased levels of 16:0 and decreased 16:3, suggesting altered homeostasis in fatty acid synthesis. In the toc132toc120+/- mutant plants, the FAD5 gene was repressed and this correlated with decreased levels of 16:3. The MGD1 gene was expressed at control levels and the mutant accumulated levels of MGDG that were similar to the wild type. In the mutant however, MGDG had decreased 16:3 levels, suggesting that the activity of FAD5 desaturase was compromised. Overall, these data show that a mutation in the TOC132 gene results in decreased 16:3 levels, indicating the need for an intact Toc132/Toc120 receptor, presumably to facilitate the import of the FAD5 preprotein into chloroplasts.

- 8 3:45 **The TOC159 Mutant of *Arabidopsis thaliana* Accumulates Reduced Levels of Polyunsaturated Fatty Acids**
 *Meshack Afithile [Western Illinois University]
 We evaluated whether the TOC159 mutant of *Arabidopsis* called plastid protein import 2-2 (ppi2-2) accumulates normal levels of fatty acids, and transcripts of galactolipid synthesis enzymes. The MGD1 gene was downregulated and the ppi2-2 mutant accumulates decreased levels of monogalactosyldiacylglycerol (MGDG) and 16:3, which suggests that the prokaryotic pathway was impaired in the mutant. The HY5 gene, which encodes long hypocotyl5 transcription factor, was upregulated in the mutant. The DGD1 gene, an HY5 target was marginally increased and the mutant accumulates digalactosyldiacylglycerol at the control level. The mutant had increased expression of 3-ketoacyl-ACP synthase II gene, which encodes a plastid enzyme that elongates 16:0 to 18:0. A gene that encodes stearyl-ACP desaturase (SAD) was expressed at the control level and 18:1 was increased, which suggest that SAD may be strongly regulated at the posttranscriptional level. The molar ratio of MGDG to bilayer forming plastid lipids was decreased in the cold-acclimated wild type but not in the ppi2-2 mutant. This indicates that the mutant was unresponsive to cold-stress, and is consistent with increased levels of 18:0, and decreased 16:3 and 18:3 in the ppi2-2 mutant. Overall, these data indicate that a defective Toc159 receptor impaired the synthesis of MGDG, and affected desaturation of 16 and 18-carbon fatty acids.

- 9 2:15 Grad **Genome Analysis and Knock-Out Plasmid Construction for Two Dicer Genes in *Schizophyllum commune* (Schizophyllaceae)**
 *Jill LaRue, Allison Germann, Thomas Fowler [Southern Illinois University Edwardsville]
 RNA interference is a conserved silencing mechanism of eukaryotes that is involved in a wide array of cellular functions. RNAi involves an endonuclease, Dicer, which binds dsRNA and cleaves it into fragments of small, nearly uniform lengths. The role of RNAi has not yet been studied in the mushroom *Schizophyllum commune*. Bioinformatic analysis of the *S. commune* genome (strain H4-8; Ohm et al., 2010) identified two

potential Dicer proteins (Gene IDs: 9586776 and 9596013) with amino acids lengths of 1342 and 1343, respectively. BLASTp analysis of the genome was carried out. Each putative Dicer produced best matches to the other with amino acid identities of 29%, implying the likely presence of only two Dicers in *S. commune*. EMBOSS-Needle pair-wise alignment produced alignments with amino acid identity near 24%, consistent with BLASTp results. Automated annotation of the genome identified several commonly conserved domains in the predicted Dicer proteins, including ribonuclease III domains and the helicase conserved C-terminal domain. Extending from these analyses, plasmids were designed to knock out the Dicer genes to better understand their roles in *S. commune*. Two recombinant plasmids were constructed from the phleomycin-resistance plasmid pXHAg, and verified. For the plasmid construction, DNA located 3'- and 5'-adjacent to each Dicer gene was amplified by PCR with primers incorporating restriction endonuclease recognition sites. These 1-2 kb products were cloned into plasmid pXHAg to flank the phleomycin-resistance gene. For each Dicer gene, homologous recombination between linearized plasmid and the genomic DNA in a Ku80-deleted strain of *S. commune* should replace its coding region with the plasmid's phleomycin-resistance marker. Non-homologous end joining is abolished in the Ku80-deleted strain leading to more efficient detection of knock-out mutants produced by homologous replacement.

10 3:45 UG

Effect of Kava Extract on Mechanosensory Function in *C. elegans*

*Spencer Jacquet, Brent McCollum, Bwarenaba Kautu [Greenville College]

Kava is a plant root mixture which is heavily consumed by many Pacific Islanders. The extract contains active kava lactone ingredients which are believed to be responsible for the biological effects of kava on the human body. It has been documented that kava extract can cause sedation and helps to lower anxiety suggesting that it may affect various functions of the nervous system. In addition, kava consumers often describe the feeling of numbness which can be felt in different parts of the body, indicating the possibility that sensory function may be partially compromised. This observation led us to hypothesize that the chemical constituents of kava may interfere with mechanosensory transduction. Here, we use the nematode *C. elegans* as model system to investigate the possible effect of kava on mechanosensory function. Our results showed that kava significantly impaired mechanosensory function in *C. elegans* at various concentrations. Using various mechanosensory mutants, we are currently determining the molecular mechanism by which kava affects mechanosensory signaling in *C. elegans*.

11 2:15 UG

Paralysis and Epileptic-Like Convulsions Induced by Kava Extract in *C. elegans*

*Michael Mengarelli, Kautu Bwarenaba, Dominic Goggin, Juli Phillips, Kellie Steele [Greenville College]

Kava is a plant extract consumed by many South Pacific Islanders. The extract is known for its sedative and anxiolytic effect on the human body suggesting that the ingredients in the extract may interfere with various functions of the nervous system. Despite that, very little is known about how the chemical constituents of kava interact with the nervous system at the molecular, cellular, and physiological levels. Here, we use *C. elegans* as a model system to test the effect of kava in the nervous system. We found that treatment of worms with kava induced paralysis and epileptic-like convulsion phenotypes. Such phenotypes are often indications of perturbations of the inhibitory-excitatory neurotransmission in the nervous system. As such, we hypothesize that kava may partially affects GABAergic neurotransmission. To test this hypothesis, we are currently assaying worms carrying specific mutations in GABA receptors, Glutamate Decarboxylase Enzyme (GAD), and GABA transporter respectively.

12 3:45 UG

Sequencing the AMP-Activated Pan Aquatic Invasive Invertebrate

*Marshall Moyer, Jennifer Jost [Bradley University]

Previous lab work on *D. polymorpha* (zebra mussel), a model invasive invertebrate species, has shown that AMP-activated protein kinase (AMPK) has a central role in energy conservation during stress and is a useful heat stress indicator. It is currently unknown if heat induced AMPK activity is caused by increased protein synthesis or by increased phosphorylation of an existing baseline of AMPK protein. The goal of this research project is to sequence the AMPK gene in order to develop specific primers and use qPCR to quantify AMPK mRNA in mussels. Thus far, genomic DNA and cDNA (reverse transcribed) have been isolated from zebra mussel tissue and amplified using PCR with designed degenerate primers. Products have been identified using gel electrophoresis, eluted, and purified. This project aims to use molecular cloning (via a bacterial host) to generate enough isolated cDNA to sequence the specific gene for AMPK. Once sequences are

obtained, real time quantitative PCR and progressive temperature exposure will be employed to measure AMPK mRNA levels in heat stressed and control organisms. It is predicted that heat stressed organisms will show elevated levels of AMPK mRNA.

- 13 2:15 Grad Impact of Transcription Factors on Fibroblast Specific Gene Silencing in Somatic Cell Hybrids: A Whole Genome Approach**
 *Tania Ray, Garry Bulla [Eastern Illinois University]
 Extinction of tissue-specific genes in mammalian somatic cell hybrids is a well-known epigenetic phenomenon, but the mechanisms responsible for gene silencing are largely unknown. Somatic cell hybrids have been used for several years to study the phenomenon of tissue specific gene extinction. Since most cell hybrid studies have used fibroblasts as a fusion partner, we sought to examine potential regulatory elements in the extinction of fibroblast-specific gene expression using hepatoma X fibroblast somatic cell hybrids as a model system. Transcription factors (TFs) are powerful activators and/or repressors of gene expression in mammalian cells. In our prior work on hepatoma-specific gene extinction we have confirmed that the loss of expression of many hepatoma associated genes was a consequence of loss of hepatoma-specific TFs. Based on these findings, we hypothesized that loss of fibroblast phenotype may be due to loss of fibroblast-specific TF's. We therefore subjected somatic cell hybrids (FR) to whole genome transcriptional microarray profiling, assigned a 5 fold cutoff as a selection criteria. We have identified several genes including PRRX1, SNAI2 and SHOX2 as fibroblast associated transcription factors that were repressed in somatic cell hybrids by more than 5 fold and function as TFs. We validated the repression of these TF's and downstream targets using end point PCR and q-RT-PCR. Our findings confirm that loss of fibroblast-specific TF's likely affect gene expression of many downstream targets.
- 14 3:45 UG Potential Role of Kava Extract In Cholinergic Transmission at the *C. elegans* Neuromuscular Junction**
 *Juli Phillips, Kellie Steele, Bwarenaba Kautu [Greenville College]
 Kava extract comes from the root of a plant species *Piper methysticum* which grows on many islands in the South Pacific. The plant mixture is known to produce sedative and anxiolytic effects on the human body suggesting that it may interfere with certain neurotransmitters. Several active ingredients from kava have been characterized however, very little is understood about how they may affect cholinergic signaling at the molecular and cellular levels. Here, we showed that worms treated with kava extract displayed hypersensitivity to an acetylcholinesterase inhibitor, aldicarb suggesting a possible up-regulation in cholinergic signaling at the *C. elegans* neuromuscular junction. This increase in cholinergic signaling could be due to either presynaptic increase in acetylcholine release or postsynaptic changes in receptor activity. We are currently assaying worms carrying specific mutations in both presynaptic and postsynaptic proteins of the cholinergic neurons to determine the molecular action of kava in the nervous system.
- 15 2:15 UG Examining the Role of the SWI/SNF Chromatin Remodeling Complex in Planarian Regeneration and Stem Cell Function**
 *Toria Trost, Brittany Mersman, Mallory Robbins, Austin Dillon, Peyton Crowe, Amy Hubert [Southern Illinois University Edwardsville]
 Stem cells are essential to living organisms both during early development and for cell turnover in adults, but the mechanisms by which they can both self-renew and produce daughter cells that differentiate into other cell types are not fully understood. Planarians such as *Schmidtea mediterranea* are excellent models for the study of stem cells because they possess a large pool of adult stem cells (called neoblasts) that give them the extraordinary ability to regenerate any part of their body following injury or amputation. Epigenetic regulation, the control of gene expression levels through modification and rearrangement of the histone proteins that DNA is packaged with, is important for controlling stem cell pluripotency and differentiation in many species, including humans. However, many of the proteins that mediate this type of regulation have yet to be characterized in planarians. We used BLAST to identify planarian homologs of sixteen proteins in the human SWI/SNF-related chromatin remodeling complexes and used RNA interference (RNAi) to examine the role these genes play in planarian regeneration and stem cell function. Planarians were fed double-stranded RNA either 3 or 6 times to induce knockdown of the target genes and then amputated anterior to the pharynx and observed over a two week period of regeneration. The phenotypes observed included defects in regeneration (such as delayed photoreceptor formation and a reduction in blastema size) as well

as phenotypes typically associated with loss of the stem cells (including head regression, ventral curling and lysis). Future directions for this project include examining the expression pattern of each SWI/SNF gene by whole-mount in situ hybridization and further characterizing the knockdown phenotypes by staining for markers of various cell types, including mitotic neoblasts.

16 3:45 Grad The Role of CREG1 as a Master Regulator of Liver Function

***Anit Shah, Gary Bulla [Eastern Illinois University]**

Liver development is a complex process which involves multiple pathways for directing differentiation, proliferation and regeneration. Disruption within the developmental pathways lead to many anomalies such as hepatocellular carcinoma (HCC) and liver disease. Transcriptional studies of liver specific transcription factors and the genes encoding them will help to understand the cellular and molecular mechanism pathways of development, regulation and maintenance of mammalian liver. Various cell model system can be used to study the transcriptional activation pathways of the genes that play an important role in activating expression of many hepatic genes. Cellular repressor of E1A stimulated gene (CREG1), a transcription factor, is a candidate master regulator identified via whole-genome microarray. CREG1 is ubiquitously expressed in differentiated adult tissues and human cell lines. To study the role of CREG1 in liver function, a hepatoma variant cell line was used which lacks the liver phenotype (i.e. defective in expressing several liver specific genes, including the well-characterized α 1-antitrypsin (SERPINA1) gene. Hepatoma variant cell line H11 was transfected with a CREG1 expression vector and transfectants were selected and isolated for over-expression of CREG1. Results show that ectopic expression of CREG1 activates the several repressed genes, partially reverting the phenotype of non-hepatic h11 cell to a hepatic phenotype. Activated genes include liver specific markers genes such as SERPINA1 and HNF6. Hepatocyte nuclear factors (HNFs) forms a regulatory network and expression of these liver enriched factors is known to activate downstream genes. This suggests that reversion to the liver of phenotype involves reprogramming and remodeling of transcriptional activation pathways and includes multiple hepatocyte enriched nuclear factors (HNF1, HNF4, HNF6) functioning either synergistically or acting individually.

17 2:15 UG Assessment of Nanoparticle Safety for Use in Breast Cancer Treatments

***Olivia Waszczuk, Jennifer Schroeder [Millikin University]**

Nanoparticle composites are a recent research hotspot, being examined as drug-delivery vehicles for more efficient treatment of malignant cancerous tumors. First, chemotherapeutics are encapsulated in a liposome tethered to transition metal or hydroxide nanospheres. These composites are then injected at a tumor site, and can be opened with UV light, dispersing toxins in a localized manner. Since the synthesis and fabrication of nanoparticle composites is a relatively new application, there must be research to examine its safety. The focus of our study was to examine short (1 day and 1 hour) and long (1 week) term mutagenic effects of two synthesized gold nanoparticles, HPN1 and HGN2. HPN1 are 40 nm diameter colloidal nanoparticles, which reflect a purple hue, while HGN2 are 10 nm and reflect an orange color. To measure short-term toxicity, β -galactosidase-based DNA damage assays were completed using four *E. coli* strains: KP266, KP263, BW λ rec and BW λ lex, which have either the LexA or RecA gene coupled to β -gal. These strains indicate DNA damage through LexA or RecA transcription after the accumulation of single strand DNA, giving a colorimetric indicator of DNA damage. The bacteria were grown in the presence of either HPN1 or HGN2 for up to twenty-four hours, followed by the β -gal assay. We did not observe changes in β -gal activity, thus indicating no change in DNA damage in any of the strains upon exposure to either nanoparticle. In order to assess long-term toxicity, MTT cell viability assays were performed in two breast cancer cell lines (MDA-MB-231 and MCF-7) after one week of nanoparticle exposure. We observed a cell type-specific effect where viability was unaffected in the MDA-MB-231 cell line, yet dramatically increased in MCF-7 cells. Taken together, these results indicate that we must be cautious moving forward in the development of new chemotherapeutic techniques, since acute tests may not be indicative of the true toxicity of these compounds.

18 3:45 UG The Effects of Environmental Stress on Channel Catfish: Detection of Cellular Stress Proteins During High Temperature and Hypoxic Stress

***Emily Soltis, Sarah Keshwani [Bradley University]**

In recent years, global climate change and its effect on ecosystems has become an increasingly important topic of research. As anthropogenic effects cause a changes in the water temperature and dissolved oxygen content of aquatic ecosystems, it is vital to understand the implications on these ecosystems and its

resonance within the economy. One species of economic importance is the channel catfish, *Ictalurus punctatus*, which along with the flathead catfish, accounts for nearly one-third of the commercial fishing industry. In order to investigate stress physiology, we focused on two biologically relevant stressors, water temperature and hypoxia. More specifically, we exposed channel catfish to either high water temperature, hypoxic water, or a combination of both high temperature and hypoxia. Using isolated liver tissue, we measured heat shock protein 70 (HSP) levels as an indicator of cellular heat stress and protein denaturation, phosphorylated AMP-activated protein kinase (AMPK) levels as an indicator of sublethal cellular stress and energy reserves, and lactate accumulation as an indicator of anaerobiosis. Catfish exposed to both heat/hypoxia had a significant increase in lactate concentration after 1 hour and 100% mortality after 2 hours. Catfish exposed to hypoxia experienced a significant increase in AMPK activity while animals exposed to heat lacked a significant increase in any of the cellular markers. These results suggest that a combination of heat and hypoxia is a lethal stress event, hypoxia alone represents a sublethal stress, and heat alone does not elicit a stress response.

CHEMISTRY

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| 19 | 2:15 | Grad | <p>Structural Elucidation of Humic Acids by Carbon-13 NMR Spectroscopy</p> <p>*Ajith Poladi, Deepa Rekulapally, Steven Wailand, Matthew Cash, Scott McConnell [Western Illinois University]</p> <p>Soil organic matter (SOM) is a heterogeneous mixture of plants, animals and microbial deposits at different stages of decomposition that contains carbon as the main component. At least 50% of soil organic carbon is composed of humic substances that are humic acids (HA), fulvic acids (FA) and humin. Humic substances are obtained from soil utilizing strong base. Humic acids are insoluble at low pH and may be precipitated by adding strong acid. The utilization of modern analytical equipment like Nuclear Magnetic Resonance (NMR) is an essential condition as the chemical structure of HA and FA are not yet fully understood. In the present study solid state C-13 CPMAS NMR spectra of HA extracted from native prairies and prairie restoration sites were determined using Tecmag 360 NMR system operated at 363 MHz using a 7mm CPMAS duty probe. Results from NMR data indicate that it is a difficult task to obtain structural information for humic acids.</p> |
| 20 | 3:45 | UG | <p>The Role of Environmental Conditions on Forensic Soil Comparisons: HPLC, Conductivity, and Settling Rate Analyses</p> <p>*Alexis Jones, Andrea Alvashere [Western Illinois University]</p> <p>Experimental soil samples from several mock "crime scenes" in West-Central Illinois are evaluated for the influence of on-site weathering (timing of sample collection) and sample storage conditions on forensic testing results. Storage conditions tested include: dried immediately and stored at room temperature, undried and frozen, undried and refrigerated, undried and stored in a dark drawer, and undried and stored on a sunlit shelf. High performance liquid chromatography (HPLC), conductivity, and settling rate results are compared.</p> |
| 21 | 2:15 | Grad | <p>Analysis of Local Water Contents by Direct Analysis in Real Time, DART, and Mass Spectrometry</p> <p>*Shelby Crawford [Western Illinois University]</p> <p>Local lakes and rivers contain fresh water sources that may have chemicals and analytes we are not aware of. An ongoing project of collecting local water samples for analysis has been proven as an invaluable research material. Direct Analysis in Real Time, or DART, is the first ion source in chemistry history that can ionize liquids, solids, or gases and instantaneously supply them to the detector, or mass spectrometer. DART works under ambient conditions and requires no sample preparation such as extraction, purification, or derivatization. Bellott Research Lab team members traveled to Bradley University in Peoria, Illinois to collaborate with Dr. Remsen and his students to analyze our water samples using DART. The data is analyzed to discover contents such as pesticides or benzodiazepines. Further quantitation will be completed utilizing instrumentation available at Western Illinois University such as high performance liquid chromatography and gas chromatography.</p> |

- 22 3:45 UG High Performance Liquid Chromatography of Fenuron**
 *Rachel Austin [Western Illinois University]
 High performance liquid chromatography (HPLC) utilizes common analytical techniques like reverse phase separation and internal standards. Separation of analytes allows for specific detection and qualitative analysis. Use of an internal standard helps with quantitation. This method background allows us to test local water supplies for possible contamination. Our research team collects water samples from KilJordan Creek in Macomb, IL monthly. These samples are used to test for all different kinds of contaminants, toxic and nontoxic alike. Fenuron is a phenyl-urea herbicide typically used to treat perennial weeds and unwanted woody plants. Another new use is as an aquatic herbicide because of its low toxicity to fish. Control is still important though because the acute oral LD50 of fenuron is 4000-5700mg/kg. Over-use can still have toxic effects on the ecosystem. Our lab is working on a method to detect possible traces of fenuron.
- 23 2:15 UG Comparative Evaluation of GC-FID, Density Gradient, and ORP Protocols for Forensic Soil Analysis**
 *Jasmine Gentry [Western Illinois University]
 Forensic soil analysis is very important to criminal investigation because identifying the source of case samples can provide physical evidence supporting the guilt or innocence of possible suspects. Forensic science requires careful validation of new techniques and procedures to analyze the evidence collected at crimes scenes. This research compares several methods of soil sample preparation and analysis by gas chromatography (GC-FID), density gradient, and oxidation-reduction potential (ORP). Multiple soil samples from specific research sites in West-Central Illinois are tested and data are compared to see which method works best.
- 24 3:45 UG Primers Design for Amplification of Putative Secondary Alcohol Dehydrogenase Gene from *Nocardia cholesterolicum* NRRL5767**
 *Joshua Diaz, Jenq-Kuen Huan, Lisa Wen [Western Illinois University]
Nocardia cholesterolicum NRRL5767 (NRRL 5767) is well known microorganism that converts oleic acid to 10-hydroxystearic acid (10-HSA) with excellent yield (> 95% yield, w/w) and some minor 10-ketostearic acid (10-KSA) (~5%, w/w) by oleate hydratase and secondary alcohol dehydrogenase, respectively. This microorganism is a potential candidate for developing an industrial microbe for the production of 10-HSA if the expression of the secondary alcohol dehydrogenase gene (2-ADH) were blocked. Blocking the expression of 2-ADH by genetic engineering approach should eliminate the conversion of 10-HAS to 10-KSA therefore reducing the labor and operative costs for separation of 10-HSA from 10-KSA. As a first step, the gene of 2-ADH from NRRL 5767 must be identified and sequenced. The 2-ADH gene from *Micrococcus luteus* wiujh 20 (*M. luteus* wiujh20) (gene bank accession number: E2D104_MICLU) and its functional recombinant enzyme have been studied in our lab. *M. luteus* wiujh 20 and NRRL 5767 are different bacteria species. We used the gene sequence of 2-ADH from *M. luteus* wiujh20 as query via BLAST (Basic Local Alignment Search Tool) to retrieve the annotated 2-ADH genes from *Nocardia* species to design eight degenerate primers (four primer-pairs). These primer pairs will be used for amplification of the putative 2-ADH from genomic DNA of NRRL 5767 by Polymerase Chain Reaction (PCR). In this study, the design of degenerate primers by bioinformatics and the preliminary data of PCR amplification will be presented.
- 25 2:15 Grad Determination of Trace Amounts of Drugs and Pesticides in Local Water Samples Using High Performance Liquid Chromatography and Mass Spectrometry**
 *Abigail Gibson [Western Illinois University]
 Water samples collected from local sources are often contaminated with trace amounts of compounds. Depending on the location of the water source, the water may come into contact with pesticides that are used on farms or with drugs of abuse that are common among the population of people in the surrounding areas. The compounds that are present and their concentration can be determined using high performance liquid chromatography (HPLC) and mass spectrometry (MS). In the present study, water samples were collected from various locations on Spring Lake in Macomb, Illinois. The unknown analytes were extracted using disposable pipette extraction (DPX) and were subjected to HPLC analysis. A reproducible signal retented at 4.2 minutes, but the identity of the compound responsible for the signal was unknown. Analytical standards of cocaine and a few common pesticides were also analyzed, and they were ruled out as the unknown analyte in the water sample. Current research is focused on collaboration with Southern Illinois University at Edwardsville in order to obtain mass spectrometry data. With these efforts, the unknown

analyte will be determined and then will be quantified using liquid chromatography. A thorough statistical analysis will be completed on the samples in order to compare the data from the various sample locations. The analysis of variance will provide information about how different the analytes in the center of the lake are from those near the spill-off region of the lake.

- 26 3:45 UG Forensic Soil Comparisons Using HPLC, ORP, and Microscopic Analysis**
 *Brittany Donovan [Western Illinois University]
 Chemical and microscopic analyses can be used to create profiles or fingerprints of soil samples from different areas. These techniques can be very beneficial in making comparisons of soil residues taken as evidence in criminal investigations. This study uses high performance liquid chromatography (HPLC), oxidation reduction potential (ORP), and microscopic analysis to differentiate between soil samples from several locations in west-central Illinois.
- 27 2:15 UG Comparison of Protocols for FTIR, Density Gradient, of Forensic Soil Samples**
 *Ashley Hardt [Western Illinois University]
 There are many different methods available for performing forensic soil analysis. These methods can range from highly-expensive to reasonably-priced. Finding the method that provides the best information at the least expense can help to improve analysis success while minimizing costs. This study examines how different protocols or reagents can affect the testing results of three common soil analysis methods: Fourier transform infrared spectroscopy (FTIR), soil density gradient, and soil conductivity. FTIR uses the energy that is absorbed by a molecule to characterize its functional groups. Density gradient assays use layered solutions of increasing densities to sort the components of soil samples into visible profiles that can be compared. Conductivity is another property that can help to distinguish soils, and also may determine the rate at which forensic evidence buried in a soil will degrade or decompose. In this project, varied protocols for each of these three methods are compared for soil samples from several locations in West-Central Illinois.
- 28 3:45 Grad Evaluation of Synthetic Thiosemicarbazone Containing Compounds as Inhibitor of Cathepsin K**
 *Amanda Ellison, David Vanderway, Jena-Juen Huang, Lisa Wen, Rose McConnell [Western Illinois University]
 Cathepsin K is a lysosomal cysteine protease that is predominantly expressed in osteoclasts. It has also been found in elevated levels in people with rheumatoid arthritis, prostate cancer, and breast cancer. Due to its strong collagenase activity, cathepsin K has been described as a major enzyme responsible for the turnover of extracellular matrix proteins and plays a fundamental role in bone resorption. Cathepsin K is a novel drug target for osteoporosis, osteoarthritis, and bone metastasis. Here, we report screening and evaluation of five new synthetic inhibitors against recombinant cathepsin K. The recombinant human procathepsin K was overexpressed in *E. coli*, purified from inclusion bodies, and activated by pepsin treatment. Cathepsin K inhibition assay was performed spectrophotometrically with N-Carbobenzoxymethyl-L-Phenylalanyl-Arginine-4-nitroanilide hydrochloride as the chromogenic substrate. Upon the kinetic studies of the inhibitors 3-2, 3-3 and 3-4 it was determined that inhibitor 3-4 exhibited the properties of an uncompetitive inhibitor. The other inhibitors were deemed mixed mode inhibitors but still highly effective as an inhibitor. Data analysis of the effectiveness of these inhibitors will be used to foster future development of newer effective inhibitors for the treatment of osteoporosis, possibly rheumatoid arthritis and cancer. Funding provided by National Cancer Institute at NIH (Grant No. 3R15CA086933-04 and 3R15CA086933-04A2S1) and Western Illinois University.
- 29 2:15 UG Evaluating Microscopic, GC-FID, and Conductivity Methods for Forensic Soil Comparisons**
 *Shan Mei Jones [Western Illinois University]
 A variety of laboratory methods can be utilized to differentiate between soil samples taken from distinct locations. This can be especially important in criminal investigations where a soil sample from a suspect's shovel, vehicle, or clothing might be compared to soil from a crime scene. Some methods can also be useful in identifying whether soil samples contain certain compounds of interest in a case, such as evidence of arson accelerants. In this study, microscopic analysis of soil, gas chromatography with a flame ionization detector (GC-FID), and conductivity analysis are evaluated for their utility in distinguishing soil samples from several simulated crime scenes in West-Central Illinois. Multiple ways to sort and describe microscopic soil components are explored. GC-FID and conductivity analyses are also evaluated for their utility in performing

comparisons of samples from the various mock crime scene locations, and from multiple areas on a given site.

- 30 3:45 Grad **Synthesis of Palladium Diphosphine Complexes for X-Ray Absorption Spectroscopy Analysis****
 *Chelsie Forrest [Western Illinois University]
 Ligand K-edge X-ray spectroscopy (XAS) is an analytical tool that can be utilized to quantify how electrons are shared between two atoms. While the technique itself can be quite difficult to comprehend, the information obtained, being the amount of electron sharing, is not. One of the newest elements now being examined by XAS is phosphorus. One reason that phosphorus is being examined is due to the versatility of compounds that contain phosphorus. Compounds containing phosphorus can be used as catalysts in many different areas of chemistry. It is for this reason that focusing on the development of new catalysts containing phosphorus is so important, and it is for this reason that there has been particular focus on synthesizing new catalysts to test in order to determine which work best. My particular focus has been on synthesizing eight different palladium-phosphorus complexes so that they may be analyzed by XAS. Because none of these compounds have been examined by XAS before, correct synthesis has been a crucial part of my research. For the synthesis of these compounds, the Schlenk technique was utilized. This was due to the air sensitivity of the compound; to ensure pure compounds, the reactions were done while under nitrogen gas. The reactions were heated during this time to make sure the solids were completely dissolved. Once this process was completed, the solutions were left to cool so that the solids would form and could be collected. In order to determine that the correct compounds were synthesized, characterization was done by first finding the melting point and then by ³¹P NMR. By examining these compounds via the XAS method, the understanding of how these molecules behave as catalysts will be determined.
- 31 2:15 Grad **Copper-Catalyzed One-Pot Tandem Synthesis of Unsymmetrical Diaryl Chalcogenides****
 *Adam Koe, Shaozhong Zhang, Jin Jin [Western Illinois University]
 There has been a growing interest in organochalcogen compounds in the past few decades. A number of organochalcogenides are known to be biologically active. In particular, diaryl chalcogenides are known to have anticancer, antitumor, antiviral, antimicrobial and antioxidant properties. Additionally, organochalcogen compounds have been used extensively in carbon-carbon bond forming reactions. In our research, unsymmetrical diaryl chalcogenides were synthesized by a novel one-pot tandem process from two different aryl iodides. A symmetrical diaryl dichalcogenide (ArEEAr, E = Se or Te) was initially obtained by a Cu₂O-catalyzed coupling reaction of ArI with elemental selenium or tellurium in the presence of KOH. Without purification, it was sequentially coupled with a different aryl iodide (Ar'I) to give the unsymmetrical diaryl selenides and tellurides (ArEAr') in good yield.
- 32 3:45 UG **Soil Fingerprinting Via FTIR, pH, and Microscopic Analyses****
 *Ashley Hillenburg [Western Illinois University]
 Chemical characterization, or fingerprinting of soils and sediments can provide important information in forensic investigations. In this study, soil and sediment samples from several locations in West-Central Illinois are compared via Fourier transform infrared spectroscopy (FTIR), pH testing, and microscopic analysis. FTIR provides a good tool for differentiating soils, by providing an overall chemical fingerprint of the main organic and mineral components in soils. Microscopic analysis is used to profile the different types and ratios of sand, gravel, vegetative debris, and other components of the soil. Determination of soil pH can also provide useful information to help characterize and differentiate soil samples. This study assesses the combined utility of FTIR, pH, and microscopic analysis in providing diagnostic fingerprints of soil samples from the West-Central Illinois region.
- 33 2:15 Grad **Determination of Functional Groups of Humic Acids by Infrared Spectroscopy****
 *Deepa Rekulapally, Ajith Polaid, Steven Wailand, Matthew Cash, Scott McConnell [Western Illinois University]
 Humic substances are important components of soil organic matter. Humic substances are natural biogenic, heterogenous organic substances, formed from biochemical transformation of animal and plant tissues. Humic substances consist of humic acid (HA), fulvic acid (FA) and humin. Native prairies are natural untillied grasslands. Prairie restoration sites are cultivated sites converted to prairie conditions to increase wild life habitat. Accumulation of HA and FA should increase when cultivated areas are converted to prairie

restoration sites. Humic acid and fulvic acid were extracted using standard International Humic Substance Society methods from five native prairie sites and five nearby control sites; and five prairie restoration sites and five nearby control sites. Humic acid samples from prairies, prairie restorations and controls were analyzed using Fourier transform infrared spectrophotometer (FTIR). A Fourier transform infrared spectrophotometer (FTIR) - 8400 spectrophotometer manufactured by Shimadzu was used to find the IR spectra of the HA samples. Potassium bromide (KBr) pellets with HA were made using a hand operated pellet press. Humic acids samples were found to have carboxylic functional groups, alcoholic functional groups, phenolic functional groups, amide functional groups. Future studies will compare the spectra of humic acids from native prairies, prairie restorations and controls to determine the differences in their functional groups.

- 34 3:45 Grad Microwave-Assisted Three-Component Click Reaction in Water**
 *Kamala Keerthy Kola, Shaozhong Zhang, Jin Jin [Western Illinois University]
 Multicomponent Reactions (MCRs) are general defined as reactions where more than two starting materials to react to form a product, incorporating essentially all of the atoms of the educts. MCRs have attracted considerable interest owing to their synthetic efficiency. The bond forming efficiency, that is number of bonds that are formed in one reaction, is an important measure to determine the quality of a multicomponent reaction. Unlike the usual stepwise formation of individual bonds in the target molecule, the utmost attribute of MCRs is the inherent formation of several bonds in one operation, ideally without isolating the intermediates, changing the reaction conditions, or adding further reagents. Multi-component reactions have played a central role in the development of modern synthetic methodology for pharmaceutical and drug discovery research. We developed a microwave-assisted three-component reaction which is used to prepare a series of 1,4-disubstituted-1,2,3-triazoles. The reaction employs alkyl halides, sodium azide and alkynes as reactants, Copper (I) iodide or oxide as catalyst, and water as the solvent. The reaction was completed in 10 minutes at microwave irradiation. This method eliminates the need to handle organic azides and uses water as the solvent, making the Click chemistry more user-friendly and safe.
- 35 2:15 UG Comparison of Soil Analysis Methods for HPLC, pH and Soil Density**
 *Jacqueline Richardson [Western Illinois University]
 Soil analysis is useful in forensic science for a few different reasons. With forensic soil analysis, soil from a crime scene can be compared to a soil sample taken from another location. Soil analysis can also help in determination of time since death, or how long buried remains have been in the soil, as the chemistry of the soil has the potential to speed up or slow down the decomposition process. Many different techniques have been proposed for conducting these analyses. In this project, several methods of soil analysis are compared for their utility in distinguishing soils from several locations in West-Central Illinois. Soil density gradients, created using two different sets of reagents; high-performance liquid chromatography (HPLC) analysis, using two different soil preparation methods; and soil pH, tested by using a field meter and a laboratory meter; are compared to determine the optimal protocols for analysis of soils from this region.
- 36 3:45 Grad Synthesis of Unsymmetrical Biaryls through Palladium-Catalyzed Cross-Coupling of Diaryl Tellurides with Organoboronic Acid**
 *Mahati Lolla, Shaozhong Zhang, Jin Jin [Western Illinois University]
 Biaryls, compounds containing two directly connected benzene rings, frequently feature in pharmaceuticals and agrochemicals as well as forming the core of many functional materials (for example LEDs, liquid crystals, conducting polymers). The biaryl scaffold has received increased attention as a privileged structure by the pharmaceutical industry. This motif has shown activity across a wide range of therapeutic classes, which include antifungal, anti-inflammatory, antirheumatic, antitumor, and antihypertensive agents. Palladium catalyzed cross-coupling of organoboranes with an organic halides or triflates is known as the Suzuki coupling reaction. In our research we are going to develop a new method to synthesize unsymmetrical biaryl compounds by the cross-coupling of diaryl tellurides and organoboronic acids. The synthesis of symmetrical diaryl tellurides was carried out first. It used aryl iodides and elemental tellurium as starting materials in the presence of KOH. It is a one-pot reaction without using any catalyst. The diaryl tellurides will then couple with a series of organoboronic acids under palladium catalysts to give the unsymmetrical biaryl products. The reaction conditions and the palladium catalysts will be screened in order to give the best yield.

- 37 2:15 UG Chalcogenide Synthesis**
 *Mattea Scanlan, Brian Bellott [Western Illinois University]
 Solid state chemistry has important applications in technology. It is used in the creation of new materials with unique structures and electrochemical properties that offer the potential for better energy conversion and memory devices. Perovskites, with the chemical structure ABX_3 , are commonly studied in solid state synthesis due to their diversity and wide array of possible uses. Less studied, however, are compounds containing complex chalcogenide anions. Chalcogens are elements in column 16 of the periodic table and include the elements O, S, Se, Te, and Po. This research will focus on the synthesis of chalcogenides, which include a chalcogen anion and an electropositive element.
- 38 3:45 UG Site Specific N-Methylation of Arginine Residues within Arginine and Tryptophan Rich Peptides**
 *Drake Mellott, Anne Rammelsberg [Millikin University]
 Peptides rich in arginine and tryptophan residues exhibit potent anticancer and antimicrobial activities. Furthermore, many peptides rich in arginine and tryptophan are known as cell penetrating peptides (CPPs) and exhibit a high potential for cell entry. Not only do CPPs exhibit a high potential for cell entry, but arginine methylation of various proteins can control cell proliferation, migration, apoptosis, and disturbances in cellular homeostasis. Therefore, the modification of known antimicrobial and anticancer peptides via site-specific methylation may prove fruitful in the search for novel peptide based drugs. Arginine and tryptophan rich peptides synthesized via Fmoc/t-Bu chemistry included RR(Me)W and WR(Me)R. Different methodologies for site-specific arginine methylation were explored, including o-NBS methylation and N-trifluoroacetamide selective on-resin N-methylation. Analysis of these peptides was conducted via HPLC and NMR. Further, biological assays were conducted to determine the efficacy of the peptides regarding therapeutic applications.
- 39 2:15 UG Analysis of Trace Amounts of Penicillin in Lake Water Using High Performance Liquid Chromatography**
 *Elizabeth Sharp, Abigail Gibson, Brian Bellott [Western Illinois University]
 High performance liquid chromatography is an analytical method that is typically used to separate components of mixtures. The separation is based on the components' interaction with both a mobile phase and the particles in a stationary phase column. However, when it is used in conjunction with an analytical standard, it can quantify a specific analyte in a matrix. Various water samples were collected from Spring Lake in Macomb, Illinois and were extracted and analyzed for penicillin. This particular pharmaceutical has been known to be prevalent in water in trace amounts. Penicillin is one of the most common antibiotics prescribed to patients experiencing a variety of symptoms. It was one of the first known drugs to effectively treat both staph and strep infections. Less than 1% of the population experiences adverse effects from this antibiotic and are likely attributed to allergic reaction. For these reasons, quantifying penicillin in local water samples is of great interest and is the focus of the study.
- 40 3:45 Grad Oxidative Transformations of 1,3-Dicarbonyl Compounds Using O-Iodoxybenzoic Acid (IBX) and its Derivatives**
 *Shashidhar Poreddy, Naresh Kore, Thottumkara Vinod [Western Illinois University]
 o-Iodoxybenzoic Acid (IBX) has become a mainstay oxidizing agent in synthetic organic chemistry due to its non-toxicity as well as due to the selective oxidative transformations brought about by the use of this reagent. In this poster presentation we report a unique and novel oxidative transformations that can be carried out on 1,3-dicarbonyl compounds using IBX and its structurally modified derivatives. The observed alpha-hydroxylation and the oxidative cleavage of 1,3-dicarbonyl compounds is demonstrated using 2-benzoylcyclohexanone as a prototypical substrate. The alpha-hydroxylated derivative of 2-benzoylcyclohexanone is formed in aqueous solvent mixtures while oxidative cleavage of the substrate is effected in dry acetonitrile. Oxidative transformations of a series of 1,3-dicarbonyl compounds in various solvent systems and the yet to be identified differences in the ease of these transformations using different batches of the catalyst will be described. A common mechanistic path leading to the two different products and reaction pathways will also be discussed. The present oxidative transformation reactions of 1,3-dicarbonyl compounds features mild reaction conditions, provide higher yields than alternative protocols and is applicable in both milligram to gram scale oxidations.

- 41 2:15 UG Evaluating the Importance of Soil Storage Conditions Using FTIR, ORP, and Soil Settling Rate**
 *Tiffany Tyson [Western Illinois University]
 Weathering and storage of forensic soil samples may make a critical difference when it comes to solving a crime. Improper collection or storage procedures can affect the testing results and provide poor or even misleading data to the investigation. It is first important to collect samples with clean tools and then to place them in the proper storage containers. It is best to store dry samples at room temperature. If wet samples are collected it is best that they are promptly either dried or frozen and stored away from sunlight or damp conditions due to the potential for mold or bacteria growth to contaminate results. For this experiment, Fourier transform infrared spectroscopy (FTIR), oxidation-reduction potential (ORP), and soil settling rate techniques are used to compare the results for samples stored under both ideal and sub-optimal storage conditions.
- 42 3:45 UG Weathering and Storage of Forensic Soil Samples: Effects on GC-FID, Settling Rate, and pH Characterization**
 *Ryan Wojdyla [Western Illinois University]
 Soil characterization is one of the many issues addressed using forensic chemistry techniques. In this study, soil pH, settling rate, and gas chromatography using a flame ionization detector (GC-FID) are examined to investigate what effects on-site weathering and soil sample storage conditions have on the results of subsequent chemical analyses in the laboratory. Samples from several simulated crime scene sites in West-Central Illinois are tested to see if soil chemistry results change over the course of several weeks, as new aliquots are taken and tested from each individual (storage and on-site) environment. This study assesses whether soil characterizations based upon pH, settling rate, and GC-FID data may be substantially affected by the timing of collection or storage conditions of soil samples submitted for comparative testing in forensic cases.
- 43 2:15 Grad Evaluation of Potential Cathepsin D Inhibitors**
 *David Vanderway, Jenq-Kuen Huang, Lisa Wen, Rose McConnell [Western Illinois University]
 Cathepsin D is an aspartyl protease responsible for the degradation of proteins within most eukaryotic cells. When a mutation occurs in the gene encoding cathepsin D, the protease may be over-expressed, disrupting homeostasis in the cell due to the increased amount of cathepsin D. The over-expression of cathepsin D has been implicated in a variety of clinical conditions, most notably Alzheimer's disease and breast cancer. Consequently, cathepsin D is a novel drug target for the treatment of such diseases and the evaluation of synthetic inhibitors that have the potential to inhibit cathepsin D protease activity is of the utmost importance. The goal of our research is to contribute valuable information to researchers involved in the development of drugs that may treat or cure disease. Herein, the screening of five tripeptide inhibitors against cathepsin D is reported, along with the IC₅₀ value (concentration of the inhibitor at which 50% of cathepsin D activity is lost) of the most potent inhibitor. In order to monitor the effectiveness of an inhibitor, an inhibition assay was completed in a fluorescence microplate reader. The substrate, MOAc-Gly-Lys-Pro-Ile-Leu-Phe-Phe-Arg-Leu-Lys(Dnp)-NH₂, was used as the substrate for cathepsin D in the assay. Cathepsin D will cleave between the two phenylalanine residues, causing the MOAc portion of the substrate to fluoresce, and the absorbance is read from the microplate reader at an excitation wavelength of 328 nm and an emission wavelength of 393 nm. Future kinetic studies will be performed in order to elucidate the binding mode of the inhibitor to cathepsin D. This research was supported by National Cancer Institute at NIH (3R15CA08933-04 and 3R15CA86933-04A2S1) and Western Illinois University.
- 44 3:45 Grad Synthesis of Macrocyclic Aromatic Tellurides**
 *Chang-chi Yen, Shaozhong Shang, Jin Jin [Western Illinois University]
 Macrocyclic compounds are of considerable interests due to their construction of molecular-recognition and ion-binding systems. There are many well-known examples of macrocycles such as crown ethers, cyclodextrins and aromatic dimides, etc. Cycloparaphenylenes (CPPs) are macrocyclic molecules with 5 to 20 units of benzene rings joined together at para position. They have attracted much attention from researchers in various perspectives. Their applications in electronic materials and as the building blocks for the preparation of p-expanded and p-layered materials have been investigated. Cycloparaphenylene (CPP) is the shortest repeat unit of carbon nanotubes. The recent synthesis of CPP represents an opportunity to explore

bottom-up nanotube synthesis and once produced, these additional features might be used to arrange the nanotubes into a device. The objective of this research is to explore a method to make macrocyclic aromatic tellurides. The macrocyclic aromatic tellurides will then undergo detelluration reaction (removal of the tellurium atom from the ring) with a palladium catalyst to give CPP. The synthesis of macrocyclic aromatic tellurides starts from 1,4-diiodobenzene reacting with a nucleophile sodium telluride. Once the macrocyclic aromatic tellurides are successfully made, they will be proceeded the detelluration reaction to remove tellurium atoms and lead to the final target CPPs. Compared to the previous methods to synthesize CPPs, our synthetic route will be much shorter and easier to operate.

- 45 2:15 Grad A New Method to Synthesize Biaryl Compounds**
 *Souseeelya Vedula, Shaozhong Shang, Jin Jin [Western Illinois University]
 Biaryls are organic compounds containing a substructure that is an assembly of two aromatic rings or aryl groups, if joined by a single bond. Aryl-aryl bond forming is one of the most important goals in the organic chemistry field. The methodology for the formation of aryl-aryl bond has challenged organic chemists for over a century. Biaryl compounds are wide-spread in many of natural products including alkaloids, terpenes, flavonoids, peptides, etc. For example, a lot of natural pigments and several glycopeptide antibiotics contain biaryl structures. In the past few years, methods for preparing biaryls have relied predominantly on cross-coupling “a method in which two differentially pre-functionalized benzene rings are connected together in the presence of a catalyst. The power of this method was recognized in the 2010 Nobel Prize in Chemistry. Despite major advances in this area, most direct couplings still only operate under undesirable conditions, for example strongly acidic solvents, high temperatures, high concentrations of toxic metal catalysts, large excess of one reactant, and so on. The appeal of the new direct process is increased still further by the ease with which it can be performed. In our research, a highly efficient new protocol for C-Te bond formation leading to symmetrical and unsymmetrical diaryl tellurides has been developed. Utilizing this new protocol, a variety of aryl and heteroaryl iodides are reacted with elemental tellurium to afford the corresponding diaryl tellurides in good to excellent yields. These synthetic diaryl tellurides will be used as the starting materials to generate biaryl compounds under exceptionally mild conditions. The biaryls will be produced by the detelluration reaction. Our method for the synthesis of biaryls by detelluration occurs in good yield at a very mild reaction condition such as room temperature, in the presence of catalytic amount of palladium and a mild base sodium carbonate. The new method will lead to a more benign alternative to the synthesis of biaryls.
- 46 3:45 Grad Synthesis of Phenyl Substituted o-Iodoxybenzoic Acid (IBX) Derivatives for Probing Hypervalent Iodine Twist**
 *Praveen Reddy Yeredla, Krishna Jogiraju, Thottomkara Vinod [Western Illinois University]
 One of the ongoing projects in our laboratory is aimed at understanding the role of the recently theorized hypervalent iodine twist in the oxidation of alcohols using o-iodoxybenzoic acid (IBX). Succinctly, the phenomenon of hypervalent twist refers to the coordinated motion of ligands around the iodine center in IBX-alcohol adduct formed in the ligand exchange step. Attainment of planarity by the oxo ligands allows the transition state of the second reductive elimination step to resemble the planar product iodosobenzoic acid (IBA) produced. We report here the synthesis of two biphenyl based hypervalent iodine reagents with a sterically demanding hypervalent iodine centers unable to attain the needed planarity for the oxo-ligands in the transition states. The structural features of the reagent should make oxidation of alcohols very slow, if at all possible. The new reagents also incorporate suitably positioned hydrophilic groups to make them water-soluble and thus enabling the reagent to potentially oxidize alcohols via the H-abstraction mechanism without relying on the sterically demanding ligand-exchange mechanism.

ENVIRONMENTAL SCIENCE

- 47 2:15 Grad The Study of the Permeability Effects of Bifenthrin on the Tight Junctions of the Blood-Brain Barrier**
 *Meeta Chavan, Melissa Chan [Southern Illinois University Edwardsville]
 Pyrethroids, derived from the natural insecticide, pyrethrum, have been widely used in households, agriculture and pest control. They are classified into two groups; Type I pyrethroids lack an alpha-cyano

group and Type II pyrethroids contain an alpha-cyano group. The toxicological effects of pyrethroids depend on the presence or absence of the alpha-cyano group. It has been reported that pyrethroids can cause a series of neurotoxic effects in laboratory animals. The present study is aimed to study the permeability effect of bifenthrin (Type 1 pyrethroid) on the tight junctions of the blood-brain barrier (BBB) in human brain microvascular endothelial cell (HBMEC) by measuring the transendothelial electrical resistance. TEER is an important physiological marker, which measures the tightness of the BBB. The functions of the tight junctions are to prevent toxic substances from passing from the blood to the brain and vice-versa. We hypothesized that TEER would decrease in a dose- and time-dependent manner when treated with bifenthrin.

48 3:45 UG

Evaluating Long-Term *Sedum* Green Wall Coverage

*Mary Christensen, Kelly Thompson, Mark Ostendorf, ¹Mark Wollbright, Susan Morgan, Bill Retzlaff [Southern Illinois University Edwardsville, ¹Living Wall Ventures]

Green walls serve as an innovative tool in urban environments for thermal, aesthetic, storm water retention, and other environmental benefits. In July 2007, eighteen cylindrical green walls, seven feet in diameter, were established on the SIUE campus and planted with a variety of *Sedum*. *Sedums* were chosen for their particularly resilient traits in arid environments and their water conservation characteristics. Six treatments comprised of walls planted *Sedum kamtschaticum*, *S. (Phedimus) takesimensis*, *S. spurium*, mixed *Sedum*, and *S. hybridum* 'Immergrau' plus a control unplanted wall were established in three replicates. Percent wall coverage by *Sedum* plants were initially measured in September 2007. Wall coverage by *S. kamtschaticum* was the greatest (>60%) and the wall coverage by *S. (Phedimus) takesimensis* was the lowest.

49 2:15 Grad

Evaluating Native Plant Performance on a Mid-Western Green Roof

*Allyssa Decker, Susan Morgan, ¹Kelly Luckett, ²Grace Koehler, Bill Retzlaff [Southern Illinois University Edwardsville, ¹Green Roof Blocks, ²Pizzo Native Plant Nursery]

Green roofs have many ecological benefits that address many modern environmental issues. Many studies have evaluated *Sedums* on green roofs, on the other hand, there is much interest in seeing how native plants will perform on a green roof. In my study, planting treatments consisted of Green Roof Blocks planted with native species only, with native species plus *Sedums* and with *Sedums* only. In the native only planting areas there are eight plugs per block and one plug per species. The species in the native only planting areas were *Eragrostis spectabilis*, *Coreopsis lanceolata*, *Penstemon pallidus*, *Penstemon hirsutus*, *Koeleria cristata*, *Rudbeckia hirta*, *Aster laevis* and *Carex muhlenbergii*. Natives were planted in between the current *Sedum* plantings in the natives plus *Sedum* planting areas. There are six native plugs per block and one plug per species in the native plus *Sedum* planting area. The species in the native plus *Sedum* planting areas were *Bouteloua gracilis*, *Buchloe dactyloides*, *Asclepius verticillata*, *Bouteloua curtipendula*, *Geum triflorum* and *Sporobolus cryptandrus*. Native plants were planted in the two treatments on 5/29/2013 and 6/5/2013. All plants in the study plots were irrigated weekly as needed in 2013 and 2014. On November 7th and 8th 2013 and June 10th and 23rd 2014 plant survival was measured. In the plots with natives only, survival ranged from 0 to 67 percent. Currently, *Coreopsis lanceolata* and *Penstemon pallidus* have the greatest percent survival. In the plots with natives plus *Sedums*, survival ranged from 1 to 100 percent. Survival of the four native grasses was greater than 99 percent in the first growing season. Survival of *Bouteloua gracilis*, *Buchloe dactyloides* and *Sporobolus cryptandrus* is still greater than 60 percent. In addition, *Coreopsis lanceolata* is rapidly spreading outside of the initial planting areas indicating that this native species not only survives on the roof, but reproduces successfully.

50 3:45 Grad

An Investigation of the Mechanism of Pyrethroids Across the Human Brain Microvascular Endothelial Cells and its Application in Health Risk Assessment

*Keith Flaugh, Melissa Chan [Southern Illinois University Edwardsville]

Pyrethroids are pesticides derived from natural insecticide pyrethrin commonly used in households, pest control and agriculture. Pyrethroids are divided into two classes by the presence of an α -cyano group and the difference in toxicological symptoms depend on the presence or absence of the α -cyano group. Due to the widespread application of pyrethroids in domestic and agricultural environments, some research suggested that these compounds can cause a series of neurotoxic and immunotoxic effects in animals and humans based on epidemiological data, clinical reports and laboratory studies. The blood brain barrier consists of endothelial cells that are connected by tight junctions. These tight junctions assist the barrier function in

preventing toxic substances, such as pesticides, from passing through the cells. If the barrier function is disrupted, dysfunction due to the loss of neuronal microenvironment regulation may occur. It has been demonstrated that low level of exposure to pyrethroids has significantly altered the function in BBB permeability. It has also been found that pyrethroid exposure during neonatal period has affected the learning abilities and resulted in other behavioral disturbances in adulthood. The aim of this study is to evaluate the mechanism of pyrethroids across the human brain microvascular endothelial cells and its application in health risk assessment. Deltamethrin, permethrin and bifenthrin will be used as test chemicals. We hypothesized that BBB permeability would decrease in a dose- and time-dependent manner when treated with these pyrethroids. We also hypothesized that deltamethrin would demonstrate a greater permeability effect on the tight junctions compared to permethrin and bifenthrin due to the presence of the α -cyano group.

- 51 2:15 UG Native Bee Diversity in Illinois Restored Prairies and Sand Prairies**
 *Eric Haaksma, Jared Ruholl, Kenneth McCravy [Western Illinois University]
 Bees are the most important group of pollinators. They play a critical role in crop production and in pollination of many wild plant species. However, the native bee fauna of many areas is still poorly known, and there is evidence of declines in bee diversity in some locations. The objectives of this study were to examine the bee diversity in west-central Illinois prairies, to compare bee diversity of restored prairie and natural sand prairie habitats, and to compare bee diversity collected using different trap types. This study was done from May to September 2014 in three restored prairies and three sand prairies in Henderson, Hancock, McDonough, and Mason Counties. Bees were sampled using ground-level pan traps, elevated pan traps, and vane traps. We collected over seventy species of bees. There was substantial overlap in species composition between the two prairie types. However, several species were significantly associated with a single prairie type. Certain bee genera and species were strongly associated with a particular trap type.
- 52 3:45 Grad Population Demography of the Illinois Chorus Frog, *Pseudacris illinoensis*, in Southwestern Illinois**
 *Lisa Hebenstreit, Richard Essner [Southern Illinois University Edwardsville]
 Populations of the Illinois Chorus Frog, *Pseudacris illinoensis*, have been devastated by degradation of wetlands due to development. *P. illinoensis* is a fossorial frog that spends most of its life underground, only emerging to breed in early spring. The range for this species is limited, occurring in southwestern Illinois, southeastern Missouri, and northeastern Arkansas in sand prairie habitat. Populations of *P. illinoensis* are considered rare and declining and are listed as threatened in Illinois. Conservation of this species is critical to preserving amphibian diversity in Illinois. An isolated population of *P. illinoensis* is present in Madison County at the Sand Road Wetland Compensation Site. The purpose of this study is to assess the status of this population and to compare it with other known locations. Frogs will be captured by hand and weighed, sexed, measured for SVL, and photographed for individual identification via pattern mapping. Population size, age distribution, and sex ratio will be estimated using the Jolly-Seber index and compared with population demographic data from other locations in order to inform recovery efforts.
- 53 2:15 UG Long-Term Evaluation of *Sedum* Cuttings as an Establishment Method on Mid-Western Green Roofs**
 *Amanda Henderson, ¹Roxane Krutsinger, ²Kulley Luckett, ³Vick Jost, Bill Retzlaff [Southern Illinois University Edwardsville, ¹USACE, ²Green Roof Blocks, ³Jost Greenhouses]
 Over the past few decades, green roof systems have become environmental tools to reduce storm-water runoff, reduce the heat island effect, and decrease energy costs for commercial and public buildings. For economic purposes, the study of vegetative roofs remains of high importance, with a practical goal: to reduce the cost of installation of green roof systems. This study examines the long-term strategy of using *Sedum* cuttings and *Sedum* plugs as functional, cost-effective establishment methods. The study is located on the Student Success Center (SSC) at Southern Illinois University Edwardsville. In 2010, four establishment treatments (*Sedum* cuttings only, *Sedum* cuttings with Atlas Soil Lock, *Sedum* 406 plugs only, and *Sedum* 406 plugs with Atlas Soil Lock) were applied to 10 Green Roof Blocks (GRBs) in two, East and Middle, replicates on the roof. Since 2011, no data had been collected on this project, only routine maintenance and irrigation of GRBs, conducted by volunteers. On Oct. 23rd, 2014 I re-measured *Sedum* roof coverage of this experiment to evaluate whether the establishment treatments had an effect on vegetative roof coverage. *Sedum* cuttings had greater than 44% roof coverage, while GRBs with 406 plugs had roof coverage less than 35%. When first

established in 2010, the *Sedum* roof coverage was also the greatest in GRB treated with *Sedum* cuttings. In this experiment, evaluated over a long term period, it appears that *Sedum* cuttings were the best method for green roof establishment.

- 54 3:45 Grad **The Relationship between Sediment Genotoxicity and Oxidative Stress Responses in Blue Gill Sunfish (*Lepomis macrochirus*) and Mosquitofish (*Gambusia affinis*)**
 *Stephanie Matthew, Christopher Theodorakis [Southern Illinois University Edwardsville]
 Aquatic environments frequently receive biological and chemical contaminants from various sources. Many of these chemical contaminants are genotoxic - meaning they cause DNA damage in exposed organisms-- which ultimately results in detrimental effects to organismal fitness and survivability. Oxidative stress is a genotoxic process in which the excess production of reactive oxygen species leads to interference with and breakage of DNA strands, eventually leading to mutagenesis in cells and tissues of exposed organisms. Widespread genotoxic effects within aquatic environments may lead to population decline, disruption in community function, and overall ecological decline. In order to identify the presence and extent of these risks to local biota, sediment samples will be collected from area streams and analyzed with the SOS Chromotest to quantify the genotoxic potential of the samples. Blue gill sunfish (*Lepomis macrochirus*) and mosquitofish (*Gambusia affinis*) will then be collected from streams with genotoxic sediments for analysis. DNA damage will be assessed via the Comet assay and flow cytometry, and the extent to which the damage is due to oxidative stress will be assessed by performing an array of assays to measure the concentration and presence of various antioxidants. Results are expected to show that streams with genotoxic sediments will also have fish with significant DNA damage, and that the extent of DNA damage will correspond with the level of genotoxicity identified in the sediment.
- 55 2:15 **Assessing the Soil Nitrate-Nitrogen and Extractable Soil Phosphorus Status of the Spring Lake Watershed**
 *Scott McConnell, Stephanie Nicioli, Karen Ribordy, ¹Jeff Boeckler [Western Illinois University, ¹Northwater Consulting]
 Nitrate-nitrogen and phosphate fertilizers are used worldwide including the Midwestern United States in agricultural operations to increase crop yields. Substantial amounts of fertilizer nitrates and phosphates, both solid phase and solution phase, may be lost from the soil to nearby aquatic systems. Nitrates and phosphates may also contaminate lakes and rivers from animal wastes or native N and P bearing materials. Increased nitrogen and phosphorus in aquatic systems may exacerbate eutrophication. Eutrophication is currently negatively impacting Spring Lake in McDonough County, Illinois. This lake is a major drinking water source for the city of Macomb, Illinois and the surrounding region. Systematic soil samples were taken from the Spring Lake watershed in areas affected by soil erosion to determine the soluble nitrate and phosphate content of the soil. The surface (0 - 5 cm) soil nitrate-nitrogen content was found to average 12.9 mg NO₃--N/kg soil across all sites; while the extractable soil phosphorus was found to average 353 mg extractable P/kg soil across all sites. Both values indicate that soil erosion and runoff from these sites could negatively impact Spring Lake through increased N and P loading of the water of Spring Lake. The N and P loading of natural water bodies frequently increases eutrophication to hypereutrophic levels. The principal effect of increased eutrophication of Spring Lake is to decrease the potential of the lake as a bio-habitat and to reduce the use of the lake as a drinking water source.
- 56 3:45 **Orchid Bees of Cusuco National Park, Honduras**
 *Kenneth McCravy, ¹Joseph Van Dyke, ²Thomas Creedy, ³David Roubik [Western Illinois University, ¹West Virginia University, ²Hope House, UK, ³Smithsonian Tropical Research Institute]
 Orchid bees are abundant and important pollinators of Neotropical forests, but orchid bee diversity is still poorly known in much of Mesoamerica, particularly in cloud forests. We present results of a 2012-2013 survey of orchid bee diversity in Cusuco National Park, a cloud forest environment in northwest Honduras. A total of 4293 orchid bees representing 24 species and 4 genera were collected. One species, *Euglossa imperialis*, accounted for 67.6% of total individuals collected. Several species records were established for Honduras, and substantial southeasterly range extensions were established for *Euglossa obtusa* and *Eufriesea pallida*.

- 57 2:15 Grad **Establishing *Schmidtea mediterranea* as a Model to Study Nanoparticle Toxicity in Freshwater Systems**
 *Morgan Rakers, Amy Hubert, Chris Theodorakis [Southern Illinois University Edwardsville]
 Nanotechnology is rapidly increasing, and thousands of consumer products now incorporate nanoparticles. The small size and large surface-to-mass ratio of nanoparticles allows for greater interaction with cells and cellular structures than is possible for bulk materials. However, these unique properties also have the potential to induce toxicity. We are using the planarian *Schmidtea mediterranea* to assess the toxic effects of nanoparticles. These flatworms are a good model system for studying freshwater toxicology because they are sensitive to contaminants, have easily observable endpoints, and their lower evolutionary position can be predictive of higher taxa responses. Thus far, we have shown that the worms are susceptible to varying concentrations of silver nitrate and copper sulfate. Following these preliminary tests, we plan to expose the worms to silver and copper nanoparticles to look for behavioral changes, effects on specific cell types, and changes in expression of oxidative stress response genes.
- 58 3:45 UG **Long Term Effects of Weeding Green Roof Systems**
 *Kayla Tatum, ¹Ben Greeling, ²Kelly Luckett, ³Vic Jost, Susan Morgan, Bill Retzlaff [Southern Illinois University Edwardsville, ¹USACE, ²Green Roof Blocks, ³Jost Greenhouses]
 Green roof systems offer a method of providing food, reducing building thermal costs, reducing storm water runoff and other environmental benefits. However, to provide these benefits, rooftop maintenance must be performed. A 16,000 ft² green roof was planted in April 2009 with five *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 consisted of four sections of ten Green Roof Blocks (GRB) each based on their clipping/weeding cycle; in one section all weeds were clipped every two weeks, in the second all weeds were clipped every four weeks, in the third all weeds were clipped every six weeks, and the fourth section was left unclipped. Initial weeding treatments proceeded from October 2009 until November 2010. Vegetative roof coverage was recorded for each treatment and the results indicated *Sedum* roof coverage was the same across all weeding treatments. Five years later, all of the plots were weeded and then *Sedum* roof coverage was re-measured using the same methods as before. *Sedum* roof coverage was greater than 56% across all four weeding treatments. Biomass of weeds from each of the plots ranged between 54.3 to 62.3 grams. It appears that initial weeding treatments do not have a long term effect on *Sedum* roof coverage.
- 59 2:15 Grad **Biogenic Volatilization of Selenium from Nanoselenium-Treated Soil-*Stanleya pinnata* System**
 *Jun Wang, Ricky Mahajan, ¹Yinhe Zie, Z.Q. Lin [Southern Illinois University Edwardsville, ¹Shanxi Agricultural University]
 Selenium (Se) is an essential nutrient element for humans and animals, but previous studies show that Se at high concentrations can be toxic to organisms. Elemental Se is generally not water soluble and therefore, less bioavailable for biological accumulation and transformation. However, due to their unique physical and chemical properties of small nanoparticles, the potential environmental impact of nanoscale Se, as an emerging contaminant in the environment, has become a matter of significant concern. Little is known on the chemical behavior of nanoselenium in soil-plant systems. In particular, the biological processes that control the transport and fate of nanoselenium in the environment have not been well elucidated. We hypothesized that nanoselenium particles can be bio-transformed by soil bacteria associated with Se-hyperaccumulator plant *Stanleya pinnata*. This laboratory study determined the biogenic volatilization of elemental nanoselenium particles in the soil-*Stanleya pinnata* system, with a special focus on soil bacterial accumulation and volatilization of nanoselenium particles.
- 60 3:45 **Effect of Thyroid Hormones and Arsenite on Expression of Glutathione-Metabolizing Genes in Zebrafish**
 *Christopher Theodorakis, Mohammed Afzaal Nadeen [Southern Illinois University Edwardsville]
 The objective of this research was to determine the effect of thyroid hormone-modulating compounds on 1) gene expression of glutathione-metabolizing enzymes, and 2) arsenite-induced expression of these genes. Arsenite is known to induce oxidative stress, and gamma glutamyl-cysteine-ligase (GCL), glutathione peroxidase (GPx), and glutathione s-transferase pi (GSTP) are involved in the oxidative stress response. Pro-

oxidants such as arsenite are also known to induce gene expression of these enzymes. Thyroid hormones mediate the oxidative stress response, and perchlorate is a of thyroid hormone synthesis agonist. Therefore, this research was designed to test the hypothesis if thyroid hormone affects the gene expression of GCL, GPx and GSTP enzymes in zebrafish (*Danio rerio*). Zebrafish were exposed to arsenite, perchlorate, exogenously-added thyroid hormone, or a combination of thyroid hormone plus perchlorate. RNA was extracted from liver and gill tissue, and expression of gcl, gpx and gstp genes was determined using qualitative RT-PCR. Beta actin was used as the reference gene. It was found that 1) exposure to perchlorate enhanced expression of these genes, while thyroxine inhibited expression of gpx and gstp, at least in some concentrations; 2) arsenite induced expression of of gcl and gstp genes, 3) a combination of arsenite and perchlorate induced expression of of gpxl and inhibited expression of gstp, and 4) the treatment effect (gene expression in treated fish-gene expression in control fish) in arsenite-treated fish was significantly different from arsenite + perchlorate treated fish. Therefore, it can be concluded that 1) thyroid hormone-modulating chemicals mediate expression of gcl, gpx and gstp, 2) arsenite exposure results in upregulation of these genes, and 3) perchlorate (a thyroid hormone synthesis antagonist) abrogates this arsenite-mediated upregulation.

61 2:15 Grad Partitioning of Nanoselenium Particles in the Soil-Winter Wheat System

*Sahar Zeinali, Z.Q. Lin [Southern Illinois University Edwardsville]

Selenium (Se) is one of the important nutrient elements for animal and human health. Agricultural soil Se contents vary significantly from deficient to toxic levels in the world. Development and uses of Se-enriched agricultural products can increase human daily dietary Se intake in Se deficiency areas. Wheat is one of the major staple foods in the U.S. Previous studies show that wheat Se accumulation is significantly affected by the chemical forms of Se in soil, but few with nanoscale elemental Se. Thus, this greenhouse study determines the partitioning of nanoselenium particles in the soil-winter wheat (*Triticum aestivum*) system and the bioavailability of nanoselenium particles in the soil. The soil Se treatments include 0, 1, 5, and 10 mg/kg of Se from Na₂SeO₄, elemental Se, and nanoscale elemental Se particles, respectively. This presentation also reports the temporal change of nanoselenium particles in the fraction of soil water leachate.

HEALTH SCIENCE

62 3:45 UG Expression of Runt Related Transcription Factor 2 in Salivary Gland Cancer

*Callie Mincy, Katie Dumbell, Asha Eapen [Southern Illinois University Edwardsville]

Runt Related Transcription Factor 2 (Runx2) is best known as an essential factor in osteoblast differentiation and bone development. Recent studies have linked Runx2 with bone metastases and breast cancer. No current literature has evaluated the role of Runx2 in human submandibular salivary gland cancer. Our study aims to determine the expression of Runx2 in human submandibular salivary gland cancer tissues. Results from our study also revealed up regulation of Runx2 both at transcription and translation levels in human submandibular salivary gland cancer cell line. Overall, data obtained from our study would identify a new role of Runx2 in progression and differentiation of salivary gland cancer cells.

63 2:15 Grad Electromyogram (EMG) Amplitude Analysis of Masticatory Muscles During Mastication versus Brux-Like/Thegosis Activity

*Branden Bennett, John Devin Wall, Jacklyn Taylor, Paul Wanda, Dan Welch [Southern Illinois University Edwardsville]

Bruxism is a devastating disorder that involves involuntary nonfunctional gnashing and/or grinding of the teeth. Bruxism can occur while awake or during sleep. Bruxism may cause dental attrition or, in more severe cases, broken teeth, crowns, and fillings. Affected individuals may also exhibit, headaches and various temporomandibular disorders. The nervous system can produce precisely controlled rhythmic motor patterns. A number of rhythmic motor patterns are under the control of a special type of circuit called a central pattern generator (CPG). Brux-like behaviors might be an atavistic oral behavior that was once commonplace or functional in nature, originally used for grinding/sharpening teeth, defense, and/or aggression; a phenomenon known as thegosis. In contrast, human brux-like behavior (bruxism) is generally regarded as a pathological condition. For our initial investigation, we recorded electromyograms (EMGs) from a selection of masticatory muscles to compare mastication verses brux-like (thegosis) motor patterns.

Laboratory rats were used as an animal model since they typically grind down their continuously growing incisors. In the current study we analyzed the amplitudes of EMG bursts for the different muscles involved in mastication: the masseter, the temporalis, and the anterior digastric. The EMG amplitudes were compared under both masticatory and brux-like (thegosis) conditions. Brux-like (thegosis) EMG burst amplitudes were significantly lower when compared to masticatory EMG burst amplitudes for the masseter and anterior digastric muscles (masseter, $p < 0.05$; and the anterior digastric, $p < 0.05$). The EMG burst amplitudes were not significantly different for the Temporalis muscle ($p = .223$). Future experiments will be conducted using EMG concurrently with sonomicrometry. Sonomicrometry utilizes ultrasound to determine distance between two piezoelectric crystals, which can then be used to characterize the muscles' three dimensional movements.

MICROBIOLOGY

64 3:45 UG

Fermentation Potentials of the Bile Acid-Dehydroxylating Anaerobe *Clostridium scindens*

*Avery Allen, Emily Springer, Steven Daniel [Eastern Illinois University]

The primary bile acids chenodeoxycholic acid and cholic acid are converted, via 7 α -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. Other than bile acid dehydroxylation, little is known about the basic physiology of *C. scindens*. The goal of the present study was to determine the types of carbohydrates that support the growth of *C. scindens* and the end products of sugar fermentation. *C. scindens* ATCC 35704 was grown in an anaerobic defined medium (DM; minerals, vitamin mix [p-aminobenzoate, biotin, cyanocobalamin, folate, lipoate, nicotinate, pantothenate, pyridoxal, riboflavin, thiamine], amino acid mix [alanine, arginine, asparagine, aspartate, cystine, glutamate, glutamine, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine, valine], metals, bicarbonate, 100% CO₂ gas phase, cysteine) at 37°C. Anoxic, sterile (autoclaved) stock solutions of monosaccharides (glucose, fructose, mannose, galactose, rhamnose, sorbose, arabinose, ribose, xylose), sugar alcohols (adonitol, dulcitol, erythritol, glycerol, inositol, lactitol, mannitol, sorbitol, xylitol), disaccharides (cellobiose, lactose, lactulose, maltose, melibiose, sucrose, trehalose), trisaccharides (melezitose, raffinose), and complex polysaccharides (glycogen, dextrin, inulin, mucin, pectin, polydextrose [Litesse®], stachyose, starch), glycosides (esculin, salicin), or artificial sweeteners (saccharin, sucralose) were added to DM to final concentrations of 0.1 or 0.25%. No growth was observed (OD_{600 nm}) in DM alone. Of the 39 substrates, 6 monosaccharides (glucose, fructose, mannose, galactose, ribose, xylose), 2 sugar alcohols (dulcitol, sorbitol) and 1 disaccharide (lactose) were growth supportive. These findings suggested that *C. scindens* ATCC 35704 is somewhat limited in its ability to use carbohydrates. Glucose fermentation yielded high concentrations of acetate, with lower concentrations of succinate and formate, with trace amounts of ethanol. Future studies will address how fermentation is energetically coupled to bile acid dehydroxylation.

65 2:15 UG

Classification of Soil Microbes that Produce Antimicrobial Activity Using a DNA-Based Identification System

*Hilary Browning, Samuel Galewsky [Millikin University]

Over the last 55 years, more than 12,000 antibiotics have been discovered. Among these antibiotics, approximately two thirds of them have been isolated from soil. This study was designed to find antimicrobial activity in soil and to identify the species responsible for the activity. Multiple bacteria colonies from a Decatur, IL urban soil sample that produced a zone of inhibition were tested against specific bacterial strains, such as *E. coli* and *Bacillus thuringiensis*. Isolated soil strains were unsuccessful in inhibiting the growth of gram negative *E. coli* but successful in the inhibition of a gram positive *Bacillus*. The isolated soil bacteria strains will be tested against other bacteria in order to further characterize the antimicrobial properties. The identity of the soil bacteria will be confirmed using a DNA-based identification system in which the genus *Streptomyces* is expected to be present. *Streptomyces* account for about 80 percent of all antibiotics and are prevalent in soil.

- 66 3:45 UG Regulation of AhpA by AbrB In *Bacillus subtilis* Under Oxidative Stress and During Sporulation**
 *Alyssa King, Nicole Broden [Bradley University]
 Reactive oxygen species form in cells grown in aerobic conditions as a natural byproduct of cellular metabolism. Among these reactive oxygen species are peroxides, which damage cells by interacting with lipids, proteins, and DNA in the cell. To protect against peroxide damage, cells contain peroxide-detoxifying enzymes that break down peroxides into water and either their respective alcohols or molecular oxygen. *Bacillus subtilis* contains two primary categories of peroxide-detoxifying enzymes: catalases and alkylhydroperoxide reductases (Ahp). There are two main enzymes that protect the cell during vegetative growth: KatA, a catalase, and AhpC, an Ahp. There is a known catalase, KatX, that is active in cells during sporulation and germination, but does not appear to protect cells against hydrogen peroxide, specifically during sporulation. When under extreme stress, some bacterial species, including *B. subtilis*, create spores that lie dormant until the environmental conditions are favorable for germination. It is possible that the peroxidase of interest in this research, AhpA, works in conjunction with KatX during sporulation of *B. subtilis*. Furthermore, previous research has shown that AhpA is at least partially regulated by AbrB, a repressor of many genes involved in activating sporulation, indicating that AhpA may have some role in spores of *B. subtilis*.
- 67 2:15 UG Analyzing *Escherichia coli* Strains from Untreated Surface Waters Using Multiplex PCR for Pathogenic Loci**
 *Alexa Heumann, Yudong Qu, Kai Hung [Eastern Illinois University]
 Untreated surface water poses a threat to the public due to the potential presence of harmful organisms, like pathogenic *Escherichia coli*, which could come from animal fecal deposits carried to sources like creeks, rivers, streams, lakes, or ground water. To assay the genetic and phenotypic variance of *E. coli* in untreated surface water sources in Charleston, IL and surrounding areas, over 90 strains were isolated, identified, and analyzed for biochemical phenotypes as well as resistance to common antibiotics. This project aims to add to the characterization by detecting the presence of nine different pathogenic loci: (estA, ial, bfpA, pCVD, vt1, vt2, eaeA, ipaH, eltB). These nine loci are commonly found in 3 different types of pathogenic forms of *E. coli*: Enterotoxigenic *E. coli* (ETEC), Enteropathogenic *E. coli* (EPEC), and Enteraggregative *E. coli* (EAGEC). Frozen stocks of *E. coli* strains will be revived in batches, followed by DNA extraction with a boiling preparation method. The DNA will then be used as templates to carry out the multiplex PCR, using three separate sets of Multiplex for the nine loci. Both positive and negative control DNA will be included in each round of PCR. The results will then be analyzed using agarose gel electrophoresis. Outcomes from the study will contribute to increasing our knowledge of the diversity of *E. coli* in untreated surface water sources.
- 68 3:45 UG Optimization of Culture Conditions for *Schizophyllum umbrinum***
 *Ryan Momenteller, Thomas Fowler [Southern Illinois University Edwardsville]
 The genus *Schizophyllum* comprises only a few clearly recognized species. The model mushroom *Schizophyllum commune* has a large geographic range, and can be successfully cultured on various types of media, producing viable spores in loosely controlled laboratory conditions. *Schizophyllum umbrinum*, a sister taxon to *S. commune*, is generally found in tropical locations and has been difficult to grow successfully through its life cycle in laboratory conditions. We would like to compare *S. commune* with *S. umbrinum* to understand their very different mating strategies. However, *S. umbrinum* has proven unpredictable in producing mature fruiting bodies and viable spores in culture. In a search for *S. umbrinum* culturing methods that lead to consistent fruiting and sporulation, the media we tried included CYM (complex yeast medium), malt extract agar, modified malt extract agar, and minimal (defined) medium. Characteristic orange hyphal pigmentation and fruiting initials were observed on all of the aforementioned media except for minimal medium, but initials did not typically proceed through formation of a normal mature fruiting body. On modified malt extract agar *S. umbrinum* sometimes produced fruiting bodies, however, the spores were rarely viable when produced. The overall fruiting body form, including the characteristic split gills of the genus *Schizophyllum*, was abnormal in cultured *S. umbrinum* compared to wild-grown mushrooms. The cultured fruiting bodies were inconsistent among themselves in their morphology. In one case, a poorly-formed mushroom produced hundreds of viable spores, indicating that the complete life cycle is achievable in culture. Continued optimization of growing conditions for *S. umbrinum* would be advantageous for future comparative research with this species.

- 69 2:15 Grad **A Study of the Interactions between *Verbesina negrensii* Derived Extractions and *Helicobacter pylori***
 *Katelyn Logan, Vance McCracken, Marcelo Nieto, ¹Flor Mora [Southern Illinois University Edwardsville, ¹Universidad de los Andes]
Helicobacter pylori is a bacterium that colonizes the gastric mucosa and provokes chronic gastric inflammation upon colonization which can develop into gastric and duodenal ulcers, gastric adenocarcinoma, and gastric mucosa-associated lymphoid tissue lymphoma. New therapeutic approaches containing a novel mechanism of action are necessary to improve eradication of *H. pylori* infections. For centuries, plants have been used to treat infections and other illnesses in humans. The genus *Verbesina* has been used among the local Venezuelan communities for the treatment of gastrointestinal complaints; a phytochemical analysis revealed a great variety of terpenoids, which are involved in anti-inflammatory effects and contain gastroprotective components. To assess antimicrobial activity against *H. pylori*, compounds extracted from *Verbesina negrensii* were examined using a bio-guided isolation with disk diffusion assays, leading to the isolation of the novel active compound 6-O- α -cinnamoyl- β -hydroxy-4 α -dihydroxyeudesmane (1). Fractions containing (1) inhibited *Helicobacter pylori* (ATCC 43504) with a MIC of 32 μ g/ml and decreased the expression of inflammatory cytokines TNF; however, the compound did not alter the expression of IL-8. These lead compounds are being examined to assess their ability to prevent adhesion of *H. pylori* to human gastric epithelial cell lines and evaluate the expression of inflammatory cytokines IL-1 β and IL-10.
- 70 3:45 UG **Resistance of *Trichoderma koningiopsis* to Heavy Metals and its Effects on Plant Growth**
 *Eliese Potocek, Terry Torres-Cruz, Andrea Porras-Alfaro [Western Illinois University]
 Soil pollution caused by heavy metals as a result of technological waste is a threat to the environment and human health. *Trichoderma*, a common fungus in the soil has shown potential to be used for bioremediation of heavy metal contaminated soils. This genus can promote plant growth and is resistant to several heavy metals but very few species have been tested. The objectives of this study are to determine the tolerance index of *T. koningiopsis* to different concentrations of Ni and determine the potential of this fungus to increase plant survival in a substrate contaminated with different concentrations of Ni. Identification of the fungus was confirmed using molecular methods. The fungus will be grown on Malt Extract Agar (MEA) media with different Ni concentration (range from 100-500ppm). The plates will be incubated at 25°C for 4 to 6 days to determine the tolerance of the fungus to different concentrations of the heavy metal. To test the effect on plant growth, seeds will be surface sterilized to prevent interference of other microbes, and plated on MEA media with the fungus. Two different controls with the same MEA media will be used: one without the fungus and one without the fungus and metal. Isolates were identified using ITS rDNA. The strain selected for this study is closely related to other strains of *T. koningiopsis* found on orchid roots or associated with plants as endophytes. Tolerance to heavy metals and germination experiments to test whether *T. koningiopsis* could potentially be used to enhance plant germination under concentrated heavy metal conditions are currently being conducted.
- 71 2:15 UG **Diversity of *Escherichia coli* In Rural Illinois Creek Waters: Potential Impact on Public Health?**
 *Lindsay Pushala, Katelyn Duckett, Alexa Heumann, Laura Le Baugh, Henry Schmidt, Bernickia Arnold, Karen Shaw, Tania Ray, Derartu Fite, Kyle Broge, Matt Hladilek, Kai Hung, Steven Daniel [Eastern Illinois University]
Escherichia coli is a normal member of the human gut microbiome. While most strains of *E. coli* are harmless commensals, shiga toxin-producing strains such as *E. coli* O157:H7 are pathogenic and represent a serious public health issue. The focus of this study was to isolate *E. coli* from rural creeks in Illinois and determine phenotypic and genotypic diversity among isolates. Water samples positive for fecal coliforms based on ColitagTM analysis were transferred to EC broth (44.5°C). EC cultures producing gas and growth were streaked onto SMAC agar and then onto BHI. Fifty isolates were identified as *E. coli* using API 20E and Enterotube II, and some phenotypic variations were observed between isolates. Resistance or susceptibility to 16 different antimicrobial agents was assessed using the Kirby-Bauer Method. 45 isolates were resistant to at least one of the following: amoxicillin/clavulanic acid, ampicillin, polymyxin B, tetracycline, triple sulfa, cephalothin, cefazolin, cefuroxime, cefaclor, and ceftazidime. All isolates were susceptible or intermediate in their response to ciprofloxacin, gentamicin, imipenem, cefotaxime, cefotaxime/clavulanic acid, and cefepime. Genotypic variations were surveyed through a multiplex polymerase chain reaction for 5 genes: stx1 and stx2 [shiga toxin], eaeA [intimin] hlyA [enterohemolysin] and uidA [β -D-glucuronidase], and through

plasmid detection. Genotypic variation was observed with three isolates having both a virulence gene (*eaeA*, *hlyA*, or *stx1*) and at least one plasmid. Analysis of the *E. coli* strains will allow us to help with medical advancements and to better understand isolate diversity relative to metabolism, virulence actors, antibiotic resistance patterns, and plasmid profile.

- 72 3:45 Grad Enhanced Electrotransformation of *Leuconostoc* (Genus) *citreum* (Species)**
 *Teresa Sartore, Joseph Lucas, Scott Holt [Western Illinois University]
Leuconostoc citreum can synthesize a variety of α -glucan exopolymers and polymer-derivatives from agricultural residues such as sucrose that are both widely available and inexpensive to obtain. The chemical properties of the α -glucans and their derivatives instill these carbohydrates with properties that make them useful to improve many current and future applications in the field of biotechnology. *L. citreum*, however, has been found to be resistant to electrotransformation since published protocols result in low transformation frequencies. Low transformation efficiency of *L. citreum* may be due largely attributed to the thick peptidoglycan cell wall. The goal of this study was to improve the electrotransformation frequency in *L. citreum* by optimizing plasmid vector concentration and using treatments that weaken and permeabilize the cell wall to allow for enhanced transfer of genetic material into the host cell. Using a standard protocol, *L. citreum* was electrotransformed using varying concentrations of pGK12 and transformants were selected on MRS-chloramphenicol agar; which was then repeated in triplicate. In general, the transformation efficiency improved as less plasmid DNA was used decreasing from 1.0 μ g to 0.1 μ g. High plasmid DNA concentrations reduced electrotransformation frequency. The treatments that were used to enhance the permeability of the cell wall were glycine, penicillin, and lysozyme. Each of these treatments were tested in varying concentrations. After treating the *L. citreum* cells, they were then electrotransformed with pGK12 (0.25-0.1 μ g). Statistically significant increases in electrotransformation frequencies were obtained when *L. citreum* was treated with optimal concentrations of glycine, penicillin, or lysozyme when compared to the control (no treatments). These results were repeatable with two *L. citreum* strains.
- 73 2:15 Grad Diversity of the Beneficial Bacterium *Oxalobacter formigenes* Isolated from the Human Gut**
 *Karen Shaw [Eastern Illinois University]
Oxalobacter formigenes is an anaerobic, oxalate-degrading bacterium found in the human gut and is responsible for the prevention of kidney stones. Currently, *O. formigenes* strains are separated into two groups based on PCR analysis of the *oxc* gene. The two groups exhibit few phenotypic differences, only slightly differing in the composition of their membrane lipids. Other approaches to examine *O. formigenes* diversity are clearly needed. Pulsed Field Gel Electrophoresis (PFGE) digests DNA with restriction enzymes and separates the fragments by electrophoresis in an alternating electrical field. The DNA fragments allow researchers to identify unique patterns between bacterial strains, and PFGE is often used by the CDC and others to determine strains and types of pathogens involved in outbreaks. Thus, PFGE is a powerful tool, and its use in the analysis of bacterial species gives researchers a sophisticated approach to identify differences between strains. Since PFGE-based analysis has not been used to detect genomic variations among *O. formigenes* strains, the aim of this project was to use PFGE to determine differences between group I strains (OxB [sheep rumen], OxWR [wild rat cecum], Sox4 [lake sediment], POxC [swine cecum], OxCC13 [human feces], and HC1 [human feces]) and group II strains (BA1 [human feces], OxK [human feces], HOxBLS [human feces], OxCR [laboratory rat cecum], and OxGP [guinea pig cecum]). This approach is novel, and, with 10% of the global population suffering at least one kidney stone in their lifetime, it is indeed timely and relevant to the health issues facing our society today.
- 74 3:45 UG The Effect of *Helicobacter canadensis* on Gastrointestinal Epithelia in Humans**
 *Rosa Schulz, Vance McCracken [Southern Illinois University Edwardsville]
 The bacterial family Helicobacteraceae contains a variety of helical, gram-negative bacteria that are common in the gastrointestinal tracts of mammals and birds. *Helicobacter canadensis* has been primarily found in the Canada goose. Recently, it has been isolated in the diarrhea of humans. Our study focuses on the interaction between *H. canadensis* and human colonic epithelial cells, HT-29. To determine whether *H. canadensis* induces an immunological response from HT-29 cells, we cocultured cells and bacteria used ELISA to measure cell secretion of human interleukin-8. The ability of *H. canadensis* to adhere to and kill HT-29 cells was assessed using a fluorescence assay and MTT assay respectively. These assays determined that *H. canadensis* does not adhere to HT-29 cells nor does it inhibit the cell's ability to metabolically function.

Additional studies will need to be conducted on other human gastrointestinal cell lines in order to confirm that *H. canadensis* is an emerging pathogen.

- 75 2:15 UG Assessing Methanogen Diversity at Landfill-Impacted Site Utilizing 16S rDNA Sequence**
 *Kaleb Thornhill, Alyssa Balding, Kyle Broge, Kai Hung [Eastern Illinois University]
 Methanogens are anaerobic organisms in Archaea kingdom. These organisms metabolize organic carbons, with the aid of other microbes, and release the end product, methane. In 1996 the West Lion landfill near Mattoon Illinois was closed due to improper management including leachate leaking from the site. Leachate is the fluid that drains from a landfill and it may contain any toxic chemical that may have been present in the landfill and is thus a concern for the environment. While the site has been capped to prevent leachate from leaking to the environment, no tests have been performed to see if it was successful in doing so. Due to the high organic content, leachate helps promote methanogen growth and areas contaminated with leachate is hypothesized to have a different methanogen population. Sediment samples were taken from near the landfill and Lake Charleston (a comparison site). Genomic DNA was then extracted from these samples using a Power Soil Extraction Kit and was then utilized as a template for the amplification and extraction of the 16S rDNA gene through the use of methanogen specific primers and restriction enzymes in PCR's. This segment was then inserted into a plasmid and cloned using bacteria grown on selective plates and the resulting seventy-eight colonies from the Charleston Lake sample were then harvested for it. Sequencing and restriction fragment length polymorphism will be performed on cloned fragments to examine methanogen diversity. Results from the landfill-impacted site will then be compared to results from the control site.

PHYSICS, ASTRONOMY, & MATHEMATICS

- 76 3:45 UG Optical Properties of Lead Boro-Tellurate Glasses Doped with Fe and Co Ions**
 *Benjamin Grober, Saisudha Mallur, P.K. Baba [Western Illinois University]
 Transition metal oxides are unique due to the presence of unfilled d-orbitals. These unfilled orbitals can significantly affect the electronic properties of a glass. We used lead boro-tellurate glasses doped with Fe_2O_3 and CoO to study their effect on the optical properties of these glasses. Glasses were prepared by mixing the starting materials in different, pre-determined stoichiometric ratios. The powders were then mixed using an agate mortar and transferred to a porcelain crucible. A furnace was pre-heated to 950 °C and the materials were placed in it for 15 minutes to melt. The crucible was taken out and stirred well to homogenize the glass and to ensure that the transition metal ions were properly dispersed. The melt was then quenched by pouring it onto a thick brass plate. We used a brass washer to obtain nearly circular discs of the glasses around 3cm in diameter. The glass samples are then annealed at 400 °C to remove the thermal strain. After annealing, the glass samples are smoothened and polished. We plan to present data from the optical absorption experiments and some preliminary fluorescence data which reveal the effect of Fe and Co ions on the optical properties of boro-tellurate glasses.
- 77 2:15 UG Measuring Material Properties with Parts-Per-Billion Sensitivity by Utilizing a Tunnel Diode Resonator Circuit**
 *Justin Gonzales, Ryan Gordon [Western Illinois University]
 My research utilizes a tunnel diode resonator (TDR) circuit to measure material properties with extreme precision and at low temperatures. The TDR circuit is a specialized LC oscillator powered by a tunnel diode with a resonance frequency near 10 MHz. The key advantage of this experimental technique is its sensitivity, where frequency changes of the TDR can be measured with parts-per-billion resolution. This circuit has been used to measure magnetic properties of materials in the past by using the inductor of the TDR circuit. The main goal of this project is to use the capacitor of the TDR circuit to measure dielectric properties of samples by placing them between the conductors of the TDR capacitor. Utilizing the capacitor of the TDR to measure material properties is the first systematic study for this sense element in the experiment. My research will focus on the basic design for this TDR circuit and how it will be interfaced with the cooling stage of the closed-cycle helium cryostat in our laboratory. Once the design and construction of this circuit are finished, the plan is to study the dielectric properties of single crystals of VO_2 , which shows a transition from a state where it is a very good conductor to a state where it is a very poor conductor, also known as a metal-insulator transition.

- 78 3:45 Grad Dysprosium Fluorescence and Optical Absorption in Lead and Bismuth Borate Glasses**
 *Hio Giap Ooi, P.K. Babu, Saisudha Mallur [Western Illinois University]
 Optical properties of Dy^{3+} in bismuth borate and lead borate glasses were analyzed using Judd-Ofelt theory as a function of the glass composition. We studied bismuth borate glasses where the Bi_2O_3 content was varied from 29.5 to 59.5mol% and lead borate glasses where the PbO content was varied from 29.5 to 69.5 mol%. The intensity of an absorption band can be expressed in terms of the oscillator strength. Absorption coefficient at each wavelength was obtained from the optical absorption spectrum of a glass sample and number density of rare-earth ions was calculated from the measurement of the glass density. We then used these two parameters in Judd-Ofelt theory to calculate the oscillator strength of the glass and repeated our calculations for the entire series of lead and bismuth borate glasses. From the absorption measurements, we obtained the intensity parameter values and their variation with glass composition. These parameters can be used for the computation of the radiative transition probabilities, the radiative lifetime of the excited states and the branching ratios.
- 79 2:15 Grad Probing the Shape of High Dimensional Data**
 *Mohammad Mohammadpour Aghdam, Doug LaFountain, Mokhtar Aouina [Western Illinois University]
 Data exhibiting cyclic behavior is important in many disciplines within the natural and social sciences, as it points to the presence of periodic phenomena. For data sets plotted in one, two, or even three dimensions, many methods have been developed to support the visual identification of cycles within the data [Alpha shape, The crust, and the beta-skeleton]. For data sets of arbitrarily high dimensions, however, these methods prove to be insufficient; recently, however, a method of data analysis arising from pure mathematics, in particular the subfield of algebraic topology, has made it easy to identify cyclic behavior in arbitrarily high dimensions. This method, termed persistent homology and developed by mathematicians such as Harer, Carlsson and Zomorodian, takes as input a point cloud data set and gives as output a barcode, which itself is a plot in two dimensions by which the researcher can then see what cycles exist, and also how important each of these cycles is in determining the global shape of the data. In our work we strengthen an existing algorithm for calculating the distance between two barcodes, and hence for two different data sets; we also implement a new way of filtering a data set to produce a barcode which cleanly differentiates between microscopic and macroscopic features of this data set. Finally, we apply this in new ways to economic data, specifically labor and workforce data, in order to identify cyclic trends in which multiple predictors are allowed to vary simultaneously.
- 80 3:45 UG Optical Properties of Bismuth Borate Glasses Doped with Mn and Ni Ions**
 *Nicole Szabo, Saisudha Mallur, P.K. Baba [Western Illinois University]
 The optical properties of glasses are important in determining their applications in optical devices. Glasses doped with transition metal ions are interesting systems as the presence of transition metal ions is expected to significantly influence their optical properties. We prepared a series of bismuth borate glasses doped with Mn and Ni ions to study their optical properties as a function of glass composition. Starting materials in the appropriate stoichiometric ratios were weighed and transferred to porcelain crucibles which were then placed inside a high temperature furnace to melt them at a temperature of 950 °C. Once the sample had melted the crucible was stirred three times to ensure homogeneity. Then the samples were quenched by pouring them into brass rings on metal slabs and then covered with another metal slab. Once the samples were cooled from the quenching they were annealed for about 3 hours to remove the thermal strains. After the samples were annealed, they were flattened and polished for refractive index, optical absorption and fluorescence measurements. Here, we present preliminary results of the optical absorption, fluorescence and refractive index measurements.
- 81 2:15 UG Stochastic Population Modeling: Effects of Parameter Variation on Standard Deviation**
 *Mitchell Riley [Western Illinois University Quad Cities]
 As human activities increasingly influence the environment, and as the spread of diseases poses threats, appropriate wildlife management techniques become increasingly important for the survival of many species. Mathematical models of population dynamics form the basis for prediction and the formation of management strategies. Wildlife populations, however, are influenced by many factors that are often

impractical to include in models, such as weather patterns, which affect food supply and survival. Such stochastic factors add uncertainty to the accuracy of parameter estimates. Understanding the effect of parameter uncertainties on the total population is important for optimal control and management approaches. In this study, we develop a stochastic population model corresponding to a deterministic model having density-dependent birth and death processes. We investigate the effect of parameter variations on the coefficient of variance and its application to prairie dog population.

SCIENCE, MATH, & TECHNOLOGY EDUCATION

- 82 3:45 UG Perceptions and Misconceptions about Climate Change: Teacher Approach**
 *Brooke Kottkamp, Elaine Abusharbain [Southern Illinois University Edwardsville]
 As the problem of climate change continues to intensify, public understanding and scientific background is not adequate to address the needs for climate change remediation. Misinformation with regards to climate change has led to a sea of misconceptions. Teachers are in a position to clarify misconceptions yet, past studies show, they, themselves, have misconceptions about climate change, the greenhouse effect and ozone depletion. It is vital that teachers' misconceptions be assessed more specifically by subject and grade level. Additionally, it is important to document which materials and teaching practices are used in the classroom. A survey was developed with four sections intended to: 1) Identify which known misconceptions the participant was a proponent of, 2) Test the teacher's general and scientific knowledge with regards to climate change and confidence in their understanding, 3) Determine influences which convince or deter educators from bringing climate change into their classroom, and 4) Discover the types of materials teachers are looking for and where they go to get information/materials. The survey was sent out via teacher list serves and administered to teaching professionals working at grade schools up through universities. It was hypothesized that teachers, while unknowingly prescribing to multiple misconceptions, will show interest in teaching about climate change, but will not know where to obtain beneficial materials and accurate information. Findings on teachers' misconceptions and perspectives with regards to teaching in ways which address student misconception will be reported on at the meeting.
- 83 2:15 UG Internship in Science Education in Informal Settings**
 *Rosa Schulz, Sharon Locke [Southern Illinois University Edwardsville]
 The Robert Noyce Scholarship Program awarded a \$1.2 million NSF grant to a collaborative team representing the School of Education Health and Human Behavior, College of Arts and Sciences, and SIUE Center for STEM Research, Education, and Outreach. This NSF award will provide \$11,500 scholarships and \$2,500 internships for the recruitment and mentorship of future STEM field teachers in high-needs schools for five years. The internships are awarded to freshmen and sophomores and are designed to expose promising students to teaching. Internships consist of 200 hours in a variety of outreach education settings, with the goal of encouraging students to consider STEM education as a career. The objectives, challenges, and rewards associated with two internship positions are described in this poster.
- 84 3:45 Understanding Statistics: A Clay Modeling Activity for Statistics Classes**
 *John Kriz, ¹Diane Jedlicka [Joliet Junior College, ¹School of the Art Institute & Columbia College]
 The design of this activity allows students to visually explore the dynamics of variables and the values given from statistical tests. Results of tests can vary. This activity shows that data can employ statistical tests in order to explain their results. While this activity does not cover the mathematical usage of the tests, it does allow for a deeper understanding of the concepts employed by statisticians to describe results and possibilities.
- 85 2:15 UG Student Misconceptions on Climate Change**
 *Raneen Taha, Jordon Payton, Elaine Abusharbain [Southern Illinois University Edwardsville]
 Research has shown that college students' have many misconceptions about climate change. Little is known about the changes in these concepts throughout the college years or what kind of curricular approaches have been instituted. Identifying these trends will assist faculty in their efforts to effectively teach about these concepts. This research has found that students think of climate change more in the short term, when their attention should be toward the long term global changes. Students also have difficulties in distinguishing

between changes in weather and actual climate change. A majority of students reported they received mixed messages about climate change during their education. And while most students agreed that climate change is happening, the majority reported they only a “Basic” level of understanding. Recommendations for curricular innovation will be provided. It is imperative that future citizens and societal leaders have the correct information with which to make informed decisions.

86 3:45

Noyce Science Scholarship Program at SIUE

*Jessica Krim, Kelly Barry, Sue Wiediger, Sharon Locke [Southern Illinois University Edwardsville]
The Robert Noyce Scholarship Program awarded a \$1.2 million NSF grant to a collaborative team representing the School of Education Health and Human Behavior, College of Arts and Sciences, and SIUE Center for STEM Research, Education, and Outreach. Our specialized curriculum includes mentoring meetings where scholars network with quality STEM educators explore topics such as student motivation and time management. Scholars gain research experience in their STEM disciplines and participate in intensive teaching experiences that place them in high-needs schools prior to student teaching. The internship component provides informal teaching experiences, serving as a recruiting tool for the scholarship program.

87 2:15 UG

The Effect of Combustible Dust Concentration and Identity on Explosion Size

*Brenna McIlvoy, Sue Wiediger [Southern Illinois University Edwardsville]
Combustible dust is an often overlooked hazard in many manufacturing industries that has been the cause of several explosions including the 2012 explosion at an ink factory in New Jersey. Dust that is less than a millimeter thick can be a potential explosion hazard. Lycopodium powder is typically used to perform dust explosion demonstrations within the classroom. This powder can be an allergen for some students. . In this research project, an apparatus that a K-12 teacher could build was used to test other common dusts such as flours and sugars. The effect of dust concentration on explosion size was also examined by varying the mass of dust used. For each of the masses the explosion was filmed and the size of the explosion measured using the resulting still frames. The results of the tests will be presented and analyzed.

ZOOLOGY

88 3:45 Grad

Sequence Comparisons of Growth Hormone Receptor Genes in Closely Related *Anolis* (Sauria, Iguanidae) Lizards of Differing Body Size

*Justin Church [Southern Illinois University Edwardsville]
Body size in vertebrates is largely under endocrine control, primarily regulated through the growth hormone (GH) axis. There are very few studies that examine changes that occur in this regulatory pathway and its relation to speciation. Recent work has documented significant differences in GH levels between a small Anole species (*Anolis sagrei*) and two larger congeners (*A. carolinensis* and *A. equestris*). However, no difference in plasma GH was observed between *A. carolinensis* and the larger *A. equestris*. This suggests that other factors, such as GHR structure and subsequent interactions, may play a role in regulating size in these lizards. The current work compares the gene sequence for growth hormone receptor (GHR) among these closely related *Anolis* lizard species that vary in body size. Liver samples for each species were subject to reverse transcriptase PCR followed by PCR using gene-specific primers derived from published work on Green Iguanas. Variations found between GHR genes between species might help determine if the divergence in body size observed between species is related to changes in the endocrine regulation of growth. Changes in GHR genes of these species could also explain the differences in body size between species with similar plasma GH levels (i.e., *A. carolinensis* and *A. equestris*).

89 2:15 UG

Effects of Testosterone on Development and Locomotor Performance in Western Chorus Frogs (*Pseudacris triseriata*)

*Jade Becker [Millikin University]
Vertebrate development during the earliest stages of life is greatly influenced by steroid hormones. For amphibians that lay eggs in water, environmental chemicals can also influence development of eggs and tadpoles. Testosterone is an anabolic steroid known to promote development of sexual characteristics and growth in vertebrates, and testosterone and estrogen-like compounds are common environmental

contaminants. We studied how exogenous testosterone exposure during the tadpole stage influenced growth and locomotor performance of Western chorus frogs shortly after metamorphosis. Testosterone was dissolved in ethanol and delivered to the rearing water of the experimental tadpoles and control tadpoles received only ethanol. After metamorphosis, the frogs completed each a swimming test and a leaping test. We were able to confirm that our testosterone treatment did elevate testosterone in the experimental group. We found no difference in times between the experimental and control groups in the swimming test. We did find that the tadpoles given testosterone took significantly longer to complete metamorphosis and were larger at metamorphosis. Further, those given testosterone had significantly greater leaping distance (when controlling for body size) than those in the control group. Taken together, our results suggest that exposure to anabolic steroids during the tadpole stage significantly impacts the size and locomotor ability of individuals following their metamorphosis.

90 3:45 UG

A Survey of Terrestrial Gastropods of the Alice L. Kibbe Life Science Station in West-Central Illinois

*Andrea Hauk, Stephanie Clark, Kenneth McCravy, Sean Jenkins, Charles Lydeard [Western Illinois University]

Terrestrial gastropods are vital components in terrestrial ecosystems and are thought to play a key role in litter decomposition and nutrient release in temperate and tropical rainforests. As part of an effort to expand our knowledge of gastropod diversity in West-Central Illinois, a survey of terrestrial gastropods of the Alice L. Kibbe Life Science Station in West-Central Illinois was conducted from April to May 2013. A total of nine different sites were sampled within representative stands of five of the prevalent forest types at the Station. A total of 20 species were found representing 11 families and 17 genera. The Polygyridae were the most diverse family with 7 species. Twelve new records were found for Hancock County. Although this study sheds additional light on the terrestrial gastropod fauna of West-Central Illinois, further surveys are needed to establish baseline data and assess future trends in response to habitat modification and climate change throughout the region.

91 2:15 UG

Effects of Stress During Development on Skin Antioxidant Capacity in Western Chorus Frogs and Cuban Tree Frogs

*Ashley Fulk, Travis Wilcoxon [Millikin University]

Frogs, like all vertebrates, experience stressors through their developmental stages in life, including their free-living larval, or tadpole, stage. Studies across vertebrates have shown that stress effects the developmental processes that change the rate of age-specific transitions in early development, or in this case, metamorphosis. Increases in metabolic rate associated with faster metamorphosis in response to stressors are likely to lead to an increase in free radicals, and the potential for elevated oxidative damage. We are interested in antioxidant defense capabilities in tadpoles with the increase of stress in the environment, and whether or not there are differences in that response between temperate and tropical species. We manipulated stress levels of Western chorus frog and Cuban tree frog tadpoles by adding corticosterone to their water through their larval stage and determined total antioxidant capacity of the skin via samples of their skin surface. Using a subset of tadpoles given the same treatment as those in the experiment, we used a corticosterone enzyme immunoassay and confirmed that tadpoles with corticosterone added to their water had significantly higher corticosterone levels after 12, 24, and 48 hours than tadpoles that only received the ethanol control. Tadpoles of both species given exogenous corticosterone developed significantly faster, however; only the Western chorus frogs had significantly lower total antioxidant capacity. Exploring these antioxidant levels in amphibians reveals critical mechanisms by which amphibians maintain the health of their skin and costs associated with responding to stressors.

92 3:45 UG

Effects of Social Habituation on Coloration and Stress In Male Green Anoles, *Anolis carolinensis* (Squamata: Polychrotidae)

*Spencer Hudson, Marianne Robertson, Travis Wilcoxon [Millikin University]

Male green anole lizards, *Anolis carolinensis*, use visual displays, often involving aggressive behavior, in intrasexual interactions. Communication of agonistic messages can be mediated by changes in body coloration due to a stress response. Aggressive behavior can be reduced through social habituation with conspecifics, but the role of stress hormones and their effects on body coloration are unknown. We examined the effects of social habituation in male *A. carolinensis* with respect to stress hormone levels and

body coloration. For two weeks, we allowed randomly paired male *A. carolinensis* to interact for 10 minutes with a 1-day interval between each trial. In week three, we paired individuals with a novel male and repeated the interactions. We collected fecal samples to measure corticosterone levels and recorded body coloration before and after interactions. Prolonged social interaction led to increased corticosterone levels and an overall increase in brown coloration frequency. Although there was no significant correlation between body coloration and corticosterone levels in the initial 2-week period, a close relationship became evident during the third week. Therefore, social habituation may not be mediated by differences in stress levels among subordinate/dominant relationships, and body coloration may instead depend on acute and chronic stress conditions.

93 2:15

Venomous Sea Anemones Presumed to be *Triactis producta*, Klunzinger, 1877 Were Photographed in the Coastal Waters of Kona, Hawaii

*Anthony Garcy, ¹Debra Garcy [Chicago State University, ¹Orland Park]

Triactis producta (Order Actiniaria) are uncommon to rare, small, cryptic, solitary sea anemones in phylum Cnidaria (Class Anthozoa: Subclass Hexacorallia) found throughout the Indo-Pacific Ocean. The *Triactis* genus (Family Aliciidae) is monotypic, having only one known species that has been described as extremely venomous, with a long lasting, not easily treated painful sting. These soft-bodied sea anemones are usually found at shallow depths, typically forming aggregations near stony corals (Order Scleractinia) or in rock crevices. The columns of the polyps give rise to hollow, brown pseudotentacles, which are lined with symbiotic zooxanthellae and cnidocytes. The pseudotentacles are extended during daylight for photosynthetic activity, whereas the white, true tentacles are retracted. Gray, green, or pink bulbous vesicles lined with cnidocytes are attached to the terminus of the pseudotentacles. *Triactis producta* has been reported in the coastal waters of Oahu and Maui. In 2009 and 2010, while performing hundreds of logged, self-contained underwater breathing apparatus (SCUBA) dives, and with a preponderance of luck, several clusters of presumptive *Triactis producta*, measuring 25-40 mm in length were photographed in the coastal waters of Kona, Hawaii. They were located within crevices, worn into a lava rock ledge in approximately 5 m of water. The pedal disks and columns of the polyps were not visible; however, reddish-brown pseudotentacles and white, true tentacles were in full view. The cyclically arranged pseudotentacles varied in diameter and were densely packed. The terminus of the pseudotentacles were branched with some well-developed terminus stalks topped by green, bulbous vesicles. Future objectives will focus on collection and rigorous examination of specimens presumed to be *Triactis producta*. These results could determine the appropriate classification of the photographed cnidarians.

94 3:45 UG

Analysis of Lateral Jaw Muscle Development During Late Tadpole Stages of Gray Tree Frogs (*Hyla versicolor*/*Hyla chrysoscelis*: Anura, Hylidae)

*Kristi Johnson, David Jennings [Southern Illinois University Edwardsville]

Like most frogs, adult tree frogs are primarily insectivores, but as tadpoles their diets mainly consist of algae and vegetation. This drastic change in diet is due to the movement of their jaw muscles during development and metamorphosis. This study examines the growth and development of lateral jaw muscles in later tadpole stages of *Hyla versicolor* (Gray treefrog) and *Hyla chrysoscelis* (Cope's gray treefrog). Specifically we focus on two of the most prominent lateral muscles; the orbitohyoideus and the levator mandibulae longus superficialis muscles. These muscles work in collaboration to open and close the jaw during feeding. During metamorphosis, these muscles change orientation and eventually fuse to form the single adult depressor mandibulae. Through immunohistochemistry using an antibody to striated muscles, we were able to stain individual muscle fibers for developmental descriptions, and for quantitative analysis. During late larval and metamorphic stages, the length, width, and orientation angle of each muscle were measured for several individuals per stage. This data will be used to compare muscle development and metamorphosis in Treefrogs, with previous descriptions obtained for Narrowmouth toads (*Gastrophryne carolinensis*; Microhylidae) and the American Toad (*Anaxyrus americanus*; Bufonidae).

95 2:15 Grad

Sequence Comparisons of Insulin-like Growth Factor Axis Genes in Closely Related *Anolis* Lizards of Differing Body Size

*Seth Griffis, David Jennings [Southern Illinois University Edwardsville]

In vertebrates, body size is primarily regulated through the actions of growth hormone (GH), Insulin-like growth factors, and their receptors. The current work compares the coding sequences of insulin-like growth

factor-1 (IGF-1), its receptor (IGF-1R), and two of its binding proteins (IGF-BP1, IGF-BP3) among four closely related *Anolis* lizards varying in body size. Two species, *Anolis sagrei* and *A. carolinensis*, are relatively small bodied anoles with similar snout-vent lengths. IGF-1 sequence data for both species is available through GenBank. IGF-I sequences have not been reported for two additional species, *A. coelestinus* (intermediate sized anole), and *A. equestris* (large bodied). For all four species, total liver RNA was extracted and reverse transcribed to cDNA. cDNA for each species was then amplified using gene specific primers for various GH axis components. Sequences for the thyroglobulin domain of insulin-like growth factor binding protein 3 (IGFBP3) were obtained for all four species. Overall sequences were highly similar, with cysteines conserved at every position except in the hinge region. Differences between the smaller and larger species were observed within the nuclear localization domain. Future work focuses on obtaining the complete sequence for IGF-BP3, as well as IGF-BP1, IGF-1, and IGF-1R.

- 96 3:45 Grad **Comparing Feeding and Jumping Behavior in Northern Leopard Frogs, *Lithobates pipiens***
 *Candice Johnson, Richard Essner [Southern Illinois University Edwardsville]
 Anuran jumping is an explosive movement that requires rapid and synchronous hindlimb extension. However, the ancestral tetrapod bauplan is designed around asynchronous locomotion (i.e., lateral undulation). This raises the question as to the origin of synchronous locomotor behavior. Lunge feeding has been proposed as a possible precursor to jumping in anurans, since it too involves rapid, synchronous hindlimb extension and is the ancestral feeding condition for both frogs and salamanders. In order to elucidate the relationship between jumping and feeding, we used high speed video and electromyography to quantify kinematics and motor patterns during jumping and feeding behavior in the Northern Leopard Frog, *Lithobates pipiens*. A previous study (Essner et al., 2008) examined six muscles from the forelimbs, hindlimbs, back, and pelvis during feeding and jumping. Muscles included the semimembranosus (hip extensor), gracilis major (hind limb extensor), plantaris longus (hind limb extensor), coccygeiliacus (epaxial), longissimus dorsi (epaxial), and anconeus (forelimb extensor). The results of this study indicated that modulation of muscle amplitude rather than timing was key in differentiating between jumping and feeding. The present study will test this further using a wider array of muscles, including the iliocostalis (femoral protraction), triceps femoris (thigh flexor), sartorius (thigh flexor), and coccygeosacralis (epaxial). The addition of hindlimb flexors should provide a more comprehensive understanding of muscle function during anuran jumping and feeding.
- 97 2:15 UG **Hematological Metrics Associated with Injury, Disease, and Recovery in Birds of Prey Admitted to the Illinois Raptor Center**
 *Morgan Kincheloe, Travis Wilcoxon, ¹Jacques Nuzzo, ¹Jane Seitz [Millikin University, ¹Illinois Raptor Center]
 Wild birds, like most wild animals, are subject to naturally-occurring and human-caused incidents that greatly impact their health. One group of wild birds that are often the focus of wildlife rehabilitation efforts are birds of prey, or raptors. We are interested in both the circumstances that led to admittance of a raptor at the Illinois Raptor Center, in Decatur, Illinois, and their overall health state upon admission to the center and prior to their release. In this study, we examined hematological metrics associated with the health of birds, including hematocrit, protein levels, and calcium levels. Through this study, we also assessed baseline values for these physiological measures in different raptor species, many of which were previously unknown, and related them to variation in life history and natural history. Exploring these vital metrics in raptors has greatly facilitated our understanding of ecophysiology in free-living raptors that are not in a rehabilitation setting while also improving rehabilitation, and the ability to monitor the progress from the time of arrival to the time of successful release from rehabilitation.
- 98 3:45 UG **Visual Learning in the Common House Cricket, *Acheta domesticus* (Orthoptera: Gryllidae)**
 *Rachel Kindred, Marianne Robertson [Millikin University] **DID NOT PRESENT**
 Many crickets exhibit olfactory learning and memory, but only one species, *Gryllus bimaculatus*, has demonstrated visual learning and memory. Since both types of learning are exhibited in *G. bimaculatus*, we examined the capacity for visual learning in *Acheta domesticus*, a species that has olfactory learning. We used a T-maze with a different pattern at the end of each arm. We tested each control cricket (n = 30) twice with a 90- minute interval between the trials. We did not pair a stimulus with either pattern. We tested each experimental cricket (n = 30) 12 times with a 5-minute interval between each trial. We associated one

pattern with a positive stimulus, and we randomized which arm we placed the desired pattern to eliminate learning via direction. There was no significant difference between male versus female crickets, juvenile versus mature crickets, or control versus experimental crickets overall, indicating that crickets were unable to learn and remember a visual cue through operant conditioning. *A. domesticus* exhibits olfactory learning, but does not appear to exhibit visual learning; therefore, we conclude that this species may not have the environmental selection pressure for visual memory because crickets rely more on olfaction than vision in nature.

- 99 2:15 UG **Development of Ventral Jaw Muscles in Tadpoles of Gray Tree Frogs *Hyla versicolor* and *Hyla chrysoscelis* (Anura: Hylidae)**
 *Jamila McClinton, David Jennings [Southern Illinois University Edwardsville]
 Frogs develop from tadpoles to adult frogs, transitioning from water dwelling herbivore to carnivores that reside on land. The shift in food preference and habitat requires remodeling of a large number of features including the ventral and lateral jaw muscles responsible for feeding and respiration. The current study focuses on the development and metamorphosis of ventral jaw muscles in tree frogs: *Hyla versicolor* (Gray treefrog) and *Hyla chrysoscelis* (Cope's gray treefrog) . In order to examine muscular development, tadpoles from a range of larval and metamorphic stages were stained using antibodies to myosin. This immunohistochemical approach allowed visualization of ventral jaw muscles from their inception throughout metamorphosis. For each stage, the length, width, and orientation of the major ventral jaw muscles (intermandibularis, interhyoideus, and geniohyoideus) were recorded. These muscles grew in both length and width during larval stages before undergoing remodeling coincident with changes in the lower jaw.
- 100 3:45 Grad **Intraspecific Variation in Tail Geometry in Three Cyprinid Fishes Covaries with Stream Position**
 *Jessica Loethen, Paul Brunkow [Southern Illinois University Edwardsville]
 Intraspecific morphological variation is the grist upon which natural selection operates, and such variation can be the product of either genetic or environmental influences or a combination of both. Recent studies have highlighted subtle sources of intraspecific variation in the morphology of freshwater fishes. We studied morphology of the tail region in three species of cyprinid fish collected from a downstream site and an upstream site in the Big River in east-central Missouri. Standard length, caudal peduncle depth, caudal fin height and length, and caudal fin area were measured from scaled digital photographs of preserved specimens; geometric landmark data were collected from the same specimens as part of another study. Caudal peduncle depth was significantly lower at the upstream site when using centroid size as a covariate, but not when using standard length as a covariate. Total caudal fin area was also significantly lower at the upstream site after controlling for body size, but fin aspect ratio (measured as either fin height divided by square root of fin area or as fin height divided by fin length) did not differ between sites. There was no significant interaction between site and species for any character, suggesting that all three species differed along the stream gradient in similar ways. Caudal fin characters are often not measured as part of morphological studies, and while interspecific comparisons often establish a functional relationship between caudal fin shape and water velocity or swimming speed, this study suggests that fin shape does not change as much as relative fin area intraspecifically.
- 101 2:15 Grad **Analysis of Intraspecific Morphological Variation in Cyprinids (Cypriniformes: Cyprinidae) along a Stream Gradient in East-Central Missouri**
 *Alycia Sorensen, Paul Brunkow [Southern Illinois University Edwardsville]
 Several recent studies have documented subtle but significant intraspecific variation in morphology of fishes, particularly when comparing reservoir to stream/river channel populations. The present study addressed whether such variation existed along a river gradient of an unimpounded river. We sampled populations of three cyprinid species at a downstream site and an upstream site of the Big River in east-central Missouri. Geometric morphometrics was used to analyze shifts in the positions of 13 landmarks digitized from photographs of preserved specimens using tpsDig. The relative warps (RW = shape variables) that captured the most variation in shape scaled with overall body depth as well as the antero-posterior positions of dorsal, anal and pelvic fins; this occurred when we analyzed all fish together as well as each species separately. RW1 and RW2 differed significantly between sites , with upstream fish in all three species being more shallow bodied with dorsal, anal, and pelvic fin insertions being more posterior compared to fish from the downstream site. There was also a significant interaction between site and taxon, suggesting that stream

position affects morphology differently in these three species; one taxon showed a much stronger difference in RW1 than the other two species. The same pattern of variation (shallower body and relatively posterior fins at the upstream site) existed within each species when each was analyzed separately. This study demonstrates that a stream/river gradient potentially provides enough habitat variation to translate into subtle but significant differences in fish morphology. We discuss whether such variation might have a genetic or environmental basis, and we propose future research examining morphological variation across a broader range of fish ecotypes.

- 102 3:45 Grad Population Demography of the Eastern Narrow-Mouthed Toad, *Gastrophryne carolinensis*, in Southwestern Illinois**
 *Corrinne O'Brien, Richard Essner [Southern Illinois University Edwardsville]
 The Eastern Narrow-mouthed Toad, *Gastrophryne carolinensis*, is a small microhylid frog endemic to southern Illinois. Narrow-mouthed toads are fossorial, ant-specialists that are most frequently encountered during their visits to breeding ponds. They were historically found in six southern counties, but are now limited to Monroe and Randolph counties in southwestern Illinois. Eastern Narrow-mouthed Toads are listed as threatened in Illinois and the status of remaining populations is currently unclear. We propose to monitor populations of *G. carolinensis* through a mark-recapture study. We will place drift fences and pitfall traps around breeding ponds at known localities in Monroe County. Captured frogs will be weighed, sexed, measured for SVL, and photographed for individual identification via pattern mapping. Population size, age distribution, and sex ratios for localities will be estimated using the Lincoln-Peterson index and compared with population demographic data from other states. This study will provide baseline data for long-term monitoring of this threatened Illinois species.
- 103 2:15 Grad Behavioral Responses of Plains Leopard Frog (*Lithobates blairi*) Tadpoles to Cues from Predators and Conspecifics**
 *Katie Stoltz [Southern Illinois University Edwardsville]
 Behavioral changes induced by predators are an important selective force for tadpoles as altering behavior or morphology improves tadpole survival. Groups of tadpoles, either singly or in groups of five, were exposed to one of four cues: (1) cues from crawfish that had consumed tadpoles, (2) crawfish that had consumed non-tadpole prey (fish), conspecific alarm cues (ground tadpole), and controls. Tadpole movements were quantified by placing tadpoles in clear containers with an 'X' drawn on the bottom and counting the number of lines crossed during two 15 minute periods, one before the addition of a cue, and one after introduction of cues. Two weeks after the initial trials, tadpoles previously exposed to cues were compared to tadpoles naive to all predator and conspecific cues. If *Lithobates blairi* tadpoles respond to predator cues we predict decreased movement within groups exposed to conspecific cues or cues from crawfish that had previously consumed tadpoles. Quantifying the behavioral responses of tadpoles exposed to cues from predators consuming non-tadpole prey will allow us to determine if predator cues alone are capable of inducing behavioral changes in tadpoles.
- 104 3:45 UG Learning Behavior Using Route Selection in the Jumping Spider *Phidippus audax* (Araneae: Salticidae)**
 *Kendra Peterson, Marianne Robertson [Millikin University]
 Jumping spiders are solitary, active hunters who must seek out prey using the most effective method in order to conserve energy and resources. In nature spiders would encounter many options to catch prey, each with a different rate of success. I hypothesize that the jumping spiders would be able to learn the best route to escape a maze, and reduce their time to reach the correct route. I ran a control group of 15 *Phidippus audax* jumping spiders and an experimental group of 15 spiders through a water maze with an option of two doors, one which had no escape and gave the spiders a 12.5 volt shock, and another door which allowed the spiders to escape from the water. My control group had two trials, one before the experimental spider and one after, while my experimental group had six consecutive trials with a 5 minute rest period in between each trial. We found that there was no statistical difference between trials in regards to time, and there was no statistically significant preference for one route over the other. The overall trend of trials showed an increase in time, and the route preference only showed a random selection, which refutes my previous hypothesis. Jumping spiders may not have a selection pressure to remember a previous route if they are constantly moving in their environment. Future research may want to look into a different family of spider to see how

they react in this situation.

105 2:15 UG

Developing a New Technique for Measuring Hydrodynamic Drag and Lift on Benthic Organisms

*Lucas Winebaugh, Paul Brunkow [Southern Illinois University Edwardsville]

Hydrodynamic drag and lift can have significant effects on the ecology and evolution of lotic organisms, which live in streams and rivers. However, measuring drag and lift on benthic organisms is complicated by the behavior of water flow near a substrate. Organisms must be in contact with the substrate to gain biologically meaningful measurements, and previous techniques thus often mount the organism to a moveable plate mounted flush with the surface of a flow chamber or wind tunnel. This requires correcting for the effect of the plate itself on drag and lift measurements, but that correction is confounded by the unknown effect of the organism itself on fluid flow over the plate. We are developing a technique that allows for direct measurement of drag and lift using aluminum load cells that does not involve a mounting plate and does not require corrections for a mounting surface. The technique provides a near-frictionless contact between shell and the substrate of a recirculating flow tank for measuring drag, and a self-nulling sensor design for measuring lift. We report on preliminary results of using this technique to measure drag and lift on shells of *Elimia potosiensis*, a snail common in streams and rivers of the Missouri Ozarks. We also extend discussion toward potential application of this technique in other studies.

ADDITIONAL POSTERS

106 3:45 UG
Botany

Seed Selection In Avian Granivores - A Role for Plant Secondary Metabolites?

*Diya Majumdar, ¹Christopher Whelan [University of Illinois Chicago, ¹Illinois Natural History Survey]

Plant secondary metabolites (PSMs), found virtually universally throughout the plant kingdom, function in myriad ways, including defense against enemies, attraction of pollinators, communication between plants, and protection against various abiotic stressors. Extensive research has examined how PSMs mediate interactions between plants and herbivores and plant and frugivores. In contrast, little research has investigated their potential role in defense against granivores. In two seed selection experiments, we quantified seed preference of house sparrows and native granivores, respectively, when offered each of 10 native seeds and proso millet, a commercial bird seed. House sparrows and native granivores greatly preferred millet over all offered native seeds. House sparrows largely rejected seeds of all five wildflower species, but native granivores preferred three of the five wildflowers. House sparrows readily consumed seeds of all five native grass species, but native granivores rejected Canada rye. House sparrows and native granivores both rejected seeds of Illinois bundle flower. Although seed preferences in the non-native house sparrow and native granivores differed significantly, we have found no consistent relationship between seed selection and presence or absence of classes of plant secondary metabolites.

ORAL PRESENTATION ABSTRACTS

8:00am – 12noon, Saturday, April 11, 2015, in Knoblauch Hall

*presenter, [school] with differences noted by superscript, UG = undergraduate, Grad = graduate student, others are faculty/regular

BOTANY

8:15 UG KH330 Initial Efficacy Testing of Mycorrhizal Fungi Acquired from Orchids Native to the Central Highlands of Madagascar, through Symbiotic Seed Germination

*Hunter Bryant, Amanda Wood, Hana Thixton, Shannon Skarha, Lawrence Zettler [Illinois College]
In 2012, a collaborative 5-year research project was initiated between the Royal Botanic Gardens, Kew, and Illinois College, aimed developing a conservation program for orchids endemic to the Central Highlands of Madagascar. One goal has been to recover, identify, and safeguard the mycorrhizal fungi utilized by rare species in this unique biodiversity hotspot which is undergoing rapid ecosystem damage and species loss. In 2013, roots of terrestrial, lithophytic, and epiphytic species were collected under CITES permit by both teams (Illinois College, Kew), followed by fungal isolations carried out simultaneously in the United States and United Kingdom. Our combined efforts yielded mycorrhizal fungi assignable to the Rhizoctonia-complex, namely *Ceratobasidium* (*Ceratorhiza*), *Tulasnella* (*Epulorhiza*), and *Sebacina*. A total of 40 strains of mycorrhizal fungi, isolated at Illinois College from eight different orchid genera (*Aerangis*, *Angraecum*, *Cyorkis*, *Graphorkis*, *Habenaria*, *Polystachya*, *Tylostigma*), were sent to Kew for cryopreservation. To assess the mycorrhizal ability of some of these isolates, preliminary in vitro symbiotic seed germination experiments were carried out. Seeds of several species germinated in the presence of these strains, in particular *Tylostigma nigrescens* inoculated with a fungus initially acquired from the same species. Roots from selected leaf-bearing seedlings of *T. nigrescens* were detached, macerated, and immersed in agar. Resulting fungal colonies arising from pelotons in the agar matched the original isolate, confirming the mycorrhizal role of the fungus. Efforts are continuing in both countries to use additional fungal strains to facilitate seed germination in vitro.

8:30 Grad KH330 Screening for Allelopathic Potential in Japanese Hops (*Humulus japonicus*, Cannabaceae)

*Jon Clark, Kurt Schulz [Southern Illinois University Edwardsville]
Japanese hops (*Humulus japonicus*) is an introduced species from eastern Asia whose current distribution extends over most of the eastern U.S.A. *H. japonicus* is capable of rapid growth and can form dense blankets of foliage. Native species fare poorly under its foliage. A laboratory assay was performed to evaluate the allelopathic potential of foliage extracts on the germination and growth of fescue (*Festuca rubra*), radish (*Raphanus sativus*), and lettuce (*Lactuca sativa*). Various extracts were prepared by soaking intact leaves in deionized water, macerating fresh and dried plant material in deionized water, and macerating fresh and dried plant material in a 1:1 methanol/deionized water. All extracts were standardized for solute concentration. Seeds were placed on heat-sterilized silica in 100mm x 20mm Petri dishes (3 dishes @20 seeds per dish for each species and extract combination) and were watered with 8mL of standardized extract or DI water for controls. The plates incubated on a light table with a 14/10 hour light/dark cycle and an average temperature of 23°C. Germination was monitored daily and the experiment was terminated after 3 consecutive days of no new germination. There were significant effects on percent germination between treatments and between species (all $p < 0.001$), as well as significant delays in germination depending on species and extract type (all $p < 0.001$). These findings provide a rationale investigate whether allelopathy by *H. japonicus* has a role at the community level. A field experiment is a necessary next step before allelopathy can be considered ecologically relevant.

8:45 UG KH330 Quantifying Oak-Hickory Forest Succession in the SIUE Nature Preserve

*Noah Dell, Peter Minchin [Southern Illinois University Edwardsville]
The campus of Southern Illinois University (SIUE) was established on former farmland in 1963. Several large areas of campus that had been managed as cropland or pasture were allowed to undergo secondary succession, which in this region is expected to lead to oak-hickory forest. In 2011, a 154-ha section of campus was designated as SIUE Nature Preserve and will be protected from development for 50 years. A network of 0.1-ha circular permanent plots was established throughout the preserve to obtain baseline data and facilitate monitoring. We hypothesized that the woody vegetation should show a pattern of change in relation to the time since forest

establishment, with shade-intolerant species pioneer species dominating early and then gradually being replaced by the shade-tolerant species typical of mature forest. We also investigated patterns of temporal change in community properties, such as richness, diversity, and total abundance. The study used 100 plots for which time since reforestation had been determined from historic aerial photos. Diameter at breast height (DBH) was measured 1.4 m above ground for all trees within the plot, and shrub stems were counted by species in four 1.56 x 16 m belt transects (100 m²). Dominance data for tree species were ordinated using non-metric multidimensional scaling (NMDS) and generalized linear models were fitted for dominance of each species and community properties against forest age. Age showed a strong correlation with the ordination, confirming that the successional trend is a major dimension of variation among plots. The models illustrated a general trend from shade-intolerant species (e.g., *Robinia pseudoacacia*, *Juglans nigra*, *Celtis occidentalis*) to more shade-tolerant species (e.g., *Acer saccharum*, *Quercus rubra*). There was a decrease over time in overall tree richness, exotic tree richness, and diversity, while total dominance increased. The results will inform management of the SIUE Nature Preserve.

9:00 **Break – original presentation moved to poster session**

9:15 **Perspectives on the Evaluation of Ordination Techniques**

KH330

*Peter Minchin [Southern Illinois University Edwardsville]

The use of real data to evaluate ordination techniques is inadequate because a precise specification of success is lacking. To quantify performance, a clearly defined objective and an explicit criterion for assessing achievement of that objective are needed. A useful approach is to use simulated data, derived from explicit models of species response to ecological factors. Ordination results can then be quantitatively assessed relative to the known structure of the model. This approach makes it possible to test how ecologically plausible variations in the generating model affect ordination performance and to assess of consistency over replicate models with the same underlying structure. Unfortunately, most recent studies have used poor simulation designs that limit the generality of their conclusions or have simply applied methods to real data sets and subjectively evaluated the results. It is always possible to engineer a model or select a real data set on which a particular method performs well but a thorough evaluation should include a wide spectrum of models that vary in properties known to affect performance. These include beta diversity, relative beta diversity ("shape" of the simulated ecological space), alpha diversity, sampling density and pattern, shape of species' responses, trends in community properties (e.g., alpha diversity, total abundance), and the frequency distribution of the data. As an example, I performed a factorial simulation experiment to evaluate the performance of a range of ordination methods (non-metric multidimensional scaling, detrended correspondence analysis, correspondence analysis, constrained correspondence analysis, principal components analysis and redundancy analysis on Hellinger-transformed data, and Gaussian ordination). The results show that non-metric multidimensional scaling generally outperforms the other methods, showing remarkable robustness to variations in the generating model.

9:30 **UG Effect of Herbivory Of Painted Lady Caterpillars, *Vanessa cardui*, on Photosynthetic Rates And Chloroplast Levels of Soybean (Glycine Max) Plants of Different Ages**

KH330

*Kendra Peterson, Samuel Galewsky, Judy Parrish [Millikin University]

We explored the effects of herbivory on photosynthetic rates and the chloroplast levels of different aged soybean (Glycine max) plants. We planted soybeans on two different dates to produce plants aged 48 and 60 days old, and put each age group into either a control group (n = 29, n = 30) in which the leaf was not damaged and had sham cages or an experimental group (n = 18, n = 21) which we allowed caged painted lady caterpillars (*Vanessa cardui*) to feed on for ten hours. We measured the photosynthetic rates of the leaflet adjacent to the damaged leaflet as well as above the damaged trifoliolate for six days following damage to the plant. We also took leaf samples from the plant adjacent to damage on the second, fourth, and sixth day after damage. We then ran the leaf samples through a real time PCR to determine the ratio of chloroplast DNA to genomic DNA. Overall, the photosynthetic rate did not change significantly over the six day time period with the caterpillar damaged plants having similar rates to the control plants. We found that the chloroplast ratios had a significant interaction between the day the leaf sample was taken and the age of the plant. The caterpillar treatment had no significant effect on the chloroplast ratios in the leaves. Although there were no differences in photosynthetic rates, the differences in chloroplast ratios may indicate that the plant changes chloroplast levels by age in response to overall damage in the leaf tissue.

- 10:00 UG Preliminary Evidence for Fungal Specificity among Terrestrial and Epiphytic Orchids in the Florida KH330 Panther National Wildlife Refuge**
 *Samuel Porter, Lawrence Zettler [Illinois College]
 Located within the Big Cypress Basin eco-region, the 10,684 hectare Florida Panther National Wildlife Refuge harbors a mixture of natural communities ranging from hardwood (tropical) hammocks, wet prairies, and swamps that collectively harbor 27 species of orchids. These species include epiphytes and terrestrials alike that grow in close proximity to one another but on different substrates (e.g., host trees and soil, respectively). During the past decade, mycorrhizal fungi have been isolated from roots of a growing number of these orchids, and some of these fungal strains have facilitated seed germination in vitro confirming their physiological significance. Of the isolates recovered so far, most have been assignable to the ubiquitous basidiomycete genera *Tulasnella* and *Ceratobasidium* (anamorphs = *Epulorhiza* and *Ceratorhiza*, respectively). In previous studies, roots of the terrestrial, *Spiranthes vernalis*, and the epiphyte, *Encyclia tampensis*, both yielded *Tulasnella*, and both of their respective strains facilitated seed germination in laboratory trials. We report the outcome of two separate experiments aimed at determining whether or not these *Tulasnella* strains can be used interchangeably by orchids inhabiting different habitats. Seeds of *S. vernalis* developed to the leaf-bearing stage when inoculated with its own *Tulasnella* isolate, but were incompatible with a nearly identical *Tulasnella* strain acquired from the epiphyte, *E. tampensis*. Similarly, epiphytic orchid seeds responded favorably to the *E. tampensis* fungus, but not the *Tulasnella* strain from *S. vernalis*. These results seem to suggest that some degree of fungal specificity may be at play amongst orchids inhabiting different habitats in the Florida Panther NWR.
- 10:15 UG Mycorrhizal Fungi from Mature Epiphytic Orchids and Seedlings Native to South Florida, and a KH330 Technique for Pinpointing Pelotons in Roots**
 *Ellen Radcliffe, Kelley Bishop, Laura Corey, Lawrence Zettler [Illinois College]
 During the past two decades, a growing number of studies have surfaced worldwide that describe orchid mycorrhizal fungi associated with tropical epiphytic orchids in Asia (e.g., China, Thailand, India), South America (e.g., Brazil, Colombia, Ecuador), and more recently Africa (e.g., Madagascar). It now appears that mature epiphytic orchids may utilize mycorrhizal fungi to a greater extent than previously assumed, not just early seedling stages. Research in the Florida Panther NWR during the past 10 years has contributed to this greater understanding, but gaps of knowledge persist that must be filled if conservation measures are to succeed. The aim of this study was to recover and identify culturable mycorrhizal fungi from epiphytic orchids native to south Florida spanning seedling and mature growth stages. In particular, we wanted to pinpoint where viable fungal coils (pelotons) were located within root systems, and to identify these fungi using ITS amplification and sequencing. Among the taxa studied include six epiphytic species (*Encyclia tampensis*, *Epidendrum amphotomum*, *E. nocturnum*, *E. rigidum*, *Polystachya concreta*, *Prosthechea cochleata*), one terrestrial (*Bletia purpurea*), two well-known leafless orchids (*Dendrophylax lindenii*, *Campylocentrum pachyrrhizum*), and one invasive (*Oeceoclades maculata*). Active pelotons were located in all epiphytic seedling roots sampled, primarily in the second centimeter region beyond the tip of younger roots affixed to the host tree substrate (pop ash, pond apple). These roots harbored fungi assignable to ubiquitous genera (*Ceratobasidium*, *Tulasnella*). Roots of the leafless orchids yielded *Ceratobasidium* strains, and ribbon orchids (*C. pachyrrhizum*) in different habitats appeared to utilize the same fungal strain.
- 10:30 Southern Forest Species and Associates of Cook County Tinley Creek Woods KH330**
 *David Shepard [Moraine Valley Community College]
 Botanical research revealed the occurrence of twelve southern forest taxa and putative hybrids growing within the 324 hectare tract of the Tinley Creek Forest Preserves of southwestern Cook County Illinois. Notable species include Illinois endangered *Quercus texana* Buckl. (Nuttall's oak), *Tilia americana* L. var. *heterophylla* (Vent) Loudon (White Basswood), *Ulmus thomasi* Sarg. (Rock Elm), and state threatened *Quercus montana* Willd. (Chestnut Oak). Cook County records include *Cornus florida* L. (Flowering Dogwood), *Quercus lyrata* Walt. (Overcup Oak), *Quercus shumardii* Buckl. var. *stenocarpa* Laughlin (Shumard Oak), *Crataegus jesupi* Sarg. (Jesups Hawthorn), *Acer rubrum* L. var. *trilobum* Torrey and Gray ex K. Koch (Carolina Red Maple), and *Liquidambar styraciflua* L. (Sweetgum). The species grow in a mosaic of wet forest communities more typically found in the lower Mississippi River Valley with conservative vascular herbaceous flora that include *Allium tricoccum* Aiton (Wild Leek), *Allium subverticillata* (Pers) Alexeev (Leek), *Arisaema dracontium* (L.) Schott, *Cinna arundinacea* L. (Common Woodreed), and *Festuca obtusa* Biehler (Nodding Fescue). Evaluations of 1938 Aerial Photography validate the nativity of this discovery, not old field plantings.

- 10:45 UG**
KH330 **Mycorrhizal Fungi from Diverse Orchids in the Central Highlands of Madagascar: Preliminary Findings**
*Shannon Skarha, Kazutoma Yokoya¹, Lawrence Zettler, Jonathan Kendon¹, Martin Bidartondo^{1,2}, Andrew Stice, Laura Corey, Audrey Knight, Viswambharan Sarasan¹ [Illinois College, Royal Botanic Gardens, Imperial College]

Few regions harbor more endemic species than Madagascar. Among the island's 1,000 orchid species, 90% are endemic to this biodiversity hotspot. The Itremo Massif in the Central Highlands encompasses montane grassland, igneous and metamorphic rock outcrops, and gallery and tapia forests. Our study focused on identifying culturable mycorrhizal fungi from epiphytic, lithophytic and terrestrial orchid taxa to understand their diversity and density in a spatial matrix within protected areas. Roots from juvenile and mature orchids spanning 41 taxa were collected under CITES permit and yielded fungi that were identified and stored in liquid nitrogen for future studies. Twelve operational taxonomic units (OTUs) of three known orchid mycorrhizal genera were recognized by internal transcribed spacer (ITS) sequences of 85 isolates and, by comparing with GenBank database entries, each OTU was shown to have closely related fungi that were also found as orchid associates. Orchid and fungal diversity were greater in gallery forests and open grasslands which is very significant with future studies and orchid conservation in mind. As far as we know, this is the first ever report of detailed identification of orchid mycorrhizal fungi from Madagascar.

CELLULAR, MOLECULAR, & DEVELOPMENTAL BIOLOGY

- 8:30 Grad**
KH106 **Effect of MitoNEET on Aging**
*Sudip Paudel, David Grimm, Leonardo Altamirano, Leah Welker, Jocelyn Herrera, Britto Nathan, Mary Konkle, Michael Menze [Eastern Illinois University]

MitoNEET is a small protein which plays a role in diabetes, iron metabolism and reactive oxygen species (ROS) homeostasis. Galactose is a simple sugar that accelerates aging and age related complications impairing mitochondrial functions. Pioglitazone, an antidiabetic drug, binds to mitoNEET and ameliorates galactose toxicity. To know the probable role of mitoNEET on aging, we used Western Blotting technique and measured oxygen consumption rate and cellular mitoNEET levels in isolated synaptosomes from aged and young and, galactose treated human liver cancer cells (HepG2 cells). Western Blotting shows higher mitoNEET levels in aged mice compared to young counterparts. However, galactose reduced not only the cellular mitoNEET levels, but also the artificially inserted mitoNEET tagged with green fluorescent protein (mNT-GFP) levels in HepG2 cells. Interestingly, similar to galactose effect a concentration of 60 μ M pioglitazone reduces cellular mitoNEET levels compared to controls in HepG2 cells but not the mNT-GFP. This result suggests that biological aging and galactose induced aging are likely to be dependent of mitoNEET. Furthermore, increased expression of mitoNEET increases OXPHOS capacity in mice synaptosomes and human liver cancer cells in terms of oxygen consumption. Galactose treatment however increases OXPHOS independent of mitoNEET levels in liver cancer cells. Unlike galactose treatment, pioglitazone reduces complex I respiration independent of mitoNEET levels in liver cancer cells.

- 8:45 Grad**
KH106 **A Comparative Study on Pheromone Communication Between *Schizophyllum* Species**
*Emily Dimick, ¹Timothy James, Thomas Fowler [Southern Illinois University Edwardsville, ¹University of Michigan]

Many fungal species are studied to understand mating behavior and the sex pheromone signaling pathway. An established genetic model for mating in higher fungi is *Schizophyllum commune*, which reproduces sexually as a heterothallic using pheromones to communicate, leading to the production of meiotic haploid basidiospores. *S. commune* has thousands of mating types as part of its tetrapolar mating system. Each mating type is determined by two unlinked complex genetic loci, one of which codes for both mating pheromones and receptors (matB). *Schizophyllum umbrinum* was described by Raper (1959) as a homothallic species. Many homothallic fungi are derived from heterothallic strains by mutations that lead to self-activation of the mating pathway. *S. umbrinum* can bypass outcrossing, yet produces viable basidiospores. These studies were designed to examine components of a putative *S. umbrinum* matB mating-type locus and possible pheromone communication between two *Schizophyllum* species. *S. umbrinum* matB noncoding DNA regions were compared for variation among progeny of a wild-collected mushroom. There were no length differences detected among PCR products for the 11

siblings. This indicates little to no DNA variation and the likelihood of only one *matB* among all progeny. Some of the predicted mature pheromones coded in the *matB* loci of *S. commune* and *S. umbrinum* exhibit a strong similarity at the amino acid level. *S. umbrinum* pheromones were tested for heterologous expression and activity in baker's yeast, *S. cerevisiae*, and in the mushroom, *S. commune*. Communication of *S. umbrinum* pheromones *suph3*, *suph6*, *suph7*, and *suph9* with *S. commune* receptors in vivo was demonstrated. At the molecular level, *S. commune* and *S. umbrinum* pheromones and pheromone receptors are able to elicit signal transduction. Other factors may keep these signaling molecules from interacting in these two sympatric species in nature.

9:00
KH106

Grad The Protective Effects of Solutes in the Cryopreservation of Neuroblastoma Cells

*Trisha Bailey, Britto Nathan, Michael Menze [Eastern Illinois University]

A method to cryogenically preserve neuronal cells in an attached monolayer format does not currently exist but such a technique would aid numerous applications in the field of cell line development, biomedical engineering, and sample preservation. We investigated the effect of trehalose, proline, and dimethyl sulfoxide (Me₂SO) in cryopreservation of mouse neuroblastoma (Neuro-2a) cells in a monolayer format. Neuro-2a cell monolayers were incubated for 24 h at varying concentrations of trehalose, proline, and trehalose plus proline (50-200 mM) prior to cryopreservation to identify the optimum concentration for such pre-incubation. Only 8.3% of cells in monolayers survived freezing in cell culture medium supplemented with 10% Me₂SO, but 24.8% of cells were recovered successfully if monolayers were pre-incubated with 100 mM trehalose prior to freezing in the Me₂SO supplemented medium, with an additional increase to 35.6% recovery when 100 mM trehalose was included in the Me₂SO freezing buffer. Similarly, 19% of cells were recovered when incubated with 100 mM proline but 35.5% were recovered when proline was included in the freezing buffer. We saw the best recovery when trehalose and proline were combined in a 1:1 ratio, with 37.3% recovery when cells were pre-incubated with 112.5 mM trehalose plus proline and 52.5% recovery when trehalose plus proline was included in the freezing buffer. Our results indicate that a combination of solutes may be required to both stabilize the cells during the freezing process as well as manage signaling pathways to prevent apoptosis. We believe these findings will facilitate the development of procedures for long-term preservation of human tissues and organs in the future.

9:15
KH106

UG Measuring Genetic Diversity of an Underutilized Tropical Fruit Tree Crop: *Artocarpus odoratissimus*

*Matthew Murphy, ¹Elliot Gardner, ¹Nyree Zerega [Illinois College, ¹Northwestern University]

The growing population of the world and the threat of climate change are constantly putting new pressures on our current crop system, and the small variety of crops in the current system puts it at great risk of disease. To help address these problems, researchers are putting more focus on underutilized crops. The genus *Artocarpus* (70 spp., Moraceae), which contains the valuable Southeastern Asian tree crops of breadfruit (*A. altilis*) and jackfruit (*A. heterophyllus*), contains many underutilized species of interest. One of these is *Artocarpus odoratissimus* (terap, marang), which is native to Borneo but has been introduced and cultivated into the Philippines. *A. odoratissimus* also contains a wild, putative form called *Barbutus*. In this study, Nuclear and chloroplast DNA microsatellite data from 107 samples were collected from Sabah, Malaysia (Borneo) to study the relationship between cultivated *A. odoratissimus* and *barbutus*. The nuclear data set showed that the *barbutus* samples formed a distinct population from the *A. odoratissimus* samples; furthermore, there was little gene flow taking place between the *barbutus* and *A. odoratissimus*, which supports that *barbutus* is distinct from *A. odoratissimus* but not a wild progenitor to it. However, a chloroplast haplotype network analysis revealed two haplotypes that both contained *odoratissimus* and *barbutus* at the center of the network, which is more consistent with the wild progenitor being the *barbutus* form. The *odoratissimus* form displayed the greatest diversity in the nuclear data, but the chloroplast data showed that the genetic diversity was not significantly different between the two forms. This study is the first to look into the relationship between the two forms, but more sampling from the rest of Borneo and the Philippines, along with increased sample size of *barbutus*, will likely reveal more on these issues.

9:30
KH106

Grad Overexpression of Dentin Matrix Protein 1 in Salivary Gland Cells

*Katie Dumbell, Callie Mincy, Anne George, Asha Eapen [Southern Illinois University Edwardsville]

Salivary gland cancers account for 2-6.5% of all head and neck cancers, of which 25% of malignant tumors occur in the major salivary glands and 50% in the minor glands. Timely diagnosis and prognosis is also adversely affected due to an absence of robust molecular characterization of the various stages in the progression of salivary gland cancers, and as yet undefined markers. Dentin matrix protein 1 (DMP1), an acidic protein, has shown to be present in mineralized, non-mineralized, and malignant tissues. Research from our laboratory has

shown high expression of DMP1 in the human cancerous cell line when compared with the normal human salivary gland cell line. Therefore, this study determines the expression of DMP1 in salivary gland cancer patients. In order to further explore the role of DMP1 in salivary gland cancer, we ectopically expressed DMP1 in normal human salivary gland cells, such that they mimic the cancerous phenotype of the cancer cell line. Results from this study demonstrated that the DMP1 overexpressed cell line mimicked the metastatic potential of the cancer cell line. Exploring the role of DMP1 in salivary gland cancers by focusing on the signal transduction pathways will therefore therapeutically target this protein for novel drug design trails.

CHEMISTRY

10:15
KH105

Grad **Synthesis and Oxidative Properties of a o-Iodoxybenzoic Acid (IBX) Derivative with a Pentafluorosulfanyl Group**

*Archana Pasupulety, Thirupathi Vodnala, Thottumkara Vinod [Western Illinois University]
Synthesis and oxidative properties of structurally modified o-iodoxybenzoic acid (IBX) have been investigated in our laboratory for the last several years. Though IBX has become a mainstay as a viable eco-friendly alternative to many transition metal based oxidizing agents for alcohols, and especially for selective oxidation of primary alcohols to aldehydes, this reagent is not without its drawbacks. One of the main drawbacks of this reagent is its lack of solubility in common organic solvents apart from dimethylsulfoxide, a high boiling solvent. The lack of solubility is attributed to a secondary I=O...H-O interactions found in the crystal structure of the compound which results in its aggregation. It has been demonstrated lately in the literature that the oxidative properties of the reagent can be tweaked by electronic modification of the iodine center of the reagent. It occurred to us that an introduction of the bulky and strongly electron withdrawing pentafluorosulfanyl (SF5) group on the benzene ring could potentially improve the solubility of the reagent by preventing the aggregating secondary I=O...H-O interactions and simultaneously tweak the oxidation potential of the reagent because of the electronic nature of this substituent. The present research work focuses on the synthesis of a structurally modified IBX derivative bearing SF5 group on the arene ring. Commercially available p-tolylsulfupentafluoride serves as a convenient starting material for the synthesis of the new reagent. The synthesis and characterization of the reagent and its oxidation behavior will be discussed during this oral presentation.

10:30
KH105

UG **Synthesis of a Series of First Row Transition Metal Complexes Containing a Tetradentate Ligand**

*Hannah Drake, Brian Bellot, ¹Scott Daly [Western Illinois University, ¹University of Iowa]
The reinvestigation of the synthesis of a series of first row transition metal complexes with the tetradentate ligand 1,3,7,9-tetraaza-4,10-diketo-6,12-diphenyl-2,8 dithiocyclododecane will be reported. All complexes have been characterized via FTIR, ¹H NMR, melting point, and elemental analysis. Select single crystal structures will be reported and discussed. Preliminary sulfur and chlorine K-edge XAS results will be presented.

COMPUTER SCIENCE

9:45
KH308

An Economic Model of Cloud Capacity Planning: A Service Provider's Perspective

*In Lee [Western Illinois University]
As cloud computing penetrates rapidly into the computing industry and major computing enterprises such as IBM, Amazon, and HP develop a variety of services to attract customers, cloud capacity planning has become a subject of great focus for researchers and practitioners. The growth of cloud computing is driven by social media, high speed Internet, and mobile services which demand a great amount of computing resources. While this rapid growth of cloud computing provides revenue opportunities for service providers, high investment costs and low utilization rates are a great concern for them. To ensure that their resources are optimally utilized, service providers need to carefully assess every investment opportunity. This presentation identifies critical variables of cloud capacity planning from service providers' perspectives and develops a mathematical model to increase the value of capacity expansion under an uncertain resource demand. A resource allocation method for various types of cloud resources is also presented.

- 10:00 KH308 Grad Feature Location Using Visualization Techniques**
 *Sai Avensh Boggavarapu, Chunying Zhao [Western Illinois University]
 Nowadays software programs are getting larger and more complex. When developers apply different testing inputs to a program, they want to observe the variation of program behavior. However, comparing and understanding multiple program behavior is not easy. Given multiple inputs, a program will be executed along different execution paths. Some methods might be executed upon different inputs (we call such method as common methods), while others might be uniquely invoked by a particular input (we call such methods as unique methods). Feature location is to locate the method calls related to a particular feature/function, which are the unique method calls by the feature/function. Since the last few decades, visualization technique has been widely used and were proved to be effective to represent software artifacts, such as software architecture, static structures or dynamic behavior. In this study, we utilize visualization technique to compare multiple program executions and locate features. We first run the system several times with different inputs. Each input runs a particular function. Then we visualize the execution traces. Using a cross-referencing view, we highlight both the common or unique method calls. By visualizing the commonality or difference between program executions, we can locate the code/method calls related to a particular program function. We also plan to do user evaluation in near future.
- 10:15 KH308 UG Measuring Irrational Status Quo Bias in Online Video Games**
 *Salman Mohammed, Justin Ehrlich [Western Illinois University]
 While game theory assumes that actors always makes rational decisions, empirical evidence suggests otherwise. One reason for irrational choices may be that of status quo bias, which is the notion that actors irrationally perceive any deviation from an existing path as costly. The goal of this study is to determine whether there is a status quo bias for irrational choices and to determine to what extent this status quo bias costs before a rational decision is made instead of the irrational status quo decision, which is the perceived value of the status quo decision. To accomplish this, an online racing game was developed, in which the subjects complete a race in the shortest possible time. This game was used in a within-group study where the participants, while racing against the clock, had to make ten route-based decisions choices. The data was collected and analyzed in real time using a server-sided application, which allowed each subject to compare her time with the rest of the subjects. The data was analyzed to determine if the subject was making irrational decisions, rational decisions, or random decisions. If the choices were rational, we analyzed whether or not this was due to status quo bias. By randomizing the cost of the irrational choice, we were able to determine the costs of an irrational path necessary to cause a subject to break from the status quo to make a rational decision. This value can also be viewed as the perceived benefit of staying on the existing course. The outcome of this study has important implications in the fields of computer science and economics, as a portion of the irrationality of actors can now be accounted for in game theory models.
- 10:30 KH308 Simulating Strategic Voting Genetic Algorithms Participatory Budgeting**
 *Laurence Leff, Sam Soto, ¹Zhe Yu, ¹Runze Wang, ¹Alexander Hernandex, Justin Ehrlich, Maculay Schlicher, James Calvin [Western Illinois University, ¹New Jersey Institute of Technology]
 Our research team has developed a simulation of a genetic algorithm optimizing a tax code and budget based upon ratings given by subgroups in the demos. At each step, the participants rate members of the candidate pool of budgets 1 to 10. The genetic algorithm sums the ratings on each budget to determine its fitness. The highest rated budgets are crossed over. The probabilities that two budgets will be paired or crossed over is proportional to the sum of the ratings by all the subgroup, as weighted by the number of voters they represent. Some of the populations will be special interests. As an example, they may be the employees and stockholders of a defense contractor. Sincere voting will be that all the followers simply rate candidate budgets with high defense spending and low taxes on themselves higher than other budgets. Can they find a different set of votes that would ultimately give them more satisfaction, that is higher defense spending with lower taxes? Our research models the process of searching for such a set of votes. In conventional voting such as electing an officer from a list of more than two candidates, this is known as a manipulation. We simulated two scenarios, a strategic player, knows the sincere votes for all other voters. They use a breadth-first search where each ply represents one cycle of the genetic algorithm. The second scenario is that there are two strategic players, playing against each other. Both strategic players know how the sincere members of the population would vote on any given candidate budget. Following Saffidine, at each level, our program finds a Nash Equilibrium, at first by looking for a pure equilibrium and eliminating dominated rows and columns. Otherwise, it invokes the Gambit system to solve the

game and obtain a mixed equilibrium. Our simulation has found that in both of these scenarios, the strategic players get a less favorable outcome than if they simply voted sincerely.

10:45
KH308

Bayesian Networks Based Usable Access Control

*Anna Valeva, Binto George [Western Illinois University]

This paper explores system design with dynamic Bayesian networks for providing usable secure access control. Unlike traditional rule based static access control mechanisms, system activities are monitored in real time and a Bayesian network calculates the probability of compromising the security based on observed evidence. Such evidence includes probability of information leakage due to user activities, processes present in the system, open devices, inter-process communication patterns and network traffic. A subject's access to a specific object is prohibited when the evidence reaches or exceeds a preset threshold. At any point, if the evidence falls below the threshold, the subject's access to the object is restored. While the above design seems to be an interesting approach, its effectiveness in real life systems must still be established. Our preliminary research in this area is presented in this paper.

ENGINEERING & TECHNOLOGY

8:30 UG
KH308

Defect Detection through Computer Vision

*Bryce Brewer, Brandon Brewer, Amanda Johnson, Il-Seop Shin [Western Illinois University Quad Cities]

This project focuses on development of an autonomous defect detection method on a part on a manufacturing line using computer vision. A template image representing the geometry of the perfect part is created from specifications prior to the process. A part on the manufacturing line, subject to inspection, is surveyed by acquiring images of its faces at multiple angles. The template matching method developed for this project is then applied to identify the differences between the template and the acquired images. The key idea of this method is to incorporate point spread function into the algorithm to find edges that are most likely true edges representing the geometry of the object and that of defects. The models used to simulate the process are three inch cubes with various defects. The algorithm is written in the MATLAB programming language. To acquire images for multiple face defect detection, a turntable, controlled by an Arduino microcontroller, is constructed in order to rotate the part. The whole process from image acquisition to template matching is integrated into a Graphical User Interface (GUI) in MATLAB. At project completion, the template matching method detects defects beyond one twentieth of an inch from specifications.

8:45
KH308

Self-Verification Algorithm for Boundary Detection System

*Il-Seop Shin [Western Illinois University Quad Cities]

This work discusses an estimation algorithm to accurately extract edge information from the images of an object and provide self-verification on the estimate. An edge likelihood estimator is developed that essentially gives the probability of the presence of an edge at each potential location. Adequate verification and validation has largely been lacking in the development of boundary detection systems, which has limited their adoption in practice. We consider the capability of the algorithm for self-evaluation or self-verification, so that it can assist operators who are using the system by flagging unreliable results that call for a restart of the detection procedure or even the collection of a new data. A critical part of our algorithm involves the development of a method for characterizing the mean square error (MSE) in the estimates. This leads to computation of relative estimate errors, which serves as the quality indicator that can flag unreliable estimates. The key to this capability is that estimation procedures have inherent in themselves information that can be exploited to approximately measure estimate quality. We look at methods that consider the edge likelihood pattern in reasonably broad neighborhoods of the current estimate and that take into account the possible error between data points.

9:00 UG
KH308

Design and Construction of Direct Metal Laser 3D Printer (Phase 1)

*Kyle Slovak, Bryan Ragle, Scott Wirsing [Western Illinois University Quad Cities]

Quad Cities Manufacturing Laboratory is creating an open-sourced Direct Metal Laser Melting (DMLM) 3D printer. As a senior design project, the initial design and construction was performed by a team of engineering

students at Western Illinois University. The purpose of this project is to produce a metal 3D printing machine which will be easier to maintain and upgrade than the system currently used at the lab. The scope of the senior design project focused on the following 3D printer systems: 1) Support Structure; 2) Build Chamber; 3) Recoater System; 4) Power and Controls; 5) Software and Programming. In addition, the project included the following objectives: 1) Assembly of designed systems; 2) Working demonstration of assembled systems. The work accomplished during this project will be built upon by QCML staff to finish the 3D printer.

9:15
KH308

Effects of Fuel Injector Reynolds Number and Syngas Fuel Heat of Combustion on the Performance and Emissions of a Two-After-Body Trapped Vortex Combustor

*Khalad Zbeeb [Western Illinois University Quad Cities]

This paper presents the effects of the fuel lower heating value and the fuel injector Reynolds number on the performance and emissions of a two-after-body TVC combustor. There are two main factors that affect the performance and the emissions of the TVC combustor. The first factor is the lower heating value of the fuel and the second factor is the Reynolds number of the fuel injector of the TVC combustor. The lower heating value of the fuel is strictly dependent on its composition. Since the aim of the industry is to find and optimize alternative fuels to achieve better performance and cleaner emissions, the composition of the fuel becomes a driving factor in optimizing the combustion process. Moreover optimizing the fuel composition will result in a higher LHV and will in turn produce a more efficient performance. On the other hand, the fuel composition has a direct effect on the emissions of the TVC combustor. Most of the fuel cases that were analyzed in previous studies have shown that combusting a fuel that has a higher LHV results in a higher NO_x , CO or CO_2 emissions. This can be very challenging in selecting the best fuel for specific applications. The injector Reynolds number summarizes the effects of the mass flow rate, the density and the viscosity of the fuel on the combustion process and the output performance and emissions of the TVC combustor. The fuel mass flow rate is one of the fundamental aspects in designing a combustor. It determines the efficiency of the combustion process, and it also defines the weight of the combustor and the fuel system of the engine. The power output of a combustor is directly dependent on the lower heating value of the fuel and the fuel injector Reynolds number. The results of the correlation study of the effects of both the fuel lower heat of combustion and the fuel injector Reynolds number simplify the optimization and selection process of a syngas fuel that can satisfy the design constraints in terms of efficiency and emissions.

ENVIRONMENTAL SCIENCE

8:15
KH152

Grad Associations between Microcystin Production and Predictor Variables for The Proliferation of Microcystin Variants in Inland Illinois Lakes

*Kaitlin Hollenbeck, Tih-Fen Ting [University of Illinois Springfield]

Failure to control the nutrient load from agricultural run-off threatens water quality conditions through eutrophication that can result in a cyanobacterial bloom. Some of these blooms are harmful (i.e., harmful algal blooms, HABs) and can produce a deadly hepatotoxin variants known as microcystin. Microcystin causes a range of detrimental health, economic, and ecological effects that can be quite damaging and costly. Although toxic and nontoxic blooms have been known to occur naturally in the environment, frequency and severity of HABs have been increasing due to intensifying anthropogenic factors. Although much research has been done to determine what causes bloom formation, studies to determine stimuli for production of the microcystin toxin during a bloom event are much less prominent. The overall goal of this study was to identify potential stimuli that may contribute to microcystin production and to identify the most reliable causal indicator for microcystin production in inland Illinois lakes. Forty-five samples were collected from 9 inland lakes in the months of July, August, and October by Illinois Environmental Protection Agency biologists as part of the 2013 Statewide Ambient Lake Monitoring HAB Pilot Program. Eight predictor variables were examined: rainfall, temperature, total nitrogen, total phosphorus, TN:TP ratio, chlorophyll- α , microcystin-producing genera, and total cyanobacteria. Among them, phosphorus, rainfall, and microcystin-producing genera were significant contributors to microcystin toxin production, with phosphorus as the most robust predictor variable. In light of our findings, nutrient reduction and mitigation would be paramount to prevent and control toxin-containing blooms in aquatic freshwater systems.

- 8:30 KH152 Grad Pre-Settlement Land Survey Data as a Tool for Forest Restoration, Succession and Forest Structure**
***Kevin Huizenga [Governors State University]**
 Conservation and restoration goals are often modeled from pre-European settlement conditions. Understanding the pre-European state of our forests is therefore vital to many restoration efforts and land use policies. Early land survey records (1845-1848) from the Michigan Department of Natural Resources (DNR) were used to reconstruct pre-settlement forest compositions of Keweenaw County in the Upper Peninsula of Michigan. Data consisted of both witness trees at points and trees found along survey lines. This data was taken before the copper mining industry and logging altered the native vegetation and community composition. Similar techniques were used to compare present forest compositions to the original surveyor's data. Comparing these data sets will help understand how human activities and natural processes have changed the overall dynamics of North American forests. This study took place in the Keweenaw County, an area that is still logged today by several different logging companies. Several distance-based density estimators such as the Morisita density were used on both data sets to calculate the density of the given tree species. All four density estimators used showed an increase in the number of trees/ha. The number of species decreased from the original survey and the amount of species was also very different than the original GLO (Government Land Office) data. The largest difference being an increase in the number of maples trees from 28% of the forest trees to 41%. Oaks and Aspen trees increased slightly while almost all other species declined. No tamaracks were found at any of the survey points. Human disturbances such as logging could account for the decline of the coniferous species and increase in hardwood species as documented in other studies (Sykes and Prentice 1996). Average diameter tree size is also significantly less than the trees chosen by surveyors in the 1800s. The decline in average diameter size can be attributed slightly by surveyor bias but not entirely. Current logging practices and the removal of larger trees has contributed to the smaller tree sizes. Differences between these two data sets can be used as a tool for forest management decisions and restoration
- 8:45 KH152 Grad Development of an In Vitro Blood-Brain Barrier Model to Measure the Transendothelial Electrical Resistance of Tight Junctions due to Exposure to Pyrethroids**
***Ashley Keely, Melissa Chan [Southern Illinois University Edwardsville]**
 Pyrethroids are a type of synthetically produced pesticides that are rapidly replacing organophosphates as a common household insecticide. It is crucial to know how these pesticides will affect the central nervous system. The present study is aimed at examining and comparing the effects of two pyrethroids; deltamethrin and permethrin, on the tight junctions of the blood-brain barrier (BBB) by measuring the transendothelial electrical resistance (TEER). TEER is an important physiological marker, which measures the tightness of the BBB. The functions of the tight junctions are to prevent toxic substances from passing from the blood to the brain and vice-versa. We hypothesized that TEER would decrease in a dose- and time-dependent manner when treated with deltamethrin and permethrin. We also hypothesized that deltamethrin would demonstrate a greater effect on the tight junctions compared to permethrin due to the presence of the $\hat{1}\pm$ -cyano group.
- 9:00 KH152 UG Effects of a Living Roof Ecosystem on the Stress and Success of a Variety of Illinois Native Plant Species and Benefits on the Environment**
***Jessica Kerr, Judy Parrish [Millikin University]**
 In 2014, we constructed rooftop boxes of two depths of roofliteTM soil, 10-12 and 18-20 cm, to examine the responses of four native prairie species (*Rudbeckia hirta*, *Echinacea purpurea*, *Sporobolus aspera*, and *Bouteloua gracilis*) and two vegetable produce species, cherry tomatoes and bush beans (*Solanum lysopersicum* and *Phaseolus vulgaris*). We measured anthocyanin and chlorophyll content and photosynthetic rates of the prairie species. In the produce species, we measured anthocyanin content, yield, and biomass. We analyzed data using SPSS with multiple one-way ANOVAs over two time points. Anthocyanin content was significantly higher in shallow boxes for the prairie species, but there was no significant effect on photosynthetic rates. Both native grasses had increased chlorophyll content, though there was no significant effect for either box depth or species. There was no effect of soil depth on anthocyanin content or yield of tomatoes, but bush beans had significantly lower anthocyanin content and higher yield in deeper soil. The biomasses for the tomato plants and bush bean plants were significantly higher in deeper soil. Thus far, our hypothesis of reduced stress in deeper soil is supported by reduced anthocyanin content for *R. hirta*, *E. purpurea*, and bush beans, and biomass data for both produce vegetables. Photosynthesis and chlorophyll content were not affected by the depth of soil. We will collect winter survivorship and another growing season's data, but at this time our data suggest that we could construct a successful roof environment using the shallower depth, resulting in lower weight loads and reduced

cost for the rooftop mix soil.

9:15
KH152 UG

Arthropods in Urban Green Spaces Near Chicago, IL: Evaluating Assemblage Response to Habitat Factors

*Michael Lordon, Elsa Anderson, Jalene LaMontagne [DePaul University]

Biodiversity loss as a result of urbanization is a challenge for conservationists. The effects of urbanization are well studied for many taxa, but considering the ecological value of arthropods as a food source and as nutrient cyclers, research on urban arthropod assemblages is still lacking. In cities, different types of green space (e.g. manicured parks, natural areas) have different conservation and aesthetic goals, and it is unclear whether these distinct habitats contain similar arthropod communities. We investigated the relationship between arthropod assemblages captured via sticky traps and a suite of habitat variables in 5 city parks and 10 natural forest preserves in Cook County, IL. We generated the best multiple regression models from 18 habitat and weather variables to describe arthropod community abundance and order diversity. The most common habitat terms in the regression models included measures of dead tree abundance, but secondary factors such as weather were also included in some models. We then compared assemblages captured in city parks and forest preserves, controlling for significant environmental factors. There were not significant differences in abundances of common arthropod groups after considering significant regressions. However, four arthropod orders were found only in forest preserves, while one order was found only in city parks. Our findings suggest that while city parks may be equally suitable habitat for some common arthropod groups, greater arthropod biodiversity can be supported more effectively in forest preserve habitats.

9:45
KH152 Grad

Analysis of Present and Historical Impacts of Non-Native Cavity Nesters on Red-Headed Woodpeckers

*Kattie Morris, Jalene LaMontagne [DePaul University]

Red-headed woodpeckers (*Melanerpes erythrocephalus*; RHW) are a species in rapid decline throughout their range. The decline of RHW has been attributed to two primary drivers: habitat loss and competition. European starlings (*Sturnus vulgaris*; EUST), an aggressive non-native species, have been proposed as a contributor to the decline of this once-common species - attributed to competition between the species for nest cavities. Using a combination of camera monitoring and historical survey analysis, the relationship between these species was investigated within the region of Cook County, IL - a region where RHW exhibit disparate migratory patterns. Trail cameras were positioned at RHW nest sites overwinter through spring; footage was monitored for species utilizing the nest, any species occurring within 3m of the nest, and any interactions that occur between individuals. Nine species were recorded at nest sites located within forest preserves, and five species were recorded at nest sites located in public parks. EUSTs were not encountered at forest preserve sites until spring, but were present throughout the monitoring season in parks. No interactions between starlings and RHWs were recorded. Analysis of the Breeding Bird Survey, Christmas Bird Count, and Illinois Spring Bird Count similarly showed no strong correlation between EUST and RHW populations in the Cook County area, suggesting that starlings have not had a strong impact on this species.

10:00
KH152 Grad

A Preliminary Survey of the Migration of Bisphenol A from Plastic Baby Bottles and Babies' Feeding Teats in the U.S. Market

*Iyabode Ogunkuade, Melissa Chan [Southern Illinois University Edwardsville]

Bisphenol A (BPA) is a carbon based synthetic compound widely used in the production of polycarbonate hard clear plastics. Due to its high impact strength, lightweight, low flammability and its exceptional clarity, BPA has been widely used in a variety of applications such as bulletproof windows, break resistant lenses, compact discs etc. including baby bottles and feeding teats. In response to public concern related to the endocrine disrupting and reproductive effects of BPA as well as other potential adverse health effects, manufacturers have confirmed to FDA that they have manufactured these products as "BPA-free" for the U.S. market. Currently, there is limited data available to support the BPA-free claims in baby bottles and feeding teats in the U.S. market. The present study is aimed at developing a specific method to measure and quantify the amount of BPA leaching out from a variety of plastic baby bottles and feeding teats. We hypothesized that an increase in temperature and continuous use will increase the amount of BPA leaching out from the baby bottles and feeding teats.

- 10:15 KH152 Grad Fractionation and Speciation of Nanoselenium in Soil**
 *Mohammad Mamunur Rashid, ¹Fatema Kaniz, Z.Q. Lin [Southern Illinois University Edwardsville, ¹University of Barisal]
 Selenium (Se) is an environmentally important trace element. It is essential for humans and animals but becomes toxic at high concentrations. Nanoselenium particles (<100 nm) have unique particle-size dependent physical, chemical and biological properties, and have recently become one of emerging contaminants in the environment. Nanoscale selenium may impose significant environmental impacts on soil organisms and plants, but few studies have been conducted involving nanoscale selenium. A laboratory incubation experiment was carried out for 30 days with two levels of soil organic matter (5 and 25%) and three levels of nanoselenium treatments (1, 5, and 10 mg/kg). The size of nanoselenium particles was 50-70 nm on average as determined by Zetasizer Nano. The experimental soil pH was 7.4 and soil EC was 74.5 $\mu\text{S}/\text{cm}$. Soil samples were collected weekly and extracted sequentially using different extractants to determine nanoselenium distribution among water extractable fraction, exchangeable fraction, and organic matter-bound fraction in the soil treated with nanoselenium particles. The dominant chemical forms of selenium in each extraction solution were also determined. Preliminary results showed that there were significant changes in nanoselenium particle size, particle density, and the distribution among the fractions with increasing soil incubation time.
- 10:30 KH152 Grad Roof Coverage by Native and *Sedum* Plants in Green Roof Systems at Various Media Depths**
 *Rachel Schuchman, ¹Krista Forrester, ²Emily Woods, ³Kelly Luckett, Susan Morgan, Bill Retzlaff [Southern Illinois University Edwardsville, ¹Grigsby Middle School, ²Kentucky EPA, ³Green Roof Blocks]
 Survival of plants on green roof systems is dependent on how quickly they can establish themselves. The objective of this study is to determine native and *Sedum* plant roof surface coverage at various green roof growth media depths (10, 15, 20 cm). The green roof built-in-place systems were originally planted with *S. kamtschaticum* in 2005. My study re-planted the built-in-place systems on June 23rd, 2015 with a mixture of five *Sedum* species (*S. spurium*, *S. sexangulare*, *S. album*, *S. immergrunchen*, and *S. reflexum*) and four native species (*Sporolus cryplandrus*, *Boutelous curtispindula*, *B. gracilis*, and *Penstamen pallidus*). Roof surface coverage by *Sedum* and native plants was measured on January 23rd, 2015. *Sedum* percent roof coverage of green roof systems at all media depths was the same (>89%). Native percent roof coverage in built-in-place systems containing 20 cm of growth media was 68.9% and in 15 cm of growth media was 67.1% and both were less than *Sedum* roof coverage. Native roof coverage in the 10 cm growth media depth was the lowest (53.2%). After 9 months, natives have achieved more than 50% roof coverage in this study regardless of media depth.
- 10:45 KH152 Grad Comparison of Small Mammal Metrics at Reclaimed and Non-Reclaimed Landfill Sites in Central Illinois, USA**
 *Kelsey Townsend, Tih-Fen Ting [University of Illinois Springfield]
 The use of landfills as a waste disposal method is a common practice around the world, but even with appropriate rules and regulations in place, the potential for environmental contamination is still a possibility. One can gain insight on environmental health through the use of bioindicator species, particularly small mammals, in order to assess the impact of contamination in a given area. The overall goal of this study was to compare two landfill types: reclaimed (Taylorville Landfill) and non-reclaimed (Bishop Landfill) to determine species present and how body metrics differed between the two sites. Sherman live traps and Victor mouse snap traps were employed over a three month period (2,800 trap nights) to test the hypothesis that small mammal presence and body composition will be higher at a reclaimed landfill compared to a landfill that has not undergone the reclamation process. Though multiple species were captured on both landfills, only two species were used for metric analysis; the deer mouse (*Peromyscus maniculatus*) and the white-footed mouse (*Peromyscus leucopus*). Species inhabiting Bishop Landfill had significantly smaller individuals than that of Taylorville Landfill in regards to total body length. Bishop Landfill, however had a higher species diversity with the capture of seven different species compared to Taylorville Landfill which only had three. Both landfills were similar in vegetative structure, but vertical diversity played a larger role in overall trap success than total vegetation volume. While these results support the hypothesis that individuals are smaller on a non-reclaimed landfill site, a non-reclaimed site may potentially house a higher species diversity due to unknown reasons.

- 11:00 KH152** **Grad** **Linking Predator Life History Trade-Offs to Levels of Stability in Predator-Prey Dynamics Using a *Daphnia*-Algae Model System**
 *Ryan Wenkus, Jalene LaMontagne [DePaul University]
 Experimental studies show how extrinsic factors like food availability and quality, predation, and abiotic factors influence the performance of individuals and population dynamics. However, the intrinsic structure of populations which also affect population dynamics, such as stage or size structure, maturation time, and trade-offs between offspring number and size are much more difficult to manipulate and therefore understand. I used a *Daphnia* pulex-algae system and a novel experimental approach to explore how manipulating an intrinsic factor of predator populations, specifically maturation time via an offspring size-number trade-off, influence prey availability and prey quality in a coupled system, and the feedbacks and dynamics between life history traits and predator-prey populations. I directly manipulated *Daphnia* population structure by removing all small juveniles after birth and manually replacing them with larger juveniles. *Daphnia* population size, biomass and stage structure, and water carbon, phosphorus and chlorophyll a content were compared between control and manipulated treatments. Results to date show low quality algae in manipulated populations while control populations contained a low quantity of algae. Therefore, two alternate states may exist where one state is characterized by low quality - high algal biomass and low *Daphnia* biomass, and the other has high quality - low algal biomass and high *Daphnia* biomass. Results from this experiment may determine a link between predator life history traits and prey quality in a dynamic system.

HEALTH SCIENCE

- 9:30 KH103** **Grad** **Influence of Cancer Secretome on Proliferation and Migration of Human Salivary Gland Cells**
 *Kathryn Carter, Paul Wanda. Asha Eapen, Anita Joy [Southern Illinois University Edwardsville]
 The secretome is the collection of all macromolecules secreted by a cell, and is a vital aspect of cell-cell communication. In cancer, tumor cells often have secretomes with altered composition compared to the normal tissue from which they are derived. These changes can contribute to the acquisition and maintenance of recognized hallmarks of cancer metastasis, including increased cell proliferation and cell migration. We evaluated the influence of the cancer secretome, on metastatic potential of salivary gland (SG) carcinoma. Cell proliferation and cell migration were evaluated as indicators of metastatic potential. Human SG cancer cells (HTB-41) were aseptically cultured in DMEM-F12 growth media till they were 90% confluent. HTB-41 cells were serum-starved for 24 hours and cancer secretome was collected and stored at -20°C. To evaluate cell proliferation, normal human SG cells (HSG) were cultured till they reached 90% confluency and sub-cultured into 96-well plates. HSG cells were treated with the cancer secretome for 4 and 24 hours and designated as HSG*. The CyQuant Colorimetric Cell Proliferation Assay was carried out on naive/untreated HSG and experimental HSG* cells. Absorbance at 530nm was recorded using a µQuant spectrophotometer. To evaluate cell migration, gap-closure assays were carried out. HSG cells were grown on coverslips in DMEM-F12/growth media, while HSG* cells were grown in cancer secretome. Upon reaching 90% confluency, a uniform “gap” was created using a sterile micropipette tip (Day 0). Cells were allowed to grow and imaged each day to record the “gap” that was covered by the migrating cells. HSG* cells exhibited a significantly higher proliferation rate compared to normal HSG cells. HSG* cells also exhibited a significantly higher migration rate; normal HSG cells covered the “gap” in 5 days, but HSG* cells covered the “gap” by Day 2. Our data indicate that the cancer secretome is critical in promoting cancer progression and metastasis.
- 9:45 KH103** **Grad** **Influence of Cancer Secretome on Bone Sialoprotein and Dentin Sialophosphoprotein**
 *Samantha Hamilton, ¹Blake Fernando, ¹Asha Eapen, ¹Anita Joy [Southern Illinois University Edwardsville, ¹Southern Illinois School of Dental Medicine]
 Potential biomarkers and therapeutic targets are vital agents necessary for detection and treatment of salivary gland carcinoma. Previous studies have suggested that potential biomarkers lie within the secretome, or microenvironment of the cell. Moreover, cancer secretome encompasses proteins secreted by cancer cells, which allows for signaling and communication with the tumor microenvironment. A previous study performed by our lab showed that Small Integrin Binding N-Linked Glycoproteins (SIBLINGs), specifically BSP and DSP, are overexpressed in salivary gland carcinoma. SIBLINGs are a family of secreted glycoposphoproteins that include bone sialoprotein (BSP), dentin sialophosphoprotein (DSPP), and others. There have been no studies evaluating SIBLING expression in cancer secretome and the influence it has on normal salivary gland cells. Therefore, the

overall aim of this study is to investigate the influence of cancer secretome on normal salivary gland cells and to explore SIBLING expression, specifically, BSP and DSP, of normal cells after exposure to cancer secretome. Normal salivary gland cell line (HSG) and submaxillary salivary gland cancer cell line (HTB-41) were propagated using routine cell culture techniques. HSG*, normal cells cultured in secretome from HTB-41 cells, were utilized for protein extraction at 24, 48, and 72 hour time points and processed using SDS-Page and Western Blot techniques. Quantification and comparison of HSG, HTB-41, and HSG* cells were preformed in order to observe SIBLING expression, specifically BSP and DSP. Lastly, cells were processed via immunofluorescence in order to observe localization of SIBLINGs in HSG, HTB-41, and HSG* at 24, 48, and 72 hour time points. Western blot showed increased expression of BSP and DSP in HSG* cells, similar to that of HTB-41 cells in our previous study, when compared to HSG. Furthermore, immunofluorescence displayed distinct localization differences of the selected SIBLINGs when comparing HSG, HTB-41, and HSG*. Therefore, our studies confirm that cancer secretome and the microenvironment influence normal HSG cells to exhibit cancerous characteristics in terms of BSP and DSP expression.

10:00 Grad Endothelial Cell Matrix-Driven Differentiation of Human Mesenchymal Stem Cells

KH103 *Jennifer Yu, Anita Joy [Southern Illinois University Edwardsville]

Angiogenesis and vascular remodeling are vital events in tissue repair mechanisms. One of the major limitations to successful tissue engineering procedures is the inability to adequately vascularize tissue to promote post-surgical healing and regeneration. Numerous ongoing studies are evaluating potential strategies to enhance vascularization during treatments involving bone defects and trauma. Our interest lies in the field of regenerative endodontics and our objective is to study strategies that could enhance vascularization of dental pulp tissue following endodontic procedures. We evaluated the differentiation capacity of human mesenchymal stem cells (HMSCs) when exposed to the extracellular matrix of endothelial cells. Induced differentiation of multipotent HMSCs into an endothelial lineage could potentially enhance in vivo formation of blood vessels. Methods: Two cell lines, namely, HMSCs and human aortic endothelial cells (HECs), were cultured using optimal cell culture conditions. Endothelial cell specific markers were evaluated using immunofluorescence techniques to determine the influence of HEC matrix on HMSCs at 24, 48, and 72 hour time points. Protein levels of endothelial cell markers were also evaluated on differentiated HMSCs at 24, 48, and 72 hours. Results: HMSCs exposed to endothelial extracellular matrix expressed endothelial cell specific markers, namely VE-cadherin and CD31 at the cytoarchitectural and translational levels. Differentiated HMSCs also stopped expressing HMSC-specific CD44. Conclusion: The extracellular matrix of endothelial cells can drive differentiation of human mesenchymal stem cells into an endothelial lineage.

MICROBIOLOGY

10:00 UG Comparing Culture-Dependent and Culture-Independent Methods in Revealing 16S rDNA Variations in Methanogens from Landfill-Impacted Site

KH106

*Alyssa Balding, Kaleb Thornhill, Kyle Broge, Kai Hung [Eastern Illinois University]

A landfill site has high concentrations of decomposing organic material and low oxygen content at the bottom of the landfill, which provides the right conditions for methanogens. These organisms belong to the Archaea Kingdom and they consume the organic carbons in the oxygen-free environment to produce methane. Management of methane at landfill sites is important because accumulation of methane can destabilize the sites and cause explosions and also a greenhouse gas effect. The Western Lion Landfill next to Riley Creek (near Mattoon, IL) was shut down by the Illinois EPA in 1996 due to improper management. Since leachate can support methanogen growth at the landfill, if leaked to the surrounding, it will probably promote methanogen growth at these sites. To assess the extent of possible seeping of leachate, samples from landfill-impacted site will be analyzed using both culture-independent (DNA extraction from sediment) and culture-dependent approach (DNA extraction from anaerobic culture inoculated using sediment). This comparison is important because assessment of diversity can have very different outcome, especially if the results from the two approaches are different. Following DNA extraction, PCR using primers specific to the 16S rDNA gene of methanogens were carried out. Amplified products are purified and then cloned into pGEM-T vectors and transformants will be selected. Plasmids will be isolated from individual colonies and compared using restriction fragment length polymorphism.

- 10:15 KH106 Grad** **Distribution of Fungi in Arid Microenvironments and their Potential Role on Plant Growth**
 *Cedric Ndinga Muniani, Katrina Sandona, ¹Cheryl Kuski, Andrea Porras-Alfaro [Western Illinois University, ¹Los Alamos National Laboratory]
 In arid ecosystems, fungi form complex microbial communities with plants and other photosynthetic organisms. Many of these fungi are likely to contribute to plant survival, soil protection, and enrichment. However the role and diversity of these fungi are not well known, especially their potential pathogenicity or growth promoting potential that could impact nearby plants. We collected soil and isolated fungi from different microenvironments in the Moab Desert in Utah. The biocrust fungi were isolated from lichen, moss and cyanobacteria, and rhizosphere soils were collected from two plants, *Bromus* and *Hilaria*. Fungi were isolated using a serial dilution technique and sequenced using ITS rDNA region. From the 906 fungi isolated, 609 were sequenced and Ascomycota was the dominant phylum. Pleosporales was the dominant order in BSC and Eurotiales was the dominant order in the rhizosphere. The most dominant genera included *Aspergillus*, *Coniochaeta*, *Embellisia*, *Preussia*, *Cladosporium*, *Chaetomium* and *Penicillium*. Seed germination experiments using dominant taxa were conducted in corn and soybean to determine potential roles of these fungi on plant growth. Heat and drought bioassays will be conducted for the fungi found to be growth promoting or not showing signs of pathogenicity to determine their potential to aid plants under stressful conditions.
- 10:30 KH106 Grad** **Isolation and Molecular Characterization of Heavy Metal Tolerant Fungi from Duke Forest Soil and its Potential Use in Mycoremediation**
 *Terry Torres Cruz, Andrea Porras-Alfaro, ¹Cheryl Kuski [Western Illinois University, ¹Los Alamos National Laboratory]
 The release of heavy metals in the environment has increased continuously due to technological development and industrial activities. The objective of this project is to isolate and identify heavy metal tolerant fungi from Duke Forest soil samples. Samples were collected from Duke Forest in North Carolina from an N-fertilized and an unfertilized quadrant within an ambient CO₂ FACE plot. Serial dilutions of up to 10⁻³ of different horizons (5.4-9.7 cm and 9.7-15 deep) were inoculated on MEA supplemented with streptomycin (0.05 mg/l) and tetracycline (0.05 mg/l) with metal concentrations between 100-1000 ppm of FeSO₄, ZnSO₄, CuSO₄, Al₂(SO₄)₃, Pb(NO₃)₂, Cr(NO₃)₃, NiCl₂, CdCl₂, and K₂Cr₂O₇. Samples were incubated at 25°C. The most common morphotypes for each metal were studied to determine their tolerance index to specific metals. Fungal isolates were sequenced and further analyzed using BLAST and UNITE databases for preliminary identification. A total of 439 isolates were obtained, from which the majority were isolated using the Pb media and fewer from media containing Cr and Al. Out of 363 isolates that have been sequenced a total of 61 unique Operational Taxonomic Units (OTUs) were identified at a 97% minimum similarity as a proxy for species using the ITS rDNA region. The most common and diverse genera isolated are *Penicillium* and *Trichoderma* and their phylogenetic analysis shows that Duke Forest soils contain potential novel species for both genera. Some genera isolated in this study have not been reported or tested as heavy metal tolerant, including *Umbelopsis*, *Pochonia*, *Geomyces*, *Trichocladium*, *Bionectria* and *Ilyonectria*. Four unique OTUs were found for possible new species of *Cryptococcus* and at least 10 OTUs were not identified further than the order level using the ITS rDNA region. Additional markers will be used to resolve the phylogenetic placement of these isolates. Distribution and abundance of metal resistant taxa will be determined using Illumina databases obtained from the soils. This research supports the fact that non-contaminated soils contain a great diversity of microorganisms with potential for bioremediation.
- 10:45 KH106 UG** **Keratinophilic Fungi: Diversity and Abundance in an Arid Grassland in Utah**
 *Paris Hamm, ¹Jayne Belnap, ²Cheryl Kuski, Andrea Porras-Alfaro [Western Illinois University, ¹US Geological Survey, ²Los Alamos National Laboratory]
 Soil fungi in desert ecosystems present adaptations to extreme conditions and thrive under high soil surface temperatures and limited organic matter and water. The diversity and abundance of fungi in these systems including those that can degrade keratin are poorly known. The objective of this project is to document keratinophilic fungi from different biological soil crusts and rhizosphere soils collected in an arid grassland. Soil samples were collected near Castle Valley, UT. Keratinophilic fungi were isolated using different baits including llama and sheep wool, horse hair, and snake skin. Fungi were isolated in Sabouraud Dextrose Agar and Malt Extract Agar for a period of two months. Pure cultures were identified using ITS rRNA sequences. The unique cultures were sequenced using the LSU rRNA region. The culture collection was dominated by the phylum Ascomycota followed by the phylum Zygomycota. The orders Pleosporales, Eurotiales, Mortierellales, and Hypocreales were commonly isolated with dominant taxa represented by *Embellisia*, *Aspergillus*, *Mortierella*, and

Fusarium, respectively. Additional in vitro bioassays will be conducted to confirm the capacity to degrade keratin of these fungi.

PHYSICS, ASTRONOMY, & MATHEMATICS

- 8:15 UG Towards a General Computational Algorithm for Solving Sudoku**
KH105 *Jacob Correa, Aparna Kapale, Kishor Kapale [Western Illinois University]
 The purpose of this research project, is to create a computer program that will solve Sudoku puzzles. The method is derived from J.F. Crook's paper, "A Pencil-and-Paper Algorithm for Solving Sudoku Puzzles", Notices of the AMS 56 (4), 460 (2009). We will combine the intuitive method of solving Sudoku, with the raw power of a computer. Our final goal will be to take the project a step farther, and look into adapting the program to use algorithms based on quantum mechanics to further increase the program's speed and efficiency.
- 8:30 Grad Illinois Student Achievement in Mathematics on Standardized Exams from 2000-2014**
KH105 *Amanda Meiners [Western Illinois University]
 The expectations under NCLB were more advanced than what the previous standards (ILSM) called for. What was perceived as a simple way to help students who were behind catch up to grade level, has made the progressive problems students face in mathematics come into the dramatic spot light. Knowing how we have progressed over the past 14 year's helps educator's better measure their progress as new standards and efforts are implemented in the coming years. This study uses mathematics scores from international tests to examine how students in the United States compare to those from other countries and how those comparisons have changed over the last several years. Scores show in the lower grade levels (3-8) that student's scores appeared to rise, and then have taken several large reductions, due to the changes within the grade levels of testing and new cuts scores. Where as in the upper level, 11th grade, the only level officially tested each year has stayed stagnant with very small changes up and down depending on the year of testing.
- 8:45 UG Investigating Variability of Zeeman Pair Candidates in a Sample of Hydroxyl Masers**
KH105 *Zachary Abbott, Esteban Araya [Western Illinois University]
 Stars form in dense molecular clouds that collapse because of gravity. Magnetic fields play a role in star formation because they generate pressure that slows the collapse of the clouds. To estimate the strength of magnetic fields, we use the detection of Zeeman pairs (the splitting of spectral lines due to the presence of an external magnetic field). In this project, we are studying Zeeman splitting of hydroxyl (OH) masers at 6.035 GHz. Our sample consists of 27 sources from a survey conducted in 2012 using the Arecibo Observatory. We identified four Zeeman pair candidates in the sample. We estimated the strength of the magnetic field in the regions from the observed Zeeman splitting, and explored whether changes in the total intensity of OH radiation are accompanied by changes in the magnitude of the magnetic field (which could be linked to compression of the gas). We found no significant change of the magnetic field strength (Zeeman pair separation) as a function of time during flare events or other variability of the total OH intensity, which indicates that the observed variability is not caused by large changes in the overall magnetic field environment.
- 9:00 UG Study of Optical Band Gap in Lead Borate Glasses Containing CdSe Nanoparticles**
KH105 *Nicholas Breslin, Saisudha Mallur, P.K. Babu [Western Illinois University]
 Studying the variation of the optical band gap with composition in glasses gives information about the structure and electronic properties. Glasses containing nanoparticles are interesting due to their fundamental importance in mesoscopic physics and potential for technological applications. We studied lead borate glasses with the composition $x\text{PbO}:(100-x)\text{B}_2\text{O}_3:1\text{CdSe}$ varying x between 29-69 mol% (increments of 10%). Glasses were prepared using the melt-quench method. Starting materials were melted at 1000°C, the melt was poured onto a brass plate. Glass pieces from this quenching process were annealed for one hour at 400°C. Annealed glass pieces were then polished. Sample density was determined by Archimedes' method using xylene. Refractive index values were found by the Brewster angle method. When the Brewster angle (θ) is reached, p-polarized light will be at minimum intensity. We measured the fractional intensity of p-polarized light as a function of angle of incidence finding the minimum using a parabolic fit in Origin. Refractive index n was then calculated using $n = \sqrt{\frac{\tan^2(\theta) + 1}{\tan^2(\theta) - 1}}$. Optical absorption measurements were carried out using an absorption spectrometer. The optical band-gaps were determined from absorption edge data using the Mott-Davis model. The optical band-gap values

show unusual variation with PbO content compared to the binary system. In binary lead borate glasses, the absorption edge is due to direct forbidden transition. Systems with CdSe nanoparticles initially show indirect forbidden transition and with higher PbO content, change to indirect allowed transition.

9:15 Grad Quantum Error Correction via Weak Measurements

KH105

***Timothy Woodworth [Western Illinois University]**

It is difficult to isolate a quantum system from its surroundings. The environment is always interacting with and changing the time evolution of a quantum system. This leads to the loss of information contained in the quantum system, and it introduces errors in quantum information processing tasks that are difficult to correct. To minimize the loss of information content of a quantum system, we try to stabilize and correct the system to be as close to an isolated system as possible. It is well-known that even a single measurement carried out on a quantum system changes it irreversibly. However, there is a class of quantum measurements called weak measurements that give minimal information about the state of a quantum system that does not change it significantly. Therefore, interrogating a quantum system with weak measurements could allow us to perform information processing operation without having to stop to correct the loss of information or errors caused by the interaction with the environment. In this presentation, I will discuss general implementation of weak measurement based strategies for quantum error correction and will offer a few examples.

9:30 Grad Tunnel Diode Resonator Studies of the Ferromagnetic Superconductor Y_9Co_7

KH105

***Jerold Young, Ryan Gordon [Western Illinois University]**

The ac magnetic susceptibility of a crystalline sample of the compound Y_9Co_7 has been measured in applied dc fields ranging from 0 - 6.7 kOe by utilizing a tunnel diode resonator circuit. In agreement with previous measurements on this material, a superconducting transition has been observed to occur at $TSC \approx 2.5$ K. A broad maximum has been observed in the zero field susceptibility measurements from $2.5 \text{ K} < T < 8 \text{ K}$ and its behavior with applied dc magnetic fields is consistent with that of the itinerant ferromagnet $ZrZn_2$, which supports previous claims of itinerant ferromagnetism in this compound. The susceptibility has also been measured as a function of applied magnetic field and the results indicate that the actual Curie temperature for this system is higher than that suggested by previous reports based on Arrot plots, which were constructed from dc magnetization.

9:45 Grad Optical Properties of Sm^{3+} Er^{3+} and HO^{3+} Doped Lead Borate Glasses

KH105

***William Heidorn, Saisudha Mallur, P.K. Babu [Western Illinois University]**

Rare earth(RE) doped lead borate glasses exhibit a compositional dependence in their optical properties due to the changing short order structure of the base glass with increasing lead oxide content. A series of lead borate glasses with the composition $xPbO:(99.5 - x)B_2O_3$ ($x = 29.5$ to 69.5 in steps of 10 mol%) doped with 0.5 mol% Sm_2O_3 , Er_2O_3 , and HO_2O_3 were prepared using the melt quench technique followed by 3 hours of annealing near the glass transition temperature. Optical absorption and fluorescence spectra of these RE doped lead borate glasses were analyzed using Judd-Ofelt theory. The compositional dependence of Judd-Ofelt intensity parameters, Ω_t ($t = 2, 4, 6$), were determined. The intensity parameters were then used to calculate the radiative transition probability of the excited states and the total radiative transition probability of the glasses. From the fluorescence spectra the stimulated emission cross section, branching ratios and radiative lifetime of the excited states were calculated as a function of glass composition.

SCIENCE, MATH, & TECHNOLOGY EDUCATION

8:30 A Change Long Overdue: Moving the Statistics Curriculum from a Classical Frequentist to a Bayesian Approach

KH103

***Anna Valeva [Western Illinois University]**

This paper argues in support of the idea to move the focus of the Statistics curriculum from the classical frequentist to a Bayesian approach. There has been very little change in the way Statistics has been taught at the undergraduate level over the last decades, despite the tremendous advances in computing technology which have made it possible for Bayesian inference to become mainstream in data-based decision making. Even before computing power became ubiquitous, Bayes' rule was behind breaking the Enigma code, the Kalman filter, public

health policy practice, investment decisions in asymmetric information environment, to name a few of the many applied problems which would have otherwise been impossible to solve. Nowadays, Bayesian inference produces the most accurate and usable predictions for the behavior of complex systems, and is the only tool which makes meta-analysis of multiple independent studies on a particular question feasible. It is time to provide students with the knowledge necessary to understand a crucial aspect of contemporary decision making, especially given the fact that user-friendly software tools allow us to do that without relying on stronger quantitative background than the one already required for the traditional Statistics courses taught to majors in almost all disciplines.

8:45
KH103

Mu Sigma Pi, Pre-Health Professional Club/Organization Engaging Students with Seniors and Special Needs Individuals

*John Lloyd [Aurora University]

Mu Sigma Pi, is a club/organization that promotes all aspects of health (physical, mental, and spiritual) throughout the community and especially interacts with senior citizens and individuals with physical and cognitive disabilities. In the near future, health care providers will be interacting with an aged population. On average, Americans are living longer and the "baby boomers" are quickly approaching their "golden" years. Usually with the aging of the human body comes chronic diseases like arthritis, COPD, heart and circulatory disorders and dementia which will require continuous services from all types of health care personnel. Pre-Health Professional students should be knowledgeable about the aging process and the interpersonal dynamics of seniors and their families. With that in mind, members organize and implement various holiday celebrations throughout the year at local long term care facilities. In reference to special needs, members provide activities for individuals on campus similar to "Best Buddies" where everyone is involved and having fun. In March is the annual "Hoops for Hope" where members, faculty, and staff play a basketball game between the local Hope D. Wall Special Needs School "Rockets." In addition, members invite students from Hope D. Wall to attend the fall and spring theater plays. In regards of promoting health, Mu Sigma Pi had the first annual 3K Walk for Stress Management and Mental Well-Being this past fall, 2014.

9:00
KH103

Progress Report for the Robert Noyce Scholarship Program at Southern Illinois University Edwardsville

*Jessica Krim, Sharon Locke, Kelly Barry, Sue Wiediger [Southern Illinois University Edwardsville]

This NSF award will provide \$11,500 scholarships and \$2,500 internships for the recruitment and mentorship of future STEM field teachers in high-needs schools for five years. The interview process in Spring 2014 led to the selection of ten interns and nine scholars for the 2014-2015 academic year. This presentation will showcase the first year achievements and goals for program development. The foundation for our specialized curriculum, a self-efficacy framework for teacher preparation, will frame the presenter's talking points.

ZOOLOGY

Note that 2 concurrent rooms are being used

8:15
KH305

Grad Evaluating Ground Beetle Species Richness and Community Composition Across a Chronosequence of Restored Prairies at Nachusa Grasslands in Northern Illinois

*Katie LaMagdeleine, Kenneth McCravy, ¹Nick Barber [Western Illinois University, ¹Northern Illinois University]

Restoration ecology has become a leading discipline because of the widespread damage associated with anthropogenic alteration of natural habitats. To effectively evaluate the success of prairie restoration efforts, a better understanding of the effects of restoration on organisms that provide important ecosystem services is required. Ground beetles comprise a highly diverse and ecologically important family that includes predators of invertebrates as well as seeds. Many species of ground beetles also act as bioindicators of habitat alteration and disturbance, as they are closely tied to their environments. Their distribution is often affected by soil type, vegetative cover and microclimate. We are determining if and how ground beetle species richness and community composition shifts over time following prairie restoration at Nachusa Grasslands, a Nature Conservancy site in north-central Illinois. We collected ground beetles from April through October of 2013 using pitfall traps across a chronosequence of prairie habitats, ranging from 0 to 26 years since initial restoration. Ground beetle species richness, abundance, and diversity are being analyzed using linear models to determine if

there are any patterns in community composition over time.

- 8:30 KH305 Grad A Taxonomic Investigation of a Southern Illinois Cave-Snail of the Family Physidae**
 *Michelle Golz, Charles Lydeard, ¹Bob Weck, ²Steve Taylor [Western Illinois University, ¹Southwestern Illinois College, ²Illinois Natural History Survey]
 Physidae is an abundant family of freshwater snails commonly found in North America (Wethington and Lydeard, 2007). Despite this, Physidae is currently in a state of taxonomic confusion. Research suggests that species richness is over-estimated due to the high degree of phenotypic plasticity found in these snails (Wethington and Lydeard, 2007; Gustafson, 2014). While previous record relied on shell morphology for taxonomic classification, research suggests that many of these differences were the result of ecophenotypic variation rather than true genetic difference. The Sinkhole Plains Karst system (SPHK) is a group of karsts and related features found in southern Illinois. Surveys of invertebrate fauna suggest that a species of physid is an obligate cave inhabitant in this area (Lewis, et al., 2003). There is no current taxonomic classification available for the physid in these caves. It is unclear whether the snail is a surface specimen, washed into caves by storm water, or a permanent inhabitant adapted to life in the caves. Our research surveyed three geographically distinct regions of SPHK and collected 120 snails from caves, springs, and sinkhole ponds. DNA was extracted and sequenced for the ITS-1, ITS-2, and COI gene regions and the sequences were used to construct phylogenetic trees comparing the SPHK specimens to other physid species. In addition, the geographic trends observed in regard to individual morphotypes was documented.
- 8:45 KH305 UG Thermally-Dependent Color Change and Stress Physiology in Green Anoles (*Anolis carolinensis*)**
 *Spencer Hudson, Marianne Robertson, Travis Wilcoxon [Millikin University] **DID NOT PRESENT**
 Color is important for signaling, camouflage, and thermoregulation in many species. The costs and benefits of coloration can vary under different scenarios, increasing fitness under some conditions but decreasing it under others. Some animals are able to resolve these conflicts by changing color. Color change can increase fitness by maintaining crypsis across variable environments, by minimizing costs associated with signaling, and by aiding thermoregulation when environmental conditions change. The green anole lizard, *Anolis carolinensis*, can undergo rapid changes in skin color from bright green to dark brown. Color is associated with social status in this species, but may be important in facilitating thermoregulation as well. In this study, we examined the effects of temperature fluctuations on eliciting a stress response and color change in male green anoles. We subjected each experimental lizard to multiple temperature treatments throughout consecutive weeks, with individual body temperatures tested at cooler temperatures and subsequently with warmer temperatures. We used scaled metrics to determine body coloration and collected fecal samples to analyze corticosterone levels. We hypothesized that during cooler temperatures, individuals will have lower body temperatures, browner coloration, and higher stress levels. During hotter temperatures, we hypothesized that individuals will have higher body temperatures, greener coloration, and lower stress levels. Results may reveal a relationship between social status, stress levels, and thermally dependent performance.
- 9:00 KH305 Grad Structure and Position of Male Genitalia Morphology During Copulation in *Anastrepha suspensa* (Diptera: Tephritidae)**
 *Taylor Inboden [Eastern Illinois University] **DID NOT PRESENT**
Anastrepha suspensa is an important pest species of fruiticulture and may be controlled by disrupting fertile copulations using released sterile males. During copulation, males transfer sperm, as well as protein rich fluids, through an aedeagus and distiphallus; the female store these fluids and sperm in three separate spermathecae and one ventral receptacle. Sexual selection theory predicts that this complexity of the female reproductive tract is an evolutionary response to male mechanisms that attempt to influence paternity outcomes in multiply mated females. The purpose of this study was to elucidate the functional morphology of the aedeagus, particularly the distiphallus, in delivering male fluids and sperm to female sperm storage organs. The functional morphology of male structures was inferred through microscopy. Pairs of copulating flies were frozen at 5min (n=12), 10min (n=21), and 15min (n=3). The females' reproductive tract including the male genitalia, were dissected in situ and photographed under a stereoscope at 100x magnification to reveal the placement of the male genitalia in reference to the female's reproductive tract. Unlike previous studies, male genitalia were not closely juxtaposed with entry points to the sites of sperm storage. The male genitalia were found positioned short of the female sperm storage sites, which is not congruent with previous studies. Scanning electron microscopy (SEM) was also used to elucidate the morphology of the aedeagus and distiphallus. The SEM images showed bifurcation in the

distiphallus, which enables sperm transfer to be directed by the males. Through the results of this study, evidence for intersexual competition at play within this species can be seen.

- 9:15 KH305 Grad Overwintering Strategies of the Mountain Tailed Frog, *Ascaphus montanus***
 *Lawrence Werner, Richard Essner, Jason Williams [Southern Illinois University Edwardsville]
 The Rocky Mountain Tailed Frog, *Ascaphus montanus* is a cryophile that is associated with permanent mountain streams in the northwestern United States and Canada. Adults overwinter in these cold, fast moving streams, which requires surviving extended bouts of subzero temperatures. The purpose of this study was to determine if these frogs can tolerate winter conditions found in mountain streams by either surviving internal ice formation or avoiding freezing by resisting ice inoculation and supercooling. Winter acclimated frogs cooled from 2°C at 0.2°C h⁻¹ had relatively low supercooling points compared to other frog species (-5.0 ± 0.1°C; n=3). To test their ability to remain supercooled and/or resist inoculative freezing, two additional groups were cooled at the above rate until reaching and being held at -1°C. Frogs maintained at -1°C in the absence of ice were able to maintain a supercooled state prior to freezing for considerably longer than most other freeze tolerant species of frogs (73 ± 22 h; n=4). Similar to other frogs, *A. montanus* did not resist inoculative freezing well. Frogs cooled to and maintained at -1°C froze within 30 minutes (16.1 ± 4.6 min; n=4), following addition of a 500mg piece of ice to their skin. After the last frog froze in the supercooling point determination trial or after being held at -1°C for seven days, all frogs were warmed at 0.2°C h⁻¹ until reaching 2°C prior to assessing survival. No frogs survived the supercooling point trials or after being frozen by ice inoculation. However, two of the four frogs that were held at -1°C in the absence of ice survived supercooling for ~2 days followed by being frozen for ~5 days. In sum, *A. montanus* may be able to survive the high sub-zero temperatures found in montane streams during winter by either supercooling and/or surviving mild freezing.
- 9:30 KH305 Grad Genome Wide SNP Analysis and Morphometric Analysis of the Black Spotted Topminnow Across the River Continuum**
 *Eric Westhafer, David Duvernell [Southern Illinois University Edwardsville]
 The black spotted topminnow, *Fundulus olivaceus*, exhibits a broad distribution ranging from southeastern Texas to central Missouri. The distribution makes *F. olivaceus* an excellent model for studying population dynamics across heterogeneous habitats and environmental gradients. We sampled headwater and large river environments in the Gasconade and Meramec Rivers in Missouri to assess the impacts of genetic drift, and possibly natural selection at the local population level. Genetic analysis was conducted by sampling single nucleotide polymorphisms (SNPs) using the genotype by sequencing (GBS) method. The data set included 248 individuals sampled from two headwater and two large river habitats in each drainage. Genetic structure was more evident in the Gasconade River with 15% of the variation distributed among populations, compared to 6.5% of the variation in the Meramec River. A principle component analysis (PCA) separated drainages along the first axis and each of the four headwater populations along axes two through 5. The genetic distinctiveness of the headwater populations was also demonstrated in a STRUCTURE analysis. The distribution of genetic variation is consistent with accelerated genetic drift in the headwater populations relative to the large river populations. Next, we utilized geometric morphometric techniques to compare size and shape independent of one another across habitat types. Using relative warp scores, a PCA was used on the first four principle components which accounted for ~65% of the variation. We found statistically significant results describing sexual dimorphism (37%), body depth (12%), tail length (8%), and pelvic fin placement (7%) across the first four principle components respectively. Principle components 2 & 3 showed significant differences between drainages. Individuals in headwater habitats exhibited a larger overall centroid size than large river individuals.
- 9:45 KH305 Grad A Nationwide Evaluation of the Hacking Technique for Ospreys**
 *April Simnor, Tih-Fen Ting [University of Illinois Springfield]
 Ospreys (*Pandion haliaetus*) are large fish-eating raptors associated with coastal and riverine ecosystems. They are considered a conservation success story because osprey population increase and range expansion have occurred since the banning of dichloro-diphenyl-trichloroethane (DDT) and other persistent organochlorine pesticides, and recovery efforts such as hacking. Though states have been hacking ospreys since 1979, no formal evaluation of the effectiveness of the hacking technique has been conducted. This study identified and reviewed the hacking programs that were established by the 20 states that have previously hacked or are currently hacking ospreys in the United States. Questionnaires sent to practitioners that were/are involved in hacking programs indicated that most hacking programs were successful to some degree. Success was evaluated at three tiers: (1)

hacked birds returned to establish successful nests, (2) project goals were met, and (3) the establishment of a self-sustaining breeding population as of 2014. Number of birds hacked and hacking years, biased selection in favor of males, and site selection were chosen as the most important aspects that contribute to the success of a hacking program. As of 2014, 1851 osprey chicks have been hacked. However, this number is expected to increase because Illinois and Iowa still have active hacking programs. Results from this study are to be used to assist reintroduction practitioners in assessing their own hacking programs and provide recommendations to currently active hacking programs, such as Illinois.

10:15
KH305

Activation of AMP-Activated Protein Kinase in Response to Temperature Elevation Shows Seasonal Variation in the Zebra Mussel, *Dreissena polymorpha*

*Jennifer Jost, Sarah Keshwani, Jacob Abou-Hanna [Bradley University]

Global climate change is affecting ectothermic species, and a variety of studies are needed on thermal tolerances, especially from cellular and physiological perspectives. This study utilized AMP-activated protein kinase (AMPK), a key regulator of cellular energy levels, to examine the effects of high water temperatures on zebra mussel (*Dreissena polymorpha*) physiology. During heating, AMPK activity increased as water temperature increased to a point, and maximum AMPK activity was detected at high, but sublethal, water temperatures. This pattern varied with season, suggesting that cellular mechanisms of seasonal thermal acclimatization affect basic metabolic processes during sublethal heat stress. There was a greater seasonal variation in the water temperature at which maximum AMPK activity was measured than in lethal water temperature. Furthermore, baseline AMPK activity varied significantly across seasons, most likely reflecting altered metabolic states during times of growth and reproduction. In addition, when summer-collected mussels were lab-acclimated to winter and spring water temperatures, patterns of heat stress mirrored those of field-collected animals. These data suggest that water temperature is the main driver of the seasonal variation in physiology. This study concluded that AMPK activity, which reflects changes in energy supply and demand during heat stress, can serve as a sensitive and early indicator of temperature stress in mussels.

10:15 UG
KH306

Fecundity and Growth Rates of *Physa acuta* (Gastropoda) Under Cave and Surface Conditions

*Stephanie Mafla-Mills, ¹Bob Weck [University of Missouri St. Louis, ¹Southwestern Illinois College]

Caves in the sinkhole plain karst of Southwestern Illinois support a diverse spectrum of organisms ranging from troglobites, (obligate cave-adapted species which tend to be globally rare, threatened and endangered), to troglophiles (can reproduce in caves but are also found in surface habitats), and occasional accidentals. Nutrient enrichment of the karst groundwater in this area has created the potential for troglophilic and epigean aquatic species to outcompete troglobitic species in caves. Bioinventories of the southwestern Illinois caves (e.g. J. Lewis, et al., 2003) show widespread occurrence of physid snails whose taxonomic relationships and life histories in caves are essentially unknown. The Stemler Cave physid population has recently been identified as *Physa acuta*, a known invasive species. We conducted experiments comparing growth rates and fecundity of Stemler Cave *Physa acuta* reared under simulated cave and simulated surface conditions, using nutrient-poor well water and nutrient-rich cave water. Average egg production rates by parent snails differ dramatically between surface and cave conditions (23.06 eggs/female/day under surface conditions; 3.97 eggs/female/day under cave conditions). Hatchling snails reared under surface conditions had higher growth rates than snails reared under cave conditions and snails reared in cave water had higher growth rates than snails reared in well water. Surface treatment snails raised in cave water had the overall highest growth rate (0.181mm/day), while cave treatment snails raised in well water had the lowest average growth rate (0.118mm/day). Surface treatment snails reared in cave water were the first to reach sexual maturity, producing viable embryos 32 days post-hatching. This study provides life history data that should help assess the potential for *Physa acuta* to compete with the state endangered Enigmatic cavesnail (*Fontigens antroecetes*) in Stemler Cave.

10:30 Grad
KH305

Assessing Presence and Local Habitat Connectivity of Franklin's Ground Squirrels (*Poliocitellus franklinii*) with Track Tubes and Camera Traps in Central Illinois

*Melissa Breyer, Tih-Fen Ting [University of Illinois Springfield]

Populations of the Franklin's ground squirrel have decreased throughout the Midwestern United States. The Franklin's ground squirrel is a state-threatened species in Illinois and its geographical distribution is sparse. The secretive nature of Franklin's ground squirrel makes its detection more difficult compared to other ground squirrel species. For the recovery of this species, a better understanding of its statewide distribution is needed. However, use of live-trapping for detection is laborious and relatively costly. A less labor-intensive, but still

reliable, means of detecting Franklin's ground squirrel would be ideal for surveying a widespread area for its presence. Right-of-ways in Sangamon County and a small portion of Christian County were surveyed in this study. The purpose of this study was to determine which areas Franklin's ground squirrels might inhabit by using alternative detection methods. We utilized track-tube sampling and camera trapping, two non-invasive techniques, to collect presence/absence data. Occupancy modeling was used to estimate site occupancy and detection probabilities while ArcGIS was used to analyze Nearest-Neighbor metrics. Franklin's ground squirrels were detected at 2 of 14 sites (naive occupancy = 14.3%) during the May - September field season of 2014. Through occupancy modeling, track-tube sampling was estimated to have a slightly higher detection probability than camera trapping. The average distance between habitat patches was 4.41 km, with only 3 of 12 sites in Sangamon County within the likely dispersal threshold distance of existing populations. The study results suggest a low likelihood that individuals dispersing from the source population could reach all habitat patches in the study area and that alternative non-invasive techniques are applicable for detecting Franklin's ground squirrels.

10:30
KH306

Conquering the World in Leaps and Bounds: Hopping Locomotion in Toads is Actually Bounding

*Richard Essner, ¹Stephen Reilly, ¹Stephane Montuelie, ²Arndre Schmidt, ¹Emily Naylor, ³Michael Jorgensen, ⁴Lewis Halsey [Southern Illinois University Edwardsville, ¹Ohio University, ²Orthopedic University Hospital Friedrichsheim, ³University of Missouri Columbia, ⁴University of Roehampton] While most frogs maximize jump distance as an escape behavior, toads have traded jump distance for endurance with a strategy of hopping repeatedly. This strategy has enabled toads to expand across the continents as one of the most diverse groups of anurans. Multiple studies have revealed physiological endurance adaptations for sustained hopping in toads, however, the kinematics of their sequential hopping behavior, per se, has not been studied. We compared kinematics and forces of single hops and multiple hopping sequences and quantified field performance of hopping behaviors in free ranging toads of three species and discovered a novel aspect of locomotion adaptation that adds another facet to their exceptional terrestrial locomotor abilities. We found that bouts of repeated hopping are actually a series of bounding strides where toads rotate on their hands and then land on their extended their feet and jump again without stopping. In addition, free-ranging toads appear to use bounding locomotion more frequently than single hops. Bounding in toads has the advantage of maintaining velocity and producing longer jump distances. In comparison to single hops, cyclic bounding steps reduce energy expenditure and appear to provide limb loading dynamics better suited for potential cycling of elastic energy from stride to stride than would be possible with repeated single hops. This is the first case of the common use of a bounding gait outside of mammals. Bounding adds a key terrestrial locomotor trait to the toad's phenotype that may help explain their history of global expansion and the challenges to modern faunas as introduced toads rapidly invade new ecosystems today.

10:45
KH305

Thyroid Hormone Status Affects Arsenite-Induced Oxidative Stress in Zebrafish

*Christopher Theodorakis, Satya Nagam, Mohammed Afzaal Nadeem [Southern Illinois University Edwardsville]

It is well known that arsenic can induce oxidative stress in fish. It is also known that thyroid hormone status affects susceptibility to oxidative stress. However, the effect of thyroid hormone status on pollutant-induced oxidative stress is unknown. This is significant, because such knowledge would help to assess the risk of xenobiotics such as arsenate, a prevalent contaminant in the environment. In order to address this, we used zebrafish (*Danio rerio*). One of the key defenses against oxidative stress is glutathione (GSH), and one of the main effects of oxidative stress in cells is lipid peroxidation. Therefore, GSH concentrations, GSSG/GSH ratios, and lipid peroxidation (TBARS) were used to assess the effect of arsenic, perchlorate and thyroxine (T4) on zebrafish (*Danio rerio*) liver, gills, and muscle tissue. Arsenite was found to cause oxidative stress as reflected by GSH levels, GSSG/GSH levels, and lipid peroxidation (TBARS). Although hypothyroidism caused by perchlorate did not cause any major difference on oxidative stress, hyperthyroidism caused by treating the fish with T4 enhanced GSH levels. This indicates that thyroxine is involved in response to oxidative stress. In addition, perchlorate abrogated or reversed the effects of arsenite on oxidative stress parameters. These results support the hypotheses that thyroid hormones modulate oxidative stress in general, and arsenite-mediated oxidative stress in particular.

11:45
KH306

Building a Better Bunny: Plio-Pleistocene Evolutionary History of the Marsh Rabbit

*Dennis Ruez [University of Illinois Springfield]

The early Pleistocene Inglis 1C fauna (Citrus County, Florida) contains thousands of fossils representing the extinct rabbit, *Sylvilagus webbi*. Because this collection contains mostly specimens from immature individuals, study of the teeth involved both the occlusal and bottom (basal) surfaces. While the occlusal views depict patterns at various ontogenetic stages, the bottom surfaces show the pattern that would be present in adult individuals. The study of teeth from both immature and adult individual allowed for a depiction of the ontogenetic changes undergone in the lower third premolars (p3) of *S. webbi*. Very young individuals have a complete separation of the posterior and anterior sections of the p3 occlusal surface. A lingual wall of enamel forms later, connecting the sections. This connection widens and encloses dentine (as in adults) prior to the development of multiple anterior reentrants. The last feature to appear is the crenulation within the posterior external reentrant. This ontogenetic series coupled with hundreds of p3s representing fossil marsh rabbits from 27 localities in Arizona, California, Florida, Georgia, and Texas, yields an evolutionary scenario for marsh rabbits. As *Sylvilagus hibbardi* dispersed from the arid southwestern U.S. into the southeast, populations increased in size and the complexity of the enamel folding via peramorphosis, resulting in a new species, *S. webbi*. The two taxa were contemporaries for several hundred thousand years. *Sylvilagus webbi* evolved anagenetically into *S. palustris*, the likely ancestor of *S. aquaticus* and *S. palustrellus*.

11:00 UG
KH305

Estimation of the White-Tailed Deer Population on SIUE Campus Using Three Different Census Methods

*Aaron Alexander, Richard Essner, Peter Minchin [Southern Illinois University Edwardsville]

White-tailed deer (*Odocoileus virginianus*) play a major role in shaping the ecosystems in which they occur. Over-browsing by a large deer population can cause major changes in abundance or local extinction of understory species and prevent effective regeneration of trees. The Southern Illinois University Edwardsville (SIUE) Nature Preserve includes Sweet William Woods and a corridor that provides connectivity to Bohm Woods State Nature Preserve, adjacent to campus, the highest-quality remnant of oak-hickory forest in the region. A knowledge of the current population density of white-tailed deer is essential for effective management of the SIUE Nature Preserve. This research provides the first quantitative estimate of the deer population on campus using three census methods (spotlight counts, line transects, and scat surveys). The spotlight counts were conducted along a defined route through campus, recording both number and sex of the observed deer. Several 250-m line transects were randomly placed into each of the four main forest areas on campus and walked for both live deer numbers and for scat groupings. Density calculations were performed on each data set to help establish an average deer population density for the campus. Though data collection and analysis is still in progress, preliminary results show an average of 0.71 deer per ha. Management efforts such as harvesting or relocation may be undertaken in the SIUE Nature Preserve if results show an excessive deer population residing on campus.

11:00
KH306

Tree Cavity Availability in a Highly Urban Area

*Jalene LaMontagne, ^{1,2}R.Julia Kilgour, Elsa Anderson, ¹Seth Magle [DePaul University, ¹Lincoln Park Zoo, ²University of Guelph]

Tree cavities are used by a wide variety of species for nesting, food storage, and cover. Most studies on cavity availability have been conducted in forests, and little is known about tree cavity availability in urban areas. With urbanization, species that excavate cavities may be less abundant, natural tree-decay processes are managed, and tree densities are reduced, all of which may influence tree-cavity availability. We investigated three questions: 1) What is the prevalence of tree cavities in different habitats in the Chicago area? 2) How do the characteristics of natural and woodpecker-excavated cavities and cavity-trees differ across habitats? 3) How does the urban landscape influence the prevalence of tree cavities? We tested the capacity for large urban parks and residential areas to provide tree cavities at levels similar to forested areas. We surveyed 1545 trees in these three habitats for excavated and natural (caused by decay) cavities. Cavities were most available in forests, where the density of trees was highest. We found that a similar proportion of trees in forests and parks had excavated cavities, but excavated cavities were rare in residential areas. Trees containing cavities were larger than control trees and had more decay, and excavated cavities were in larger trees with more decay than natural cavity trees. Canopy cover was the main landscape variable influencing excavated cavity availability. Our results suggest that the prevalence of tree cavities may not be a limiting factor for urban wildlife, however that is contingent on the levels of use of natural cavities, which is currently unknown.

- 11:15 KH306** **Grad** **Dispersal and Survival of Franklin's Ground Squirrels (*Poliocitellus Franklinii*) Along Linear Habitats**
 *Jennifer Pendleton, Tih-Fen Ting [University of Illinois Springfield]
 Successful dispersal between suitable habitats by juveniles and adults is crucial to individual fitness and population persistence in fragmented landscapes. Due to habitat loss and fragmentation, Franklin's ground squirrel (*Poliocitellus franklinii*), an Illinois state-threatened species, is often found along restricted linear habitats in agriculture-dominated landscapes. In 2013 and 2014, we radio-tracked 18 juveniles equipped with radio-collars from two colonies of *P. franklinii* in two separate locations along an abandoned railroad corridor in Sangamon County, Illinois. The colony in the north has a 70-acre restored prairie nearby the corridor while the colony in the south has no grassland reserve in the vicinity. Our goals were to: 1) determine juvenile dispersal patterns along linear habitat; 2) identify specific habitat barriers to dispersal; and 3) quantify juvenile predation and over-winter survival. The average Euclidean dispersal distance was 7.40 km for juvenile males (n = 2) from the southern colony and 1.42 km for juvenile males (n = 6) in the north. Barriers to dispersal included: residential areas, high-traffic roads, creeks, and large tracts of low-cut turf grass. No collared individuals were observed dispersing along the corridor. Of the 18 collared squirrels, predation accounted for 12 mortalities (67%). Predation rates did not differ between dispersers and non-dispersers. Predation was the primary factor influencing survival with 92% of all mortality events (n=13) resulting from predation.

ACKNOWLEDGEMENTS

A great many people have contributed to the planning of the 2015 Annual Meeting of the Illinois State Academy of Science. We are extremely grateful for everyone's contributions to the planning of this conference.

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There are many faculty and staff at Western Illinois University who helped in the preparation for this conference. We thank Gilles Kouassi, who helped in the initial planning of the Annual Meeting. We thank Dennis DeVolder, Director of the School of Computer Sciences, Tom Erikson, former Dean of the College of Business and Technology (CBT), Kathleen Neumann, Associate Provost and Interim Dean of the College of Business and Technology, Susan Martinelli-Fernandez, Dean of the College of Arts and Sciences, and Rose McConnell, Chair of the Department of Chemistry, for their support. We thank Barb Arvin, CBT Instructional Technology Systems Manager, for her help in promoting this conference. We thank all the other WIU faculty, staff, and students, including all the on-site volunteers, who have worked hard to make this Annual Meeting a huge success.

We thank all the ISAS Councilors. They are extremely dedicated to furthering science research and education in Illinois. We thank the ISAS Division Chairs for the reviewing of abstracts, and for moderating oral presentation sessions. We thank Gary Bulla from EIU for his help with easels and poster-boards.

David Horn, from Millikin University, is the President of the ISAS. He has gone above and beyond during his term as President, including his continual support and encouragement in all areas of the ISAS. Robyn Myers is the Executive Secretary of the ISAS. She keeps everything running smoothly at all times, especially with our Annual Meetings. Tere North is the ISAS Webmaster. Tere has done a tremendous amount of work in preparation for our Annual Meeting, including preparing the Supplement to the Transactions for the Annual Meeting, and ensuring that the abstract submission and registration processes ran smoothly. Tere also served as the Editor of the Transactions of the Illinois State Academy of Science for 25 years! Thank you David, Robyn, and Tere!

We thank Professor Victor Jongeneel, for his Keynote Address, *Biology Meets Big Data: High-Throughput Computing for Genomics and Beyond*.

We thank all the presenters, research coauthors, research mentors, and attendees.

Thank you to everyone for making the 2015 Annual Meeting a huge success! Sincerely,

Jim McQuillan,
Vice President, 2015 Annual Meeting.