

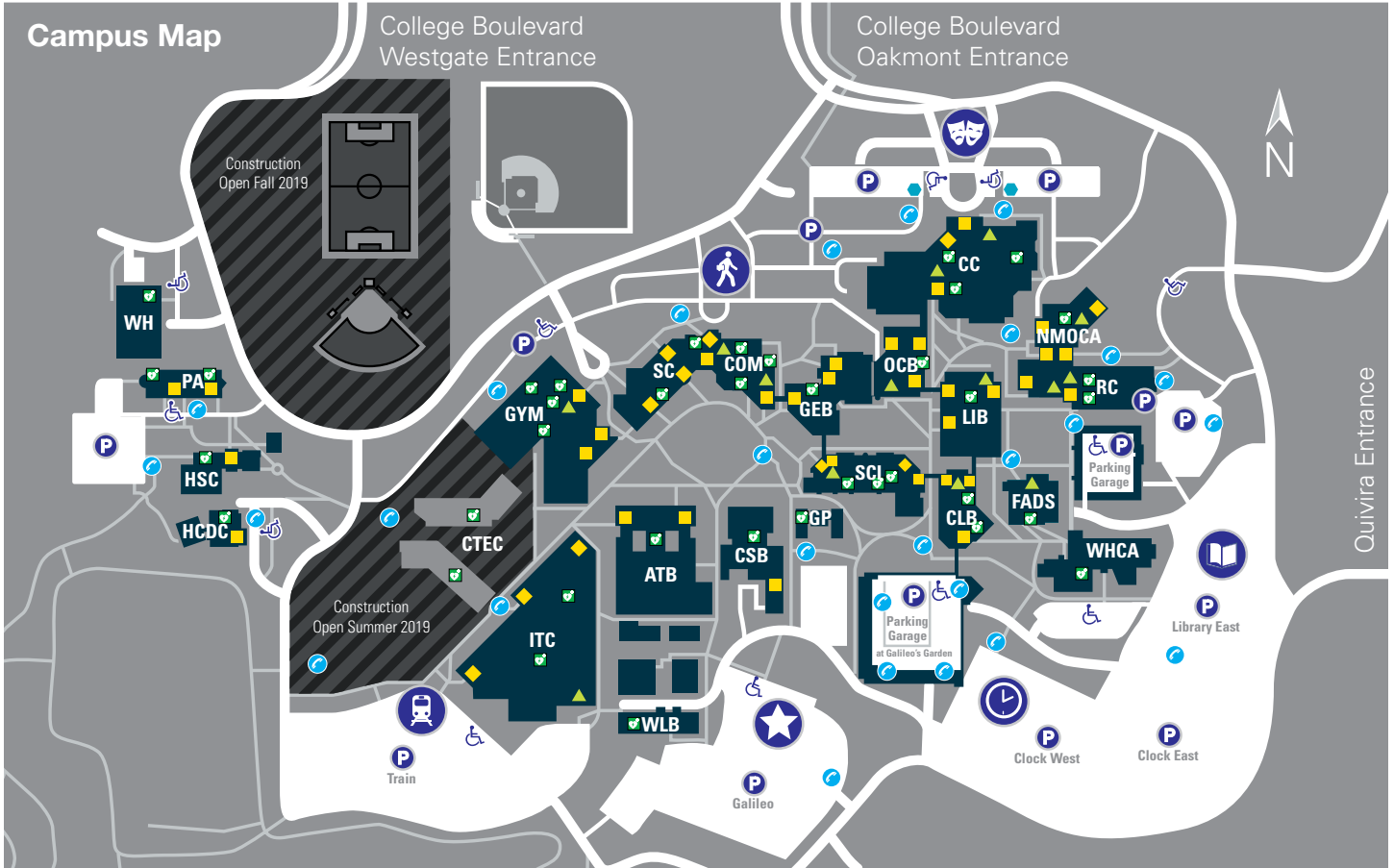


**151<sup>st</sup> Kansas Academy of Science  
and the  
95<sup>th</sup> Kansas Entomological Society  
Joint Annual Meeting Program**

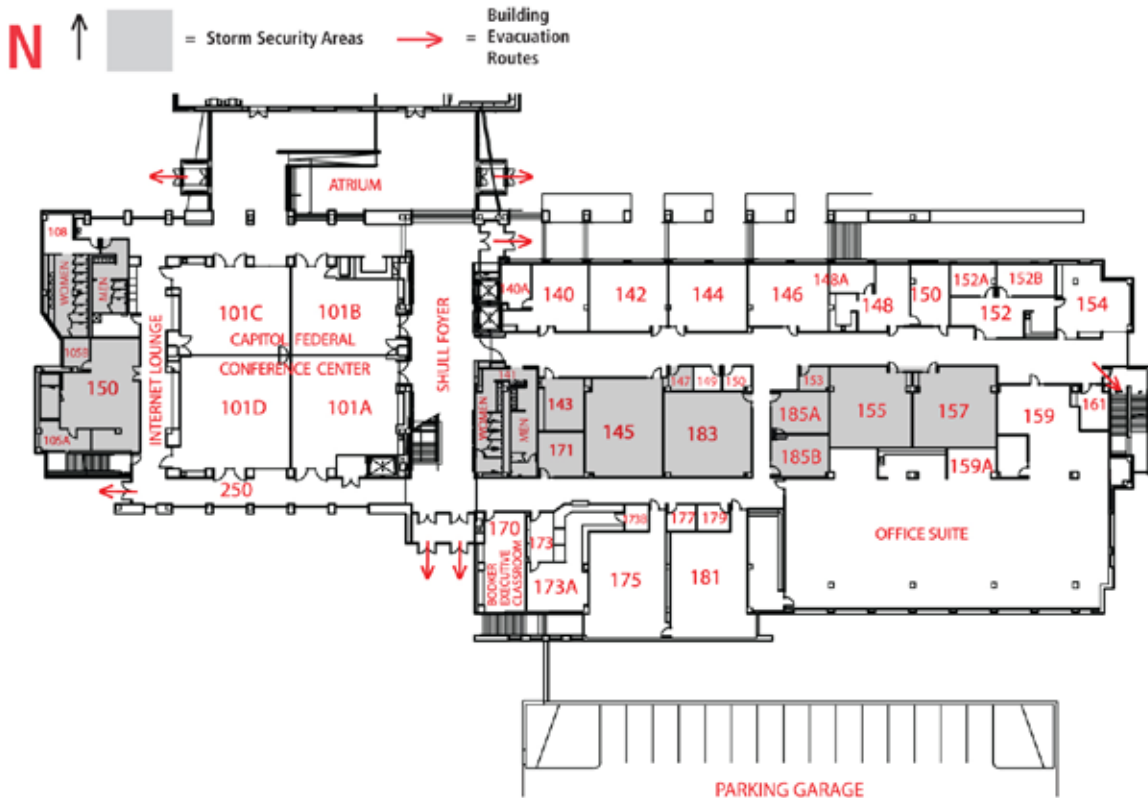


**March 29-30, 2019  
Johnson County Community College**

# JCCC MAPS



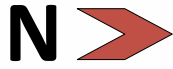
## RC, First Floor



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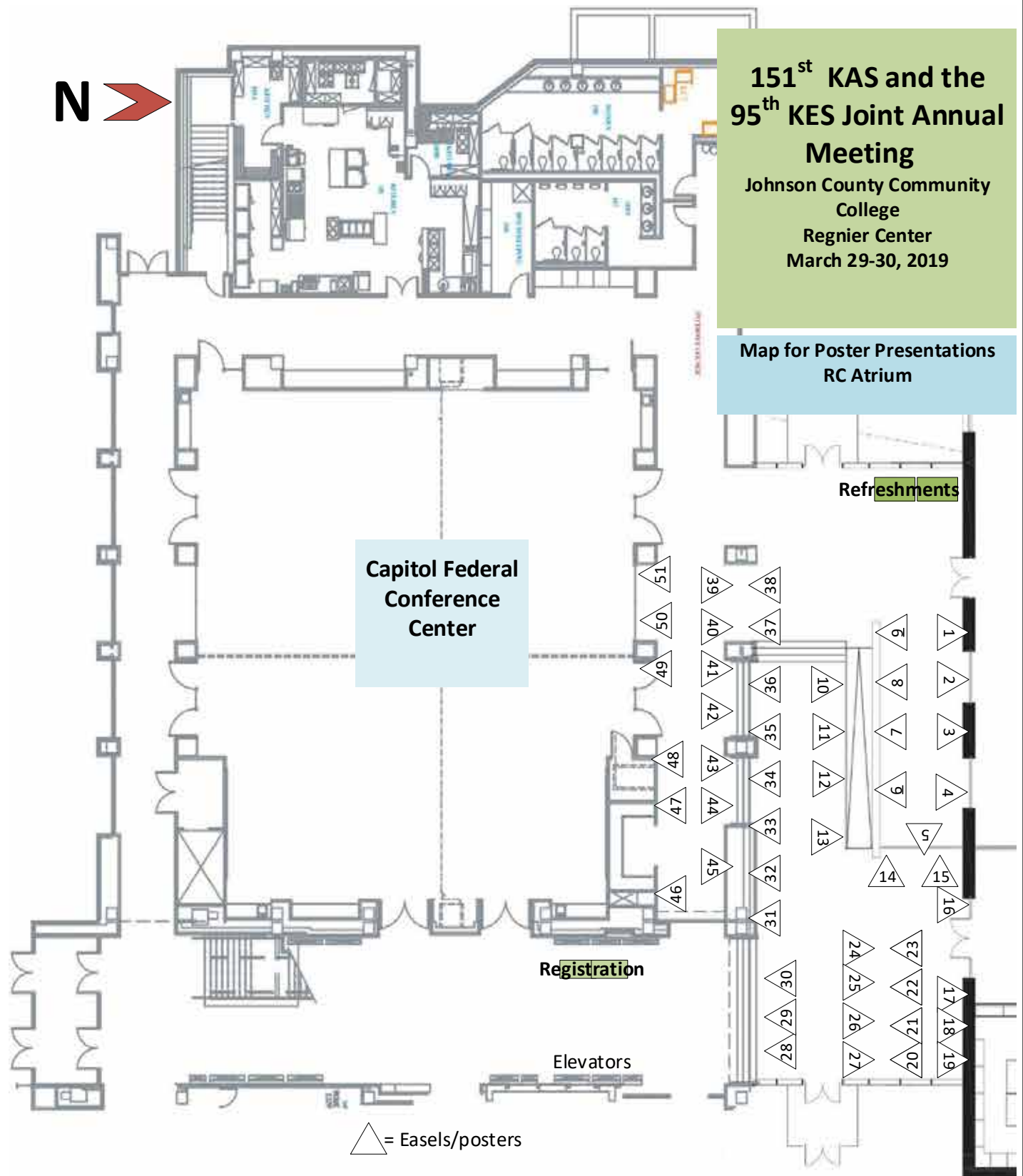
# MAP FOR POSTER PRESENTATIONS



## 151<sup>st</sup> KAS and the 95<sup>th</sup> KES Joint Annual Meeting

Johnson County Community  
College  
Regnier Center  
March 29-30, 2019

### Map for Poster Presentations RC Atrium



△ = Easels/posters

\* Diagram not drawn to scale

# PROGRAM SCHEDULE

## 151<sup>st</sup> Kansas Academy of Science and the 95<sup>th</sup> Kansas Entomological Society Joint Annual Meeting Schedule

### FRIDAY, MARCH 29, 2019

<b>Time</b>	<b>Event</b>	<b>Location</b>
1:00-4:00 pm	Field Trip - The Linda Hall Library (see field trip information page for details)	Meet in the Regnier Center Atrium
3:30-5:00 pm	Field Trip - Campus as a Learning Lab: Open Petal Farm and Sustainability at JCCC (see field trip information page for details)	Meet in the Regnier Center Atrium
5:00-5:45 pm	Check-in at Registration Table Social Hour	1st Floor Regnier Center Capitol Federal Room 101 Regnier Center
5:45-7:15 pm	Banquet	Capitol Federal Room 101 Regnier Center
7:30-8:30 pm	Keynote Presentation: “ <b>Good vibrations: the (not so) secret world of insect vibrational communication</b> ” Dr. Kasey Fowler-Finn, St. Louis University	Hudson Auditorium 2nd Floor Nerman Museum
8:30-9:30 pm	KAS Board of Directors Meeting	Regnier Center 270
8:30-9:30 pm	Ad Astra Night at JCCC (see field trip information page for details)	Meet in the Regnier Center Atrium

# PROGRAM SCHEDULE

## SATURDAY, MARCH 30, 2019

Time	Event	Location
7:30-10:00 am	Check-in at the registration table Poster setup (posters must be up by 10 a.m.)	1st Floor Regnier Center Regnier Center Atrium
7:45-8:15 am	Judges Meeting Moderators Meeting	Regnier Center 171 Regnier Center 170
8:00-8:30 am	Continental Breakfast	Regnier Center Atrium
8:30-10:00 am	Oral Presentations Session #1 Chemistry / Biochemistry / Microbiology / Science Education Organismal Biology / Entomology Ecology/Organismal Biology Ecology/Organismal Biology Paleontology Symposium (session will go to 10:10 a.m.)	Regnier Center 142 Regnier Center 155 Regnier Center 157 Regnier Center 101C Regnier Center 101D
10:00-10:30 am	Poster Presentations Authors available at posters Mid-Morning Break / Refreshments	Regnier Center Atrium Regnier Center Atrium
10:30-12:00 pm	Oral Presentations Session #2 Organismal Biology / Entomology Ecology / Organismal Biology Ecology / Organismal Biology Ecology / Organismal Biology / Entomology Space Science / Physics / Astronomy	Regnier Center 142 Regnier Center 155 Regnier Center 157 Regnier Center 101C Regnier Center 101D
12:00-1.30 pm	Lunch KAS Business Meeting Keynote Presentation: <b>“Mating is difficult in a warming world!”</b> Dr. Kasey Fowler-Finn, St. Louis University	Capitol Federal Room 101 Regnier Center
1:30-2:30 pm	Poster Session Authors available at posters	Regnier Center Atrium
2:30 – 2:45 pm	Refreshment Break	Regnier Center Atrium

# PROGRAM SCHEDULE

## SATURDAY, MARCH 30, 2019 (cont.)

2:45-3:45 pm	Featured Speakers <b>“Expanding the search for novel antibiotics: An Authentic Course Based Research Program”</b> Dr. Heather Seitz, Dr. Jaimie Cunningham, and Dr. Melanie Harvey, Johnson County Community College	Hudson Auditorium 2nd Floor Nerman Museum
	Featured Speaker <b>“Monarch Butterflies: Past, Present and Future”</b> Dr. Orley “Chip” Taylor, University of Kansas	Capitol Federal Room 101 Regnier Center
4:00-4:30 pm	Awards Presentation	Hudson Auditorium 2nd Floor Nerman Museum
4:30-5:30 pm	KES Business Meeting	Regnier Center 270





# HISTORY OF KAS and KES

## **The Kansas Academy of Science**

The Kansas Academy of Science was founded on September 1, 1868. It is the second oldest state Academy of Science in the United States, after Connecticut's. Article II of the constitution of the Kansas Academy of Science identifies the purpose of the Academy as (1) "To encourage education in the sciences and dissemination of scientific information through the facilities of the Academy" and (2) "To achieve closer cooperation and understanding between scientists and non-scientists, so that they may work together in the common cause of furthering science."

The journal *Transactions of the Kansas Academy of Science* was established in 1872 and is the official journal of the Kansas Academy of Science. This peer-reviewed journal includes all subjects of biological, cultural, and physical sciences, mathematics and computer science, history and philosophy of science, and science education.

This weekend's meeting is the 151<sup>st</sup> annual meeting of the Kansas Academy of Science. Johnson County Community College has hosted this meeting on two other occasions, in 2013 and 2005.

For more information about the history of the Kansas Academy of Science, membership, student grant opportunities, and the journal, please visit the Kansas Academy of Science website at [www.kansasacademyscience.org/](http://www.kansasacademyscience.org/)

## **The Kansas Entomological Society The Central States Entomological Society**

The Society goes by both of the above names. The Society was established in 1928 with the primary objective of the advancement of the interests of entomology in its broadest sense. The society welcomes as members all persons interested in insects or other arthropods. The society produces a quarterly publication, the *Journal of the Kansas Entomological Society*, which publishes original work in all areas of research involving insects and other arthropods.

The Society holds annual meetings in Kansas or nearby states, at which students as well as established entomologists present results of their research or reviews of topics of interest, fostering interactions among individuals and their diverse disciplines.

For more information about becoming a member of The Kansas Entomological Society, visit <https://kes.allenpress.com/kes/Home.aspx>

# KEYNOTE SPEAKER

## Dr. Kasey Fowler-Finn, St. Louis University

“Good vibrations: the (not so) secret world of insect vibrational communication”

7:30-8:30 pm, March 29, 2019

Hudson Auditorium

2nd Floor Nerman Museum

“Mating is difficult in a warming world!”

12:00 pm (during luncheon), March 30, 2019

Capitol Federal Room 101, Regnier Center



Photo by Emily Hutti



Photo by ImpactMediaLab

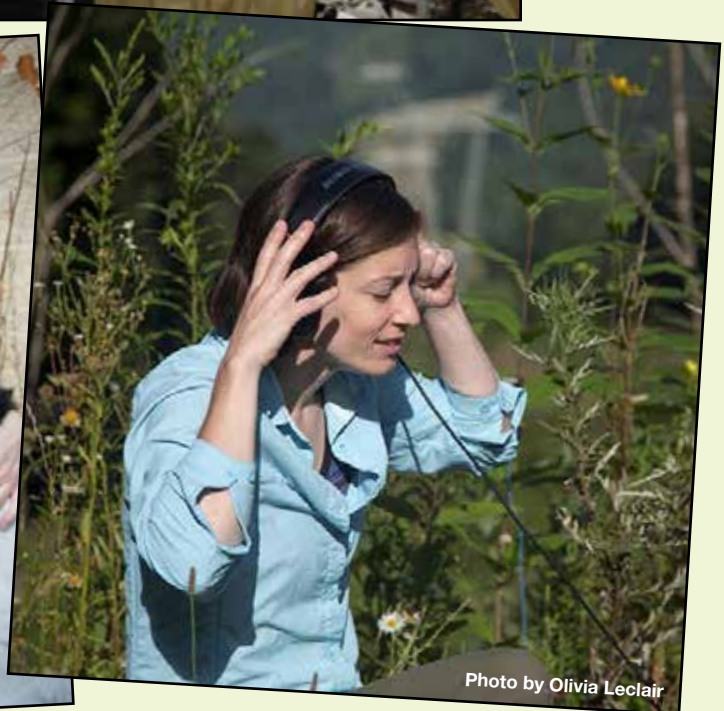


Photo by Olivia Leclair

## FEATURED SPEAKERS

### **Dr. Heather Seitz, Dr. Jamie Cunningham and Dr. Melanie Harvey Johnson County Community College**

**“Expanding the search for novel antibiotics: An Authentic Course Based Research Program”**

**2:45-3:45 pm, March 30, 2019**

**Hudson Auditorium**

**2nd Floor, Nerman Museum**



**Dr. Heather Seitz**



**Dr. Jamie Cunningham**



**Dr. Melanie Harvey**

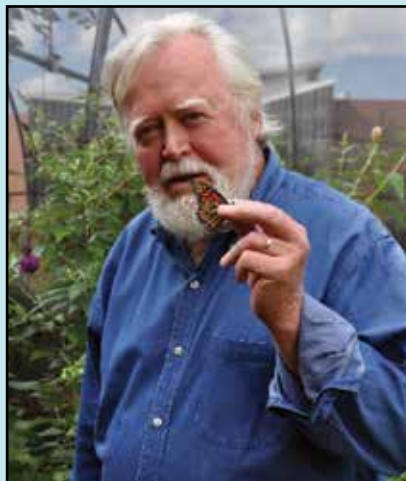
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### **Dr. Orley “Chip” Taylor, University of Kansas**

**“Monarch Butterflies: Past, Present and Future”**

**2:45-3:45 pm, March 30, 2019**

**Capitol Federal Room 101, Regnier Center**



**Dr. Orley “Chip” Taylor**

## FIELD TRIP INFORMATION



1

### **Trip to the Linda Hall Library at the University of Missouri-Kansas City**

**Friday, March 29, 2019**

**1:00 - 4:00 pm**

**Meet in Regnier Center Atrium Lobby**

Join Steve Giambrone, Professor, Biology, JCCC on a trip to UMKC to visit the Linda Hall Library which is one of the world's foremost independent research libraries devoted to Science, Engineering and Technology. The Library maintains a collection of rare books of scientific and technological importance. This guided field trip will feature a behind the scenes look at some of the most rare and historical books. Transportation will be provided.



2

### **Campus as a Learning Lab: Open Petal Farm and Sustainability at JCCC**

**Friday, March 29, 2019**

**3:30 - 5:00 pm**

**Meet in Regnier Center Atrium Lobby**

Join Dr. Jay Antle, Professor/Director of Sustainability, JCCC and Stu Shafer, Professor / Chair, Sustainable Agriculture, JCCC for a tour of the Open Petal Farm and sustainability initiatives at JCCC. The tour will include a visit to the College's in-vessel composting operation, Galileo's Pavilion (a LEED Platinum building with living walls) and the Green Infrastructure Storm Water Project (the most biodiverse spot on campus). Wear walking shoes.



3

### **Ad Astra Night at JCCC**

**Friday, March 29, 2019**

**8:45 - 9:45 pm**

**Meet in Regnier Center Atrium Lobby**

Dr. Doug Patterson, Professor, Astronomy, JCCC, will host a viewing party at the Paul Tebbe Observatory atop the CLB roof on the JCCC campus. Objects of interest that will be visible are the Orion Nebula, Jupiter and Pleiades Cluster. Meet at the RC atrium lobby immediately after the keynote presentation. Dr. Patterson will escort participants to the roof of CLB (weather permitting). No registration required.

# POSTER PRESENTATIONS

## Regnier Center Atrium

Note: Presenters are bolded.

### CHEMISTRY

- 1 **Haller, R.** and Leung, S.H., Department of Chemistry, Washburn University  
PROGRESS TOWARD THE SYNTHESIS OF EXPANDED OXOPHLORES
- 2 **Hosek, A.** and Schmidt, S., Department of Chemistry, Washburn University  
ALKYLATION OF NOSYLAMIDE TO FORM AZAMACROCYCLES
- 3 **Cooper, D.** and O'Neill, H., Department of Chemistry, Washburn University  
PRELIMINARY STUDIES ON MORE AFFORDABLE EFFECTIVE MEANS OF  
HOMOGENIZATION AND QUANTITATION OF TETRAHYDROCANNABINOL (THC) IN  
MARIJUANA CASES

### COMPUTER SCIENCE

- 4 **Jones, R.**, Physical Science Department, Emporia State University  
EXPERIMENTS WITH AN AUTONOMOUS SOFTWARE AGENT A.S.A. H.

### ECOLOGY

- 5 Brittan A., Wilson, B.A.<sup>1</sup>, Rock, M.O.<sup>2</sup>, **Almario-Kopp, D.**<sup>3</sup>, Ramirez, I.<sup>3</sup> and Davis-Berg, E.C.<sup>3</sup>, <sup>1</sup>Liberty Public Schools, <sup>2</sup>University of Illinois at Chicago and Garfield Park Conservatory, <sup>3</sup>Department of Science and Mathematics, Columbia College Chicago  
MOLLUSCAN SUCCESSION IN A RE-ESTABLISHED FOREST ECOSYSTEM AT FITCH NATURAL HISTORY RESERVATION
- 6 **Drees, R.G.**, Tucker, A., and Greer, M.J., Fort Hays State University, Department of Biological Sciences, Fort Hays State University Department of Agriculture  
RESTORING MAGNESIUM TO THE WORLD'S FOOD SOURCE THROUGH SOIL NUTRIENT ADDITIONS.
- 7 **Harrison, S.** and Greer, M.J., Department of Biological Sciences, Fort Hays State University  
ANALYSIS OF PLANT-SOIL MICROBIOMES SURROUNDING NATIVE AND NON-NATIVE GRASSES ACROSS A PRECIPITATION GRADIENT IN KANSAS
- 8 **Osterhaus, D.** and Jensen, W., Department of Biological Sciences, Emporia State University  
DOES ACTIVITY OF WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) VARY BETWEEN HUMAN-HUNTED AREAS AND REFUGES?
- 9 **Ruelas-Aranda, S.**<sup>1</sup>, **Allison, N.**<sup>2</sup>, Groom, M.<sup>1</sup>, Sargent, C.<sup>3</sup>, Schumacher, J.<sup>4</sup>, **Tanis, M.**<sup>2</sup>, Noland, M.<sup>3</sup>, Schmidt, C.<sup>3</sup>, Greer, M.<sup>3</sup> and Adams, A.M.<sup>3</sup>, <sup>1</sup>Department of Nursing, <sup>2</sup>Kansas Academy of Mathematics and Sciences, <sup>3</sup>Department of Biological Sciences, <sup>4</sup>Department of Agriculture; Fort Hays State University  
MONITORING THE EFFECTIVENESS OF POND RESTORATION EFFORTS THROUGH THE MACROINVERTEBRATE COMMUNITY

## POSTER PRESENTATIONS

- 10 Schwindt, C.<sup>1</sup>, Stark, N.<sup>1</sup>, Pfannenstiel, B.<sup>1</sup>, Stark, W.<sup>2</sup> and **Maricle, K.**<sup>1</sup>, <sup>1</sup>Thomas More Prep-Marian High School, <sup>2</sup>Department of Biological Sciences, Fort Hays State University  
ASSESSING WATER QUALITY OF BIG CREEK IN ELLIS COUNTY, KANSAS
- 11 **Skelton, M.C.**<sup>1</sup>, Noland, M.A.<sup>1</sup>, Schmidt, C.J.<sup>2</sup>, Stark, W.J.<sup>1</sup>, Adams, A.M.<sup>1</sup>, and Greer, M.J.<sup>1</sup>,  
<sup>1</sup>Department of Biological Sciences Fort Hays State University, <sup>2</sup>Sternberg Museum of Natural History  
PRE-RESTORATION ASSESSMENT OF A WATERWAY WITHIN AN URBAN GREEN SPACE AT THE STERNBERG NATURAL AREA, HAYS, KS.
- 12 **Smith, N.E.G., Tooley, E.G.** and Maricle, B.R., Department of Biological Sciences, Fort Hays State University.  
EFFECTS OF NITROGEN FERTILIZER ON SALT-STRESSED MILO (*SORGHUM BICOLOR*)
- 13 **Sargent, C.**<sup>1</sup>, Perryman, H.<sup>1</sup>, Allison, N.<sup>2</sup>, Groom, M.<sup>3</sup>, Ruelas-Aranda, S.<sup>3</sup>, **Schumacher, J.**<sup>4</sup>, Tanis, M.<sup>2</sup>, Schmidt, C.<sup>1</sup>, Greer, M.<sup>1</sup>, Adams, A.M.<sup>1</sup>, <sup>1</sup>Department of Biological Sciences, <sup>2</sup>Kansas Academy of Mathematics and Sciences, <sup>3</sup>Department of Nursing, <sup>4</sup>Department of Agriculture; Fort Hays State University.  
BATS? USE OF NATURAL AREAS IN AN URBAN LANDSCAPE
- 14 **Stramel, D.A.**, and Greer, M.J., Department of Biological Sciences, Fort Hays State University  
A STUDY OF THE ALLELEPATHIC EFFECTS OF TWO SPECIES OF OLD WORD BLUESTEM
- 15 **Urban, A.** and Houseman, G., Department of Biological Sciences, Fairmount College of Liberal Arts and Sciences.  
THE DISTRIBUTION OF LEGUME SPECIES ACROSS THE PRECIPITATION GRADIENT OF KANSAS

### ENTOMOLOGY

- 16 **Albin, C.**, Kansas State University  
POTENTIAL REPELLENCY OF CEDARWOOD OIL FROM A NOVEL EXTRACTION METHOD TO STORED PRODUCT INSECTS.
- 17 **Breitkreutz, B.**, and Mercader, R., Department of Biology, Washburn University. INFLUENCE OF AGING ON DECISION MAKING IN OVIPOSITING *PIERIS RAPAE*.
- 18 **Burton, Z.** and Fore, S.A., Department of Biology, Truman State University  
WHERE ARE ALL THE NYMPHAL *DERMACENTOR VARIABILIS*?
- 19 **Cloonan, A.**, Fore, S., and Kim, H., Truman State University  
MODELING THE ACTIVITY OF ADULT *DERMACENTOR VARIABILIS* OFF-HOST USING ENVIRONMENTAL VARIABLES
- 20 Alzahrani, A., **Cuthill, L.**, Burnett, N.A., Dominick, K. and Ghosh, A., Department of Biology, Pittsburg State University  
ECOLOGY AND PREVALENCE OF TICKS AND TICK-BORNE BACTERIAL PATHOGENS IN SOUTHEAST KANSAS

## POSTER PRESENTATIONS

- 21 **Engel, R.P.** and Maricle, B.R., Department of Biological Sciences, Fort Hays State University  
THE INFLUENCE OF LAND USE ON HONEY BEE (*APIS MELLIFERA*) FORAGE
- 22 **Grasing, M.** and Sempertegui-Sosa, C., Truman State University  
TICK ABUNDANCE AND SEASONALITY IN TWO LOCATIONS IN CENTRAL MISSOURI
- 23 **Grosdidier, R.**, Morrison, W., Domingue, M., Arthur, F., and Myers, S.W., Department of Entomology, Kansas State University; USDA-ARS Center for Grain and Animal Health Research, Manhattan, KS; USDA-APHIS Otis Laboratory, Buzzards Bay, MA.  
*TROGODERMA VARIABLE* IS NOT AN ADEQUATE SURROGATE SPECIES FOR THE BEHAVIORAL RESPONSE OF THE INVASIVE STROED PRODUCT PEST *TROGODERMA GRANARIUM* (COLEOPTERA: DERMESTIDAE).
- 24 **Nonnenmacher, N.**, Biology Department, Pittsburg State University  
INSECT FORAGERS ON TALL THISTLE *CIRSIIUM ALTISSIMUM* (L.) SPRENG. AND LATE BONESET *EUPATORIUM SEROTINUM* MICHX. IN CHEROKEE COUNTY KANSAS
- 25 **Pittenger, M.S.** and Stark, W.J., Department of Biological Sciences, Fort Hays State University  
GROUND BEETLE DIVERSITY IN NATIVE, INVASIVE, AND ENCROACHING PLANT COMMUNITIES
- 26 **Sempertegui-Sosa, C.**, Romine, D., Schrier, J. and Connolly, M., Truman State University  
PRESENCE OF *RICKETTSIA MONTANENSIS* AND *EHRlichia CHAFFEENSIS* AND ABSENCE OF *ANAPLASMA PHAGOCYTOPHYLUM* INFECTIONS AMONG ADULT TICKS COLLECTED IN CONSERVATION AREAS AND PRIVATE LANDS OF ADAIR COUNTY, MISSOURI
- 27 **Tribble, M.**<sup>1</sup>, Stone, R.<sup>1</sup> and Yearout, K.<sup>2</sup>, <sup>1</sup>Wichita State University, <sup>2</sup>Zbar Ranch, Turner Enterprises  
ASSESSING THE DIVERSITY AND ABUNDANCE OF DUNG BEETLES (COLEOPTERA: SCARABAEOIDEA) OF A BISON RANCH ECOSYSTEM IN THE KANSAS RED HILLS

### FORENSICS / GENETICS

- 28 **Pascual, C.**<sup>1</sup>, Lambert, S.<sup>1</sup>; Hodges, C.<sup>2</sup>, and Bailey, M.M.<sup>1</sup>, <sup>1</sup>Emporia State University, MSFS Program, <sup>2</sup>Kansas Bureau of Investigation.  
THE IMPACT OF STORAGE CONDITIONS, SAMPLE VOLUME, AND COLLECTION TECHNIQUE ON BLOOD ALCOHOL CONCENTRATION IN NON-DECOMPOSED DEFIBRINATED SHEEP'S BLOOD.
- 29 **Rindom, K.J.**<sup>1</sup>, Van Stratton, M.J.<sup>2</sup>, Ballester, J.<sup>3</sup>, and Bailey, M.M.<sup>1</sup>, <sup>1</sup>Department of Biological Sciences, Master of Science in Forensic Science Program, Emporia State University, <sup>2</sup>Van Stratton, Winer, & Associates, Topeka, Kansas, <sup>3</sup>Department of Physical Sciences, Emporia State University  
MEASUREMENT DETERMINATION OF BLOOD SPATTER ON A HORIZONTAL SURFACE.
- 30 **Turner, R.** and Hong, W.F., Department of Biology, Sterling College  
ANALYSIS OF A PEDIGREE TREE IN A FAMILY WITH HIGH MELANOMA

# POSTER PRESENTATIONS

## MICROBIOLOGY

- 31 **Laney, H.**, Beaty, M. and Cunningham, J., Biology Department, Johnson County Community College  
CHARACTERIZATION OF THE ANTIMICROBIAL ACTIVITY OF A BURKHOLDERIA ISOLATE
- 32 Morris, B., and **Hong, W.F.**, Department of Biology, Sterling College. A PRELIMINARY STUDY  
OF AN EXTREMELY HALOPHILIC ARCHAEA ISOLATED FROM SALT MARSH AT QUIVIRA  
NATIONAL WILDLIFE REFUGE, KANSAS.
- 33 **Picking, T.J.** and Maricle, B.R., Department of Biological Sciences, Fort Hays State University  
ANTIMICROBIAL PROPERTIES OF SECONDARY METABOLITES FROM PLANTS IN KANSAS  
WETLANDS
- 34 **Still, M.B.** and Crupper, S.S., Forensic Science Program, Emporia State University  
THE MOUSE THANATOMICROBIOME AND POST MORTEM INTERVAL ESTIMATION

## PALEONTOLOGY / ORGANISMAL BIOLOGY / EVOLUTION

- 35 **Elias, A.**<sup>1,2</sup>, Dumont, B.L.<sup>2,3</sup>, Coyle, K.P.<sup>2</sup>, White, J.<sup>2</sup>, Roberts, N.B.<sup>2</sup> and Roberts, R.B.<sup>2</sup>, <sup>1</sup>Department of  
Biology, Avila University, Kansas City, MO, <sup>2</sup>Department of Biological Sciences, North Carolina State  
University, Raleigh, NC, <sup>3</sup>The Jackson Laboratory, Bar Harbor, ME  
GENOMIC SURVEY OF SEX DETERMINATION SYSTEMS IN CHICHLIDS REVEALS AN  
EVOLUTIONARY HOT-SPOT
- 36 **Gonzales, E.N, Banes, T.C.** and Williams, D.R., Department of Biology, University of Saint Mary  
INITIAL REPORT ON SKELETAL LESIONS IN VIRGINIA OPOSSUMS (*DIDELPHIS*  
*VIRGINIANA*) FROM LEAVENWORTH COUNTY KS
- 37 **Madeira, B.C.**, Emporia State University  
REVIEW OF CURRENT CONTROVERSIES IN THE EVOLUTION OF THE GENUS *HOMO*
- 38 **Mers, M.M.**, Emporia State University  
PRELIMINARY ANALYSIS OF ENIGMATIC TRACE FOSSILS FROM LATE CRETACEOUS  
DEPOSITS OF MONTANA
- 39 McCloud, J., **Gaede, C.** and Parris, M., Biology Department, Tabor College  
TESTING DNA BARCODING CRITERIA FOR COMMON AIRBORNE FUNGI: ARE ALL THE  
ASSUMPTIONS TRUE?
- 40 **McPhail, B.**, and Boyd, L., Department of Biology, Washburn University. DEVELOPMENT OF A  
BEHAVIORAL BASELINE OF CAPTIVE *L. ROSALIA* AT THE TOPEKA ZOO.
- 41 **Roberts, E.K.**, Earth Science Program, Emporia State University  
A PRELIMINARY ANALYSIS OF A JUVENILE TRICERATOPS SKULL AND LOWER JAW  
MATERIAL AND COMPARISON OF JUVENILE CERATOPSIDIAN CHARACTERISTICS
- 42 **Santoso, M.** and Holcroft, N., Biology Department, Johnson County Community College  
EXPLORING ORGANISMAL BIOLOGY THROUGH ART: BRINGING UNFAMILIAR  
ORGANISMS TO LIFE THROUGH SCULPTURE



## POSTER PRESENTATIONS

- 43 **Thurber, N.A.**, Jones, M.F. and Beard, K.C., Emporia State University, University of Kansas  
NEW SPECIMENS OF *CHIROMYOIDES* (MAMMALIA: PLESIADAPIDAE) FROM THE LATE PALEOCENE SHED LIGHT ON THE EVOLUTION AND BIOGEOGRAPHY OF THE GENUS

### PHYSIOLOGY

- 44 **Compton, K.**, Quispe, N.C., Elliot, J.E., Kobayashi, Y. and Maricle, B.R., Department of Biological Sciences, Fort Hays State University  
ENZYMATIC TOLERANCE OF COMMON TOXINS IN PLANT ROOTS AND CATFISH TISSUES
- 45 **Elliot, J.E.**, Quispe, N.C. and Maricle, B.R., Department of Biological Sciences, Fort Hays State University  
EFFECTS OF SULFIDE ETHANOL AND LACTIC ACID ON CYTOCHROME C OXIDASE AND CITRATE SYNTHASE ACTIVITIES IN PLANT ROOTS
- 46 **Kjaer, E.L.** and Houseman, G.R., Department of Biological Sciences, Wichita State University  
THE EFFECTS OF AGGREGATED SEED ARRIVAL AND SOIL HETEROGENEITY ON PLANT DIVERSITY
- 47 **Kostner, D.**, Dougherty, M., Schmidtberger, A., Oaklee, A. and Kobayashi, Y., Department of Biological Sciences, Fort Hays State University  
RELATIONSHIP BETWEEN O-LINKED N-ACETYLGLUCOSAMINE TRANSFERASE (OGT) MRNA EXPRESSION AND NUTRITIONAL STATUS IN THE CHANNEL CATFISH MUSCLE
- 48 **Quispe, N.C.**, Elliott, J.E., Kobayashi, Y., and Maricle, B.R., Department of Biological Sciences, Fort Hays State University  
EFFECT OF SULFIDE, LACTIC ACID, AND ETHANOL ON RESPIRATION ENZYME ACTIVITIES IN CATFISH TISSUES.
- 49 **Schafer, J.**, Puga, T., Harris, P., Strasser, N., Branum, G. and Agbedanu, P.N., Friends University  
INVESTIGATING INCREASED CO<sub>2</sub> CONCENTRATION ON THE pH OF VARIOUS PLANT SPECIES
- 50 Titus, C., **Milam, C.**, and Agbedanu, P.N., Friends University.  
INVESTIGATING THE MOST EFFICIENT CAFFEINE DOSING TECHNIQUE.
- 51 Yacoub, M., **Apfl, A. and Burgess, K.**, Department of Biology, Avila University  
HISTONE ACETYLATION DIMINISHES PLANARIAN REGENERATION

### SPACE SCIENCE

- 52 **Turner, J.** and Patterson, J.D., Astronomy Department, Johnson County Community College  
COMPOSITIONAL VARIATION OF SOLAR ENERGETIC PARTICLES OVER TWO SOLAR CYCLES

## ORAL PRESENTATIONS SESSION 1: 8:30-10 a.m.

**Note: Presenters are bolded.**

### CHEMISTRY/ BIOCHEMISTRY/ MICROBIOLOGY/ SCIENCE EDUCATION

**Room: RC 142**

**Moderator: Deborah Williams**

- 8:30            **Curtis, M.**, McPherson College  
CANNABIDIOL ANTIBIOTIC PROPERTIES AGAINST GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIA
- 8:50            **Forster, H.** and Shuai, B., Department of Biological Sciences, Wichita State University  
EXOGENOUS SMALL INTERFERING RNAs MAY INHIBIT GROWTH OF THE PHYTOPATHOGENIC FUNGUS *MACROPHOMINA PHASEOLINA*
- 9:10            **Heffren, P.** and Schmidt, S., Chemistry Department, Washburn University  
SCHIFF BASE CYCLIZATION TO FORM A CROSS PROTECTED TETRAAMACROCYCLE
- 9:30            **Williams, D.**, Environmental Science Department, Johnson County Community College  
CULTURAL TABOOS AS A FACTOR IN THE PARTICIPATION RATE OF NATIVE AMERICANS IN STEM

### ORGANISMAL BIOLOGY / ENTOMOLOGY

**Room: RC 155**

**Moderator: Nancy Holcroft**

- 8:30            **Davis, H.**, Ewing, JR., and Whitworth, R.J., Kansas State University  
FACT AND FICTION RELATED TO THE BROWN RECLUSE SPIDER, *LOXOSCELES RECLUSA*
- 8:50            **Grove, A. L.** and Packauskas, R.J., Department of Biological Sciences, Fort Hays State University  
MOSQUITOES IN WESTERN KANSAS
- 9:10            **Durr, A.N.**, and Packauskas, R.J., Department of Biological Sciences, Fort Hays State University  
ANTS IN WESTERN KANSAS
- 9:30            **Wolters, P.**, McPherson College  
MEASURING THE RELATIONSHIP BETWEEN BODY CONDITION AND BODY COMPOSITION IN TWO KANSAS SPIDER SPECIES.

## ORAL PRESENTATIONS SESSION 1: 8:30-10 a.m.

### ECOLOGY/ORGANISMAL BIOLOGY

**Room: RC 157**

**Moderator: Daniel Williams**

- 8:30      **Autz, J.<sup>1</sup>**, Buchanan, J. L.<sup>1</sup>, Mahr, M. S.<sup>1</sup>, Powell, A. F. L. A.<sup>1</sup>, Sievert, L.<sup>1</sup>, Edds, D. R.<sup>1</sup>, and Riedle, J. D.<sup>2</sup>, <sup>1</sup>Department of Biological Sciences, Emporia State University, <sup>2</sup>Kansas Department of Wildlife, Parks and Tourism    **DISTRIBUTION AND SEASONAL ACTIVITY PATTERNS OF THE MUDPUPPY IN EASTERN KANSAS**
- 8:50      **Mahr, M S. <sup>1</sup>**, Autz, J<sup>1</sup>, Riedle, J. L.<sup>2</sup>,<sup>1</sup>Department of Biological Sciences, Emporia State University, <sup>2</sup>Kansas Department of Wildlife, Parks and Tourism  
**MORPHOLOGICAL VARIATION, GEOGRAPHIC DISTRIBUTION, AND TAXONOMIC BOUNDARIES OF MAP TURTLES (*GRAPTEMYS* SPP.) IN KANSAS**
- 9:10      **Rodrigues de Queiroz, A.** and Maricle, B.R., Department of Biological Sciences, Fort Hays State University  
**INFLUENCE OF SHADED CONDITIONS IN DEVELOPMENT OF ASTERACEAE SPECIES NATIVE TO KANSAS**

### ECOLOGY/ORGANISMAL BIOLOGY

**Room: RC 101C**

**Moderator: Heather Seitz**

- 8:30      **Lawless, B. L.<sup>1</sup>**, Noland, M.A.<sup>1</sup>, Schmidt. C.J.<sup>2</sup>, and Greer, M.J.<sup>1</sup>,  
<sup>1</sup>Department of Biological Sciences, Fort Hays State University, <sup>2</sup>Sternberg Museum of Natural History, Fort Hays State University  
**SMALL SCALE RESTORATION OF THE STERNBERG NATURAL AREA: INFLUENCE ON SMALL MAMMAL COMMUNITIES**
- 8:50      **Davis-Berg, E.C.<sup>1</sup>**, and Wilson, B.A.<sup>2</sup>, <sup>1</sup>Department of Science and Mathematics, Columbia College Chicago, <sup>2</sup>Liberty Public Schools  
**MOLLUSCS IN EASTERN KANSAS**
- 9:10      **Hardgrove, C.**, and Morris, E., Department of Biology and Chemistry, Baker University  
**ANALYZING MITOCHONDRIAL GENE CYTOCHROME OXIDASE I (COI) AND CYTOCHROME B (CYTB) IN 13-YEAR PERIODICAL CICADAS**
- 9:30      **McCowen, P.J.**, Miller, W.R., and Kimball, S.A., Department of Biology and Chemistry, Baker University  
**TARDIGRADES OF NORTH AMERICA: RECORDS OF AQUATIC SPECIES NEW TO THE STATE OF KANSAS, U.S.A.**

**PALEONTOLOGY SYMPOSIUM**

**Room: RC 101D**

**Moderator: Michael Everhart**

- 8:30        **Everhart, M.J.**<sup>1</sup>, Pearson, G.<sup>2</sup> Smith, F.<sup>3</sup> and Shimada, K.<sup>4</sup>, <sup>1</sup>Sternberg Museum of Natural History, <sup>2</sup>Beloit, KS, <sup>3</sup>Tipton, KS, <sup>4</sup>DePaul University  
DISCOVERY OF THE FIRST ASSOCIATED SPECIMEN OF THE LATE CRETACEOUS SHARK, *CRETODUS* SP. (ELASMOBRANCHII: LAMNIFORMES) FROM NORTH AMERICA.
- 8:50        **Hamm, S.A.** and Cicimurri, D.J.<sup>1</sup>, <sup>1</sup>Campbell Geology Museum  
MICRO SELACHIAN FAUNA FROM THE OZAN FORMATION (MIDDLE CAMPANIAN) IN EAST TEXAS
- 9:10        **Hoffman, B.** and Hageman, S.A., Department of Natural and Physical Sciences, Park University  
PRELIMINARY ANALYSIS OF TEETH OF THE EXTINCT REQUIEM SHARK *PHYSOGALEUS CONTORTUS* (ELASMOBRANCHII: CARCHARHINIFORMES) AS CUTTING TOOLS.
- 9:30        Thomas, B., and **Oberle, J.**, Washburn University  
BIOLOGICAL IMPACT OF OZONE DEPLETION AT THE END-PERMIAN.
- 9:50        **Thomas, B. C.**, Washburn University  
EFFECTS OF NEARBY SUPERNOVAE IN THE EARLY PLEISTOCENE

**ORGANISMAL BIOLOGY / ENTOMOLOGY**

**ROOM: RC 142**

**Moderator: Erin Morris**

- 10:30 Lang, S. and **Wilgers, D.**, McPherson College  
SPIDER STDs? EXPLORING THE EFFECTS OF *PSEUDOMONAS AERUGINOSA* ON MATING BEHAVIORS IN THE WOLF SPIDER *RABIDOSA PUNCTULATA*
- 10:50 **Quellhorst, H.**<sup>1</sup>, Athanassiou, C.G.<sup>2</sup>, and Morrison III, W.R.<sup>3</sup>  
<sup>1</sup>Department of Entomology, Kansas State University, <sup>2</sup>Department of Agriculture, Plant Production and Rural Environment, University of Thessaly, Greece. <sup>3</sup>USDA-ARS Center for Grain and Animal Health Research, Manhattan  
COMPETITION OF THE STORED PRODUCT INSECTS, *PROSTEPHANUS TRUNCATUS* (COLEOPTERA: BOSTRICHIDAE) AND *SITOPHILUS ZEAMAI* (COLEOPTERA: CURCULIONIDAE), ON MAIZE IN DIFFERENT TEMPERATURES
- 11:10 **Kolok, J.**, Truman State University  
PHYSIOLOGICAL AGE DETERMINATION OF LONE STAR TICK NYMPHS IN MISSOURI
- 11:30 **Wilkins, R. V.** and Morrison III, W.R., Kansas State University  
LIFE STAGE-SPECIFIC DIFFERENCES IN MOBILITY OF *TROGODERMA VARIABLE* (COLEOPTERA: DERMESTIDAE) AFTER EXPOSURE TO LONG-LASTING INSECTICIDE NETTING

**ECOLOGY/ORGANISMAL BIOLOGY**

**Room: RC 155**

**Moderator: Jackelyn Arico**

- 10:30 **Skelton, M. C.**<sup>1</sup>, Cordes Z.<sup>1</sup>, Riedle, D.<sup>1</sup>, <sup>1</sup>Kansas Department of Wildlife, Parks, & Tourism  
<sup>2</sup>Department of Biological Sciences Fort Hays State University, Kansas Department of Wildlife, Parks, and Tourism  
A COMPARISON OF REPTILE AND AMPHIBIAN OCCURRENCES BETWEEN LARGE AND SMALL HABITAT PATCHES IN EASTERN KANSAS
- 10:50 **Buchanan, J.**, Powell, A., Sievert, L. Department of Biological Sciences, Emporia State University  
DIET VARIATION OF THE MUDPUPPY (*NECTURUS MACULOSUS*) IN KANSAS
- 11:10 **Watson, D. F.**<sup>1</sup>, Houseman, G.<sup>1</sup>, Jameson, M.L.<sup>1</sup>, Jensen, W.<sup>2</sup>, Reichenborn, M.<sup>1</sup>, Alexandra Morphew<sup>1</sup>, Kjaer, E.<sup>1</sup>, <sup>1</sup>Department of Biological Sciences, Wichita State University, <sup>2</sup>Department of Biological Sciences, Emporia State University  
EFFECT OF GRAZING AND PLANTING PRACTICE ON CRP VEGETATION COMPOSITION AND STRUCTURE ACROSS KANSAS
- 11:30 **Han, D. and Sievert, L.** Emporia State University  
THE EFFECT OF TEMPERATURE ON ACTIVITY OF THE DIGESTION AND HOPPING BEHAVIOR OF *ANAXYRUS WOODHOUSII*

## ORAL PRESENTATIONS SESSION 2: 10:30 a.m.-noon

### ECOLOGY / ORGANISMAL BIOLOGY

ROOM: RC 157

Moderator: Alan Maccarone

- 10:30        **Hanson, C. A.**, and Maricle, B., Department of Biological Sciences, Fort Hays State University  
INFLUENCES OF DROUGHT AND DISTURBANCE REGIMES ON SUBALPINE FOREST  
IN ROCKY MOUNTAIN NATIONAL PARK: COMPARISONS BETWEEN 2001 AND 2018
- 10:50        **Maccarone, A. D.** and Harper, A.C., Friends University  
BREEDING PHENOLOGY AND REPRODUCTIVE SUCCESS BY LITTLE BLUE HERONS  
(*EGRETTA CAERULEA*) IN AN URBAN MIXED-SPECIES COLONY
- 11:10        **Frank, K.** and Channell R., Department of Biological Sciences, Fort Hays State University  
SHELTERBELT CHARACTERISTICS THAT INFLUENCE BIRD SPECIES RICHNESS
- 11:30        **Steffen, D.** and Stark W. J., Fort Hays State University  
THE EFFECT OF VEGETATIVE STRUCTURE ON NEST-BURROW SELECTION BY THE  
WESTERN BURROWING OWL: COMPARING TRADITIONAL DATA COLLECTION  
METHODS TO PHOTOGRAMMETRY WITH IMAGERY OBTAINED BY AN UNMANNED  
AERIAL SYSTEM

### ECOLOGY / ORGANISMAL BIOLOGY / ENTOMOLOGY

ROOM: RC 101C

Moderator: Katie Burgess

- 10:30        **Nelson, S.**, McPherson College  
THE ANTI-BACTERIAL PROPERTIES OF *TAGETES PATULA* AND LEYLAND CYPRESS
- 10:50        **Morphew, A.R.**<sup>1</sup>, Jameson, M.L.<sup>1</sup>, Houseman, G.R.<sup>1</sup>, Jensen, W.E.<sup>2</sup>, Reichenborn, M.M.<sup>1</sup>,  
Watson, D.F.<sup>1</sup>, and Kjaer, E.<sup>1</sup>, <sup>1</sup>Wichita State University, <sup>2</sup>Emporia State University  
NATIVE BEE RESPONSES TO HABITAT MANAGEMENT OF RESTORED GRASSLANDS  
IN THE GREAT PLAINS
- 11:10        **Waite, E.S.**<sup>1</sup>, Jameson, M.E.<sup>1</sup>, Houseman, G.R.<sup>1</sup>, Jensen, W.E.<sup>2</sup>, Reichenborn, M.M.<sup>1</sup>, Watson, F.<sup>1</sup>,  
Morphew, A.R.<sup>1</sup>, and Kjaer, E.L.<sup>1</sup>, <sup>1</sup>Wichita State University, <sup>2</sup>Emporia State University  
HOW DO GROUND BEETLES (COLEOPTERA: CARABIDAE) RESPOND TO  
CONSERVATION RESERVE PROGRAM MANAGEMENT PRACTICES AND  
ENVIRONMENTAL FACTORS?
- 11:30        **Bellah, J.P.**, and Sievert, L., Emporia State University.  
DO PARASITES ELICIT A STRESS RESPONSE IN NORTHERN WATERSNAKES  
(*NERODIA SIPEDON*)?

**SPACE SCIENCE / PHYSICS / ASTRONOMY**

**ROOM: RC 101D**

**Moderator: Mary Wisgirda**

- 10:30        **Biagi, G.**, University of Kansas  
SEARCH FOR DARK MATTER PARTICLES AT LHC
- 10:50        **Lindsey, C.** and Christophe Royon, University of Kansas  
SEARCHING FOR SATURATION AT THE LHC
- 11:10        **Isidori, T.**, University of Kansas  
OVERVIEW ON TIMING DETECTOR: PARTICLE PHYSICS AND APPLICATIONS
- 11:30        **Patterson, J. D.** and Turner, J., Astronomy Department, Johnson County Community College  
SOLAR ENERGETIC PARTICLE COMPOSITION GRADIENTS OVER TWO SOLAR  
CYCLES

# Abstracts for the 151st Kansas Academy of Science and the 95th Kansas Entomological Society Joint Annual Meeting

**Albin, C., Campbell, J., Quelherst, H., Eller, F., and Morrison III, W.R., Kansas State University.** POTENTIAL REPELLENCY OF CEDARWOOD OIL FROM A NOVEL EXTRACTION METHOD TO STORED PRODUCT INSECTS. Producers need to diversify post-harvest IPM methods to preserve existing tools. One alternative strategy is push-pull, which requires both an attractant and repellent. One potential repellent is cedarwood oil, which has shown repellency to termites and ants. A novel extraction process for this compound has been developed, which leaves many of its bioactive constituents intact. To date, this compound has never been assessed for repellency to post-harvest insects. In this study, we assessed contact and long-distance repellency to *Ryzopertha dominica*, *Sitophilus oryzae*, *Tribolium castaneum*, and *Trogoderma variabile*. We used video tracking coupled with Ethovision software (contact repellency) and a wind tunnel assay (long-distance repellency). With the exception of *S. oryzae*, we found no long-distance or contact repellency to the other species in this study in either assay. Thus, cedarwood oil is not a good candidate for incorporation into a push-pull program for post-harvest insects.

**Almario-Kopp, D.<sup>1</sup>, Wilson, B.A.<sup>2</sup>, Rock, M.O.<sup>3</sup>, Ramirez, I.<sup>1</sup>, and Davis-Berg, E.C.<sup>1</sup>, <sup>1</sup>Department of Science and Mathematics, Columbia College Chicago, Chicago, IL, <sup>2</sup>Liberty Public Schools, <sup>3</sup>University of Illinois at Chicago and Garfield Park Conservatory.** MOLLUSCAN SUCCESSION IN A RE-ESTABLISHED FOREST ECOSYSTEM AT FITCH NATURAL HISTORY RESERVATION. In 1948, the Fitch Natural History Reservation was founded (Douglas County, Kansas). Prior to the foundation of the reserve, the non-forested areas were heavily cultivated or grazed. Since the late 1940s, the reserve has undergone natural succession, returning to a primarily forested ecosystem. In some areas of the reserve, succession has caused a rapid increase in foliage, resulting in a dense underbrush. Molluscan surveys were conducted in the late 1940s to 1960s, which often included a species list, specific locality information within the reserve, and information on the vegetation at the time. We have conducted periodic molluscan collections at three terrestrial sites and one aquatic site from 2004 through 2017. By comparing the more recent collections with the older data, we demonstrate how the molluscan fauna has responded to succession on this reservation over the last 50 years. We have found almost all species documented in the original surveys while conducting our own surveys. We have found an increase in the forest species found at the Reservation as well as a decrease in the grassland species, providing evidence that the molluscan fauna changes with the vegetation.

**Alzahrani, A., Cuthill, L., Burnett, N.A., Dominick, K., and Ghosh, A., Department of Biology, Pittsburg State University, Pittsburg, KS.** ECOLOGY AND PREVALENCE OF TICKS AND TICK-BORNE BACTERIAL PATHOGENS IN SOUTHEAST KANSAS. Ticks transmit a wide variety of pathogens including viruses, bacteria, protozoa, and helminthes to vertebrates. Their life cycle depends on blood meals from various hosts as well as on environmental conditions such as the temperature and habitat type. The goals of the present study were to assess the prevalence of various tick species and tick-borne bacterial pathogens in southeast Kansas and adjacent area. Ticks were collected during May-August in 2016 and 2017 from three types of tick habitats using the flag-drag method. Adults and nymphs were sexed and identified using taxonomic key and PCR. Selected bacterial species were also detected by PCR. Differences between tick species prevalence in woodland versus pasture land cover types were analyzed using Arc-GIS. Out of a total of 1678 ticks collected, the majority of ticks were identified as *Dermacentor* (50.3%) and *Amblyomma* (47.3%); very few (2.4%) *Ixodes* females and nymphs were also identified. For all the species, more females were found than males. While *A. americanum* were more frequently found in pasture (42.6%), *D. variabilis* and *I. scapularis* were found in woodland (68.6%) and (80.9%), respectively. The rate of detection in *Amblyomma* (total pooled isolation, n = 39) for *Francisella tularensis* was 2.56%, for *Rickettsia rickettsii* was 28.2% while the same in *Dermacentor* (n = 28) for *F. tularensis* was 3.57%, for *R. rickettsii* was 7.14%. The data obtained in this study would help in implementing comprehensive surveillance and management programs for ticks and tick-borne disease risk for humans and animals in this region.



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**Autz, J.<sup>1</sup>, Buchanan, J.L.<sup>1</sup>, Mahr, M.S.<sup>1</sup>, Powell, A.F.L.A.<sup>1</sup>, Sievert, L.<sup>1</sup>, Edds, D.R.<sup>1</sup>, Riedle, J.D.<sup>2</sup>,<sup>1</sup>Department of Biological Sciences, Emporia State University, <sup>2</sup>Kansas Department of Wildlife, Parks and Tourism.** DISTRIBUTION AND SEASONAL ACTIVITY PATTERNS OF THE MUDPUPPY IN EASTERN KANSAS. The conservation status and ecological role of the Mudpuppy (*Necturus maculosus*) are poorly documented. While known to be declining in many parts of the Midwest, knowledge of population sizes and distributions of Mudpuppies in Kansas is lacking. Mudpuppies may be useful as indicators of environmental problems and knowing reasons for their decline could be useful for understanding other vulnerable amphibian species that might be more difficult to sample. We are conducting trapping surveys in eastern Kansas rivers and their tributaries to describe the species' distribution and to assess effects of water chemistry on its occurrence. Target sites for our survey include locations of known historical occurrence, low-water dams, and places where the Kansas Department of Wildlife, Parks and Tourism recently conducted environmental DNA surveys to locate these aquatic salamanders. We are also trapping mudpuppies in Pomona Lake and Melvern Lake to study bait preference and seasonal activity patterns. We have caught 122 Mudpuppies in lakes and 15 in rivers. We currently have a trapping success rate of 2.9% per trap night in the lakes and 1.5% in the rivers. Preliminary results, from November 2017 through February 2019, indicate that Mudpuppies may be most active between mid-December and late April and that they do not differentiate between baited and unbaited traps.

**Bellah, J.P., and Sievert, L., Emporia State University.** DO PARASITES ELICIT A STRESS RESPONSE IN NORTHERN WATERSNAKES (*NERODIA SIPEDON*)? Corticosterone is the primary hormone produced by vertebrates in response to stress. While acute increases in corticosterone are associated with increased survival rates, chronically elevated corticosterone levels have negative health effects, including altered white blood cell profiles, reduced body growth, and reduced reproductive output. Chronically elevated corticosterone levels alter white blood cell profiles, specifically lowering circulating levels of lymphocytes and increasing heterophil levels. Endo- and ecto-parasitism is highly prevalent in wild populations of vertebrates, however, the physiological effects they exert on their hosts have only recently begun to be investigated, with the majority of studies focused on hemoparasites. In this study, I experimentally investigate the relationship between naturally-occurring helminthic parasites found in the digestive system of northern watersnakes (*Nerodia sipedon*) and their effect on corticosterone and white blood cell ratios. Subjects were treated with either fenbendazole, an antihelminthic medication, or 0.9% saline. I compared corticosterone levels and white blood cell profiles before and after treatments on day 0, 28, and 56. Overall, I found no significant difference in stress responses between parasitized and non-parasitized snakes.

**Biagi, G., University of Kansas.** SEARCH FOR DARK MATTER PARTICLES AT LHC. The development of the Standard Model in Particle Physics during the second part of the 20th century helped us understand our world at subatomic levels, but it also fails to explain some observations for instance the existence of dark matter in the universe, and new tools (both theoretical and experimental) are needed to further understand them. This talk will focus on a possible search for dark matter particles or the existence of extra dimensions in the universe using special interactions at the Large Hadron Collider at CERN where protons remain intact after the interaction.

**Breitkreutz, B., and Mercader, R., Department of Biology, Washburn University.** INFLUENCE OF AGING ON DECISION MAKING IN OVIPOSITING *PIERIS RAPAE*. Ovipositional behavior is considered to play a key role in determining host range evolution in plant feeding insects. Identifying the factors that influence host-selection behavior will therefore help gain a mechanistic understanding on how associations between plants and plant feeding insects evolve. Due to its effect on the time available for host selection and learning, butterfly age is expected to have a significant effect on host selection. As adult females age they are expected to become less selective as they become time limited, but also have the potential to be more efficient foragers due to prior

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experience. Here, we were interested in testing if a) age does have an effect on *P. rapae* ovipositional selectiveness and b) if ovipositing females exhibit behaviors consistent with learning with age. To test this, *P. rapae* were reared in laboratory conditions and female ovipositional behavior was recorded 4, 8, and 12 days after emergence and subsequently behavioral sequences were analyzed. Females were recorded with three host options, a preferred host of high quality, a less preferred host of high quality, and a non-host. Ovipositing females became more selective with age, laying a higher proportion of eggs on the preferred host plant and spent more time drumming as they aged on preferred hosts. However, they spent considerably less time drumming and rejecting the non-host plant as they aged. These results suggest that as the ovipositing females aged, they acted as time limited butterflies, but were also able to learn to reject non-hosts faster.

**Buchanan, J., Powell, A., and Sievert, L., Department of Biological Sciences, Emporia State University.** DIET VARIATION OF THE MUDPUPPY (*NECTURUS MACULOSUS*) IN KANSAS. The Mudpuppy (*Necturus m. maculosus*, *N. m. louisianensis*) is an elusive and poorly understood permanently aquatic salamander in the eastern United States. Little has been published on its natural history in Kansas, and baseline data are needed to assess its status and to inform conservation efforts. Our goal is to examine the trophic role and community interactions of the Mudpuppy through examination of its diet. We predict that dietary differences exist between sexes resulting from their different roles in reproduction. We also predict dietary differences between lake and river populations due to differences in available prey. Thus far, we have caught 135 Mudpuppies in the Marais des Cygnes and Neosho rivers and at Melvern and Pomona lakes, and have obtained stomach contents from most with a flushing protocol. Stomach contents are preserved in ethyl alcohol for identification to the lowest identifiable taxonomic group. We have recovered fish (Teleostei), frogs (*Rana* sp., *Acris blanchardi*), crayfish (*Procambarus* sp.), shrimp (Palaemonidae), caddisfly larvae (Trichoptera), mayfly nymphs (Ephemeroptera), Dobsonfly larvae (*Corydalus cornutus*), midge larvae (Chironomidae), stonefly nymphs (Plecoptera), water fleas (Cladocera), and Zebra Mussels (*Dreissena polymorpha*). As predicted, preliminary data suggest dietary differences between each of the two lakes, and between lakes and rivers, due to differences in prey species availability. However, we found no evidence to suggest that dietary differences exist between sexes. Knowledge of diet variation according to these variables will provide valuable insight into these subspecies' natural history and provide data to inform state conservation efforts.

**Burton, Z., and Fore, S.A., Department of Biology, Truman State University, Kirksville, MO.** WHERE ARE ALL THE NYMPHAL *DERMACENTOR VARIABILIS*? The most common tick species in Missouri are the *Amblyomma americanum* and the *Dermacentor variabilis*. In our long-term monitoring work in Adair County, MO, we have sampled relatively few subadult *D. variabilis*, and most of the collected *D. variabilis* were found on-host. The objective of this study was to determine if the time of off-host sampling influences the collection of nymphal *D. variabilis*. Data from previous sampling years were compiled to show that July to early September was a time period in which this life stage was active. We conducted four sampling sessions. In each session, we used bait and drag sampling to collect ticks every four hours for 24 hours. No nymphal *D. variabilis* were collected with off-host methods, and *A. americanum* was the most collected species for most time periods. The larval stage was the most common life stage collected for both species, and no adults were collected for either species during the study. Bait sampling was observed to collect more ticks than the flagging method. This study supports that *Dermacentor variabilis* nymphs are difficult to sample using off-host methods.

**Cloonan, A., Fore, S., and Kim, H., Truman State University, Kirksville, MO.** MODELING THE ACTIVITY OF ADULT *DERMACENTOR VARIABILIS* OFF-HOST USING ENVIRONMENTAL VARIABLES. *Dermacentor variabilis* is an Ixodid tick with a three-host life cycle native to the Eastern United States and is the main vector for Rocky Mountain Spotted Fever. Our objective was to create a statistical model using environmental variables to describe off-host adult *Dermacentor variabilis* activity from 2007-2013 in

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northeast Missouri. Data came from a second growth forest and an old field habitat that were sampled bimonthly from February to November. The environmental variables considered were wind speed, degree days, saturation deficit, habitat, day length, and precipitation. The negative binomial model was selected from a pool of three candidate models to be used for regression. Six model selection criteria and model averaging were used to determine a final model from all possible combinations of the environmental variables. The weighted average model gave a better understanding of how off-host *Dermaecentor variabilis* activity was affected by the chosen environmental variables.

**Compton, K.D., Quispe, N.C., Elliott, J.E., Kobayashi, Y., and Maricle, B.R., Department of Biological Sciences, Fort Hays State University.** ENZYMATIC TOLERANCE TO COMMON TOXINS IN PLANT ROOTS AND CATFISH TISSUES. Sulfide, lactic acid, and ethanol have been shown to influence cellular respiration as metabolic toxins, yet specific effects have not been characterized. The objective of this study was to compare toxicity effects on the activities of cytochrome *c* oxidase (CytOx), citrate synthase (CS), and lactate dehydrogenase (LDH). Respiration enzyme activity was measured in tissue homogenates from roots of bean and corn and catfish tissue samples in the presence of increasing concentrations of sulfide (0 to 20  $\mu$ M), lactic acid (0 to 100 mM), and ethanol (0 to 100 mM). Increasing sulfide and lactic acid concentration significantly decreased activity in all enzymes of both roots and tissue homogenates. Ethanol only marginally affected CS of plant roots. Activity of CytOx in catfish liver samples was 40-fold higher than in plant roots and was almost 50-fold more sensitive to sulfide. Sulfide had the greatest effect on all enzymes observed, compared to lactic acid and ethanol. In catfish, the inhibition constant ( $K_i$ ) of CytOx in sulfide was 500,000 times lower than in lactic acid. In plants, CytOx activity was also reduced by lactic acid but the  $K_i$  was 100,000 times that of sulfide toxicity. Our results indicated that sulfide and lactic acid negatively influenced CytOx, CS, and LDH activities to different degrees, whereas ethanol showed little to no effect on enzymatic activity. Enzymatic activity in catfish is more susceptible to sulfide and lactic acid toxicity compared to plant roots.

**Cooper, D., and O'Neill, H., Department of Chemistry, Washburn University.** PRELIMINARY STUDIES ON MORE AFFORDABLE EFFECTIVE MEANS OF HOMOGENIZATION AND QUANTITATION OF TETRAHYDROCANNABINOL (THC) IN MARIJUANA CASE SAMPLES. Since the legalization of marijuana for both recreational and medicinal use has become more prominent throughout the United States in recent years, there is growing concern regarding the actual amounts of cannabinoids in the wide variety of plants that are bred for such purposes. Most especially concerning is the concentration of tetrahydrocannabinol, or THC, the active ingredient found in the sticky resin produced by the marijuana plant, which varies over a wide range (Upton et al., 2014) depending upon the type of plant. Since some states attempt to set a threshold above which marijuana is more strictly controlled, a need arises for an effective homogenization and sample preparation method for the determination of purity and quantity of THC at low analysis costs. There are a wide variety of published methods, but few studies have evaluated the homogenization process itself, which is difficult to achieve with the sticky resin. In this preliminary study, homogenization with and without liquid nitrogen was evaluated, since cryogenic freezing is used in several published studies. A variety of marijuana case samples were dried for 20 hours in an oven (35-40 ° C), then homogenized using a mortar and pestle both with and without liquid nitrogen. The samples were extracted with ethanol and the THC quantity was determined using Liquid Chromatography-Mass Spectrometry (LC-MS) and Gas Chromatography-Mass Spectrometry (GC-MS). Preliminary results suggest that the liquid nitrogen does not improve the homogenization process.

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**Cunningham, J.<sup>1</sup>, Seitz, H.<sup>1</sup>, and Harvey, M.<sup>2</sup>, <sup>1</sup>Biology Department, <sup>2</sup>Chemistry Department; Johnson County Community College.** EXPANDING THE SEARCH FOR NOVEL ANTIBIOTICS: AN AUTHENTIC COURSE BASED RESEARCH PROGRAM. Antibiotic resistance is a serious threat to global health, and untreatable infections are no longer a prediction for the future, the incidence of antibiotic resistant infections is rising at an alarming rate. Unfortunately, the pace of antibiotic discovery is not keeping up with the rapid evolution of resistance to microbes. Few new antibiotics have been discovered in the past 30 years (McIntosh, 2016). In two separate courses at Johnson County Community College, faculty have implemented research to search for and characterize novel antibiotic producing bacteria. In the microbiology course, students are tasked with finding an environmental sample, characterizing antibiotic producing bacteria and identifying the bacteria to determine uniqueness. In the chemistry course, students further characterize and identify the antimicrobial compounds produced by the bacteria previously identified. The approach is interdisciplinary and provides opportunities for students that may not self-select into a research experience. Students experience the research process as well as have an opportunity to present their research to a wider audience. In this presentation we will provide an overview of the work being done and share some preliminary results from our collective laboratory classrooms.

**Curtis, M., McPherson College.** CANNABIDIOL ANTIBIOTIC PROPERTIES AGAINST GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIA. CBD is a bioactive compound extracted from the stem, stalk, leaves, and flowers of the *Cannabis sativa* plant. Literature suggests a great number of medicinal benefits for CBD, including anti-inflammatory; antipsychotic for motivation disorders such as depression or anxiety, and antibacterial properties. The study utilized the disk diffusion method to observe the antibacterial activity against gram-negative and gram-positive bacteria. Results suggested that CBD was not active against the strains of *Staphylococcus aureus*, *S. epidermis*, and *Escherichia coli* at 20mg/100mL concentration. Upon conclusion, an extensive literature search led to a possible explanation for the selective antibacterial properties of CBD against MRSA, but not against strains used in this experiment. MDR strains of bacteria that were susceptible to CBD according to literature, all had the over expressive efflux pump genes. The bacteria in this experiment lacked the over expression of those genes. In order to understand the role of CBD as an antibiotic, future researchers should consider the over expression or not of the efflux pump gene when planning their studies.

**Davis, H., Ewing, JR., and Whitworth, R.J., Kansas State University.** FACT AND FICTION RELATED TO THE BROWN RECLUSE SPIDER, *LOXOSCELES RECLUSA*. There are several species of spiders in the Midwest that reside with us in structures and homes. However, to most, the brown recluse spider (BRS), *Loxosceles reclusa*, is of greatest concern due to their potentially venomous bite. These spiders are mostly nocturnal and remain hidden in out of the way places where they usually go undetected. As an example, in one Midwestern home over 2,055 BRS were collected in a 6-month period. Even so, there were no bites reported by the homeowners. Thus, we initiated trials in an attempt to better understand BRS management using synthetic organic insecticides. These trials included testing residual activity on different substrates and through scavenging on treated prey.

**Davis-Berg, E.C.<sup>1</sup>, and Wilson, B.A.<sup>2</sup>, <sup>1</sup>Department of Science and Mathematics, Columbia College Chicago, <sup>2</sup>Liberty Public Schools.** MOLLUSCS IN EASTERN KANSAS. In order to understand the ecological impact of factors such as habitat destruction, climate change, and introductions of invasive species, it is useful to have baseline biodiversity levels for the region studied. We have periodic surveys since 2004 from 3 localities: Fitch Natural History Reservation, Breidenthal Biological Reserve which is part of the Baldwin Woods Forest Preserve, and Anderson County Prairie Preserve with multiple sites at each locality and other localities in the midwest. Several sites in Kansas were surveyed by malacologists throughout the 1940s – 1960s including at the University of Kansas field stations. Our results to date have found more snails in Kansas than

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in other states surveyed and at some sites a large number of gastropods per square meter. We can demonstrate fauna changes which indicate succession at Fitch Natural History Reservation. The preliminary species lists for Breidenthal and Anderson County Prairie are the only such lists for these localities. We found very few differences across years at the localities. These data will be compared to historical and land use data to estimate the current level of habitat degradation.

**Drees, R.G., Tucker, A., and Greer, M.J., Fort Hays State University, Department of Biological Sciences, Fort Hays State University Department of Agriculture.** RESTORING MAGNESIUM TO THE WORLD'S FOOD SOURCE THROUGH SOIL NUTRIENT ADDITIONS. Lack of nutrition is a problem that faces numerous people across the world. One of the most important macro minerals that much of the world's population is lacking is Magnesium. Research has shown the mass benefits that Magnesium has on several key functions within the body and more importantly, what the absence of sufficient amounts can cause. Past and current research shows that Magnesium is critical in performing hundreds of activities within the body. Humans receive only a percentage of the minimum amount of Magnesium needed on a daily basis from their diets. It may seem unusual that a mineral so important is so scarce in our food sources when in actuality, it is one of the most abundant elements on Earth. This decline is due to the overuse of agricultural soil throughout the last two centuries depleting many of the nutrients within the soil and as a result, in our food. We aim to determine what results traditional and Magnesium fertilizer applications have on a few common food crops. This experiment will focus on nutrient content of edible grain and biomass in plants exposed to magnesium fertilizer, traditional fertilizer (nitrogen, phosphorus, and potassium), and both fertilizers in combination. Results from this nutrient analysis will be available later in the experiment but plant growth response can be measured by amount of biomass produced per treatment. By increasing Magnesium content in common crop species, we hope to help counteract the magnesium deficiency in the diet of much of the world's population.

**Durr, A.N., and Packauskas, R.J., Department of Biological Sciences, Fort Hays State University.** ANTS IN WESTERN KANSAS. Burning was done in 2017 in an area adjacent to the Sternberg Museum of Natural History known as the Dr. Howard Reynold's Nature Trail area in Hays, KS. Over the past 2 summers, pitfall trapping has been conducted in the nature area to survey insect biodiversity with special focus on ants (Formicidae). Accounts of ant species found during those years will be presented including Kansas's first record of the funnel ant *Aphaenogaster ashmeadi*. Interesting trends in species occurrence across the area will also be mentioned.

**Elias, A.<sup>1,2</sup>, Dumont, B.L.<sup>2,3</sup>, Coyle, K.P.<sup>2</sup>, White, J.<sup>2</sup>, Roberts, N.B.<sup>2</sup>, Roberts, R.B.<sup>2</sup>, <sup>1</sup>Department of Biology, Avila University, Kansas City, MO, <sup>2</sup>Department of Biological Sciences, North Carolina State University, Raleigh, NC, <sup>3</sup>The Jackson Laboratory, Bar Harbor, ME.** GENOMIC SURVEY OF SEX DETERMINATION SYSTEMS IN CHICHLIDS REVEALS AN EVOLUTIONARY HOT-SPOT. Despite sex determination being a fundamental in sexually reproducing species, there is striking diversity in the mechanism. Studying sex chromosomes is essential to understand gene, chromosome, and karyotype evolution, but they present unique challenges for sequencing and assembly. Here we present two comparative genomic strategies to characterize novel sex determination loci and gain insight into how novel sex determination alleles evolve, and how they alter the evolution of the chromosomes they reside upon. In many species where a dominant chromosome determines, sex reversal permits production of individuals homozygous for the sex chromosome, easing analysis. We compared WW and ZZ individuals of the cichlid fish *Metriaclima tarakiki*, characterizing the sex determination system with relatively low coverage sequencing. We anticipate that our strategy will be broadly applicable for rapid characterization of nascent sex chromosomes in species where sex reversal is possible. Polygenic sex determination (PSD) is where multiple genetic factors segregate and interact to direct sexual development. We compared the genomes of four sex genotypes that produce two phenotypic sexes within

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a stable PSD system, *Astatotilapia burtoni*. We identified two sex determination loci at different locations in the genome and identified possible sex determiners in those refined mapping intervals, which notably lack sex determination genes previously found in other vertebrates. The development of a model PSD system will provide the unique ability to address broad questions about evolutionary transitions and epistatic interactions underlying sexual development. Interestingly, the sex determination region identified in *M. tarakiki* overlaps with one of the regions found in *A. burtoni*. Thus, the same locus has been recruited as a sex chromosome in cichlids repeatedly and independently, suggesting that some chromosomes are more likely to be used for sex determination.

**Elliott, J.E., Quispe, N.C. and Maricle, B.R., Department of Biological Sciences, Fort Hays State University.** EFFECTS OF SULFIDE, ETHANOL, AND LACTIC ACID ON CYTOCHROME C OXIDASE AND CITRATE SYNTHASE ACTIVITIES IN PLANT ROOTS. Sulfide, ethanol, and lactic acid are well known as metabolic toxins, yet specific effects on respiration enzymes have not been characterized. The objective of this study was to analyze sulfide, ethanol, and lactic acid toxicity on activities of the enzymes cytochrome *c* oxidase (CytOx), active in oxidative phosphorylation and citrate synthase (CS), active in the citric acid cycle in mitochondria. Enzyme activity was measured in tissue homogenates from roots of several plant species in the presence of sulfide (0 to 20  $\mu\text{M}$ ), ethanol (0 to 100 mM), and lactic acid (0 to 100 mM). Increasing concentrations of sulfide and lactic acid significantly decreased activity in CytOx, however sulfide toxicity had a greater effect on the enzyme compared to lactic acid toxicity. Sulfide was a potent metabolic toxin; activity of CytOx was measured as high as 0.106  $\mu\text{mol min}^{-1} \text{g}^{-1}$  in the absence of sulfide but was reduced to nearly undetectable at 10  $\mu\text{M}$  sulfide. CytOx activity was also reduced by lactic acid but the inhibition constant ( $K_i$ ) was  $10^4$  times that of sulfide toxicity. Increasing lactic acid concentrations caused a threshold response, where CytOx was not affected until 100 mM lactic acid. Ethanol had no effect on CytOx activity. CS activity was not affected by lactic acid and only marginally affected by ethanol. Both sulfide and lactic acid influenced activities of CytOx, but to different degrees, indicating environmental and physiological constraints on plant metabolism, particularly with respect to sulfide exposure and its effects on respiration.

**Engel, R.P. and Maricle, B.R., Department of Biological Sciences, Fort Hays State University.** THE INFLUENCE OF LAND USE ON HONEY BEE (*APIS MELLIFERA*) FORAGE. Pollinators are integral to plant ecology as well as worldwide food availability and security. Understanding how human-driven land use change impacts the nutrition of managed honey bees would be important in pollinator conservation efforts and contribute towards combating recent pollinator declines. Objectives of this study are to determine critical sources of forage for honey bees across different land use types in Ellis County, Kansas, through pollen analysis and taxonomic identification. Study colonies will be placed in one of three separate land use types: Urban, Cropland, or Native/Semi-native. Pollen will be sampled one day per week for the span of the growing season (March 1 to September 30). Pollen abundance (mass) and diversity (number of taxa) will be studied to assess the diet of honey bees throughout an entire growing season to identify key resources and their availability throughout time and space. Understanding the availability of resources in prairies could help to inform conservation decisions and improve understanding of community ecology in prairies. Overall colony health and overwintering success could also be improved with a better understanding of how land composition influences honey bee nutrition. Seeing deficiencies in pollen abundance or diversity collected from hives in a specific environment could indicate similar deficiencies for native pollinators in prairies.

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**Everhart, M.J.<sup>1</sup>, Pearson, G.<sup>2</sup>, Smith, F.<sup>3</sup>, and Shimada, K.<sup>4</sup>** <sup>1</sup>Sternberg Museum of Natural History, <sup>2</sup>Beloit, KS, <sup>3</sup>Tipton, KS, <sup>4</sup>DePaul University. DISCOVERY OF THE FIRST ASSOCIATED SPECIMEN OF THE LATE CRETACEOUS SHARK, *CRETODUS* SP. (ELASMOBRANCHII: LAMNIFORMES) FROM NORTH AMERICA. In 2010, a concretion enclosing several vertebrae of a large shark was discovered by one of us (F.S.) eroding from the Blue Hill Shale Member (Middle Turonian) of the Carlile Formation in Mitchell County, Kansas. About 120 teeth and 60 vertebrae of an extinct shark attributable to the lamniform shark genus *Cretodus* Sokolov were recovered. The specimen (FHSM VP-17575) was donated by the landowner to the Sternberg Museum of Natural History. This is the first known specimen of *Cretodus* in North America that includes major portions of the dentition and the vertebral column. The specimen includes examples of teeth from nearly all positions in the upper and lower jaws as well as teeth in the process of formation, and allowed for reconstruction of the probable dental pattern of this species. Most of the vertebrae were contained in four irregularly-shaped calcareous concretions that were later imaged using computed tomography. Other vertebrae were preserved singly in the surrounding shale matrix and were subjected to more detailed examination. Calculations based on measurements of the vertebrae suggest that the shark was about 4.5 m (15 ft) in length. Additional material collected at the site provides evidence of scavenging by other sharks on the remains, and possible stomach contents. *Cretodus* was one of three large sharks (others being *Cretoxyrhina* and *Cardabiodon*) inhabiting the Western Interior Seaway over Kansas during the early part of the Late Cretaceous.

**Forster, H., and Shuai, B., Department of Biological Sciences, Wichita State University.** EXOGENOUS SMALL INTERFERING RNAs MAY INHIBIT GROWTH OF THE PHYTOPATHOGENIC FUNGUS *MACROPHOMINA PHASEOLINA*. *Macrophomina phaseolina*, causative agent of the plant disease charcoal rot, impacts over 500 plant species, causing devastating crop failures worldwide. In Kansas, it is the biggest cause of soybean crop loss, and disease epidemics are increasingly frequent. Charcoal rot attacks primarily through fungus-infested soil. It enters through the roots and causes rot in roots, fruits, stems, seeds, and leaves of the plant. Traditional pathogen control means, such as natural resistance, crop rotation, and fungicides, have been ineffective or problematic. This study aims to evaluate the effectiveness of host-delivered RNA interference (HD-RNAi) to manage charcoal rot. HD-RNAi exploits the natural process of RNA interference to target essential genes for *M. phaseolina*. In this process, small interfering RNAs (siRNAs) are designed and engineered into plant genomes. Upon infection, siRNAs expressed in plant cells can enter invading fungus and prevent expression of genes necessary for successful infection. HD-RNAi has been successful against some nematodes, insects, and other fungi. In this preliminary work, we have manufactured siRNAs to interfere with genes, *chitin synthase (CHS6)* and  $\square$ -1,3-*glucan synthase (GLS2)*, required for the synthesis of *M. phaseolina* cell wall compounds. We hypothesize that without these compounds, the fungus will be unable to grow and infect plants. To test siRNA effectiveness, we incubated the fungus with siRNAs and measured its growth. To date, we have observed apparent suppression of growth in fungus treated with siRNAs against *GLS2* at early timepoints. We are working on optimizing testing conditions and developing an assay to evaluate the efficiency of siRNAs. Our work gives insights into RNA interference in *M. phaseolina* and provides a framework for future siRNA testing.

**Fowler-Finn, K., Department of Biology, Saint Louis University.** MATING IS DIFFICULT IN A WARMING WORLD! As global temperatures increase, and weather becomes increasingly unpredictable, how will insects respond? We explore how finding mates may be impacted by global warming by testing how insect songs are affected by ambient temperatures, as well as how the coordination of mating may be disrupted by temperature fluctuations.

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**Frank, K., and Channell, R., Fort Hays State University Department of Biological Sciences.**

**SHELTERBELT CHARACTERISTICS THAT INFLUENCE BIRD SPECIES RICHNESS.** Shelterbelts are one or more rows of trees that were used in the Great Plains to block wind from farms. Shelterbelts are used by birds for migration, shelter, mate attraction, food resources, and nesting. I conducted my study between April and July 2018, I used the point-count method to record species at 25 shelterbelts in Rooks and Russell counties in Kansas. My hypothesis was that shelterbelt characteristics influence bird species richness. I measured shelterbelt characteristics, including tree type, diameter at breast-height, percent canopy cover, percent foliage cover, plant growth form, litter depth, understory visual obstruction, surrounding habitat, distance to road, distance to water, distance to nearest group of trees, shelterbelt area, and shelterbelt perimeter. I recorded 58 total species. The shelterbelt with the highest species richness (n=25) and lowest species richness (n=6) were located in Webster Wildlife Area, in Rooks County. The relationship between species richness and shelterbelt characteristics will be analyzed using regression analysis. This study could be used to help landowners and range managers design shelterbelts to attract birds of preference and keep nuisance birds out of the shelterbelts.

**Gonzales, E.N, Banes, T.C., and Williams, D.R., University of Saint Mary.** INITIAL REPORT ON SKELETAL LESIONS IN VIRGINIA OPOSSUMS (*DIDELPHIS VIRGINIANA*) FROM LEAVENWORTH COUNTY, KS. We recently initiated a student-led research project to collect roadkill Virginia Opossums (*Didelphis virginiana*) in Leavenworth County, KS and analyze the skeletons for the distribution and type (healed fracture, disease) of antemortem skeletal lesions. Dog attacks, falls from trees, and automobile collisions are some previously proposed causes of these skeletal lesions. Our limited data collection thus far has led to new hypotheses. From the seven individuals collected to date we have already found two instances of tail injuries, with one adult female with the crown of a canine comparable to *D. virginiana* embedded in a proximal caudal vertebra. We found potential cases of disease as well, with the most severe being a periosteal proliferation joining two thoracic vertebrae. The healed tail injuries are consistent with observations of aggression within *D. virginiana*. The noted instance of disease is comparable in form to osteoarthritis, although further study is required to make a diagnosis. We will be collecting further data for this long-term project to further test for intraspecies aggression as a cause of healed skeletal injuries, as well as more cases of disease-related lesions.

**Grasing, M., and Sempertegui-Sosa, C., Truman State University.** TICK ABUNDANCE AND SEASONALITY IN TWO LOCATIONS IN CENTRAL MISSOURI. *Amblyomma americanum* is the most common tick species in Missouri and a rising vector of several pathogens. Our goal is to contribute to knowledge about the distribution and abundance of tick populations in Missouri and their relationship to tick-borne infections in humans. We collected ticks in two locations from March to November, using dry ice traps and drag sampling. Our sampling locations were chosen based on hotspots for reported human infections of Ehrlichiosis, caused by the bacterial pathogen *Ehrlichia chaffeensis* and Rocky Mountain Spotted Fever, caused by the bacterial pathogen *Rickettsia rickettsii*. Our sampling locations were Knob Noster State Park, in Johnson County, Missouri and Mark Twain National Forest, in Boone County, Missouri. Our hypothesis was that tick abundance would be greater in the location with higher rates of tick-borne disease in humans. Nearly all the 7,553 collected ticks were *A. Americanum*, but 0.3 percent were *Dermacentor variabilis*. There were not significant differences in the number of larvae, nymphs, adults or total ticks between the two locations. However, more nymphs were found in Knob Noster while more adults were found in Mark Twain National Forest. Adult ticks were found April to June, nymphs were found April to November and larvae were found July to November. We are in the process of obtaining current epidemiological data from the counties of our sampling locations to use in comparisons of the sites. In the future we will continue to collect at these locations to assess change in tick populations over time.



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**Grosdidier, R., Morrison, W., Domingue, M., Arthur, F., and Myers, S.W., Department of Entomology, Kansas State University; USDA-ARS Center for Grain and Animal Health Research, Manhattan, KS; USDA-APHIS Otis Laboratory, Buzzards Bay, MA.**

**TROGODERMA VARIABLE IS NOT AN ADEQUATE SURROGATE SPECIES FOR THE BEHAVIORAL RESPONSE OF THE INVASIVE STORED PRODUCT PEST, TROGODERMA GRANARIUM** (COLEOPTERA: DERMESTIDAE) *Trogoderma granarium*, the khapra beetle, is a quarantine threat in the US, but its biosecurity status slows research on optimizing surveillance tools for the species. Using a non-quarantined, but closely related dermestid as a surrogate species for the behavioral response of *T. granarium* would quicken the pace of research. One closely related species is *Trogoderma variable*, the warehouse beetle. The two species respond similarly to exposure to insecticides. To compare the behavioral responses between the two species, we used an arrestment assay and a trapping assay that tested the effectiveness of four lures with pheromones and/or food cues. We found that arrestment of larvae by the lures and the effectiveness of lures placed in box traps was species-specific. While our data does not support the use of *T. variable* as a behavioral surrogate species for *T. granarium*, it contributes valuable data on which lures may be most effective in capturing both species in future field trials.

**Grove, A.L., and Packauskas, R.J., Department of Biological Sciences, Fort Hays State University.** MOSQUITOES IN WESTERN KANSAS. Mosquitoes were captured in summer 2018 from four different locations in Hays, KS using BG-Sentinel 2 mosquito traps. Trap setup, species counts, and their importance will be presented, along with some morphology. Other species from western Kansas identified in the collection of the Sternberg Museum will also be noted.

**Haller, R., and Leung, S.H., Chemistry Department, Washburn University.** PROGRESS TOWARD THE SYNTHESIS OF EXPANDED OXOPHLORINS. Expanded oxophlorins are substances that could absorb within the visible spectrum of light. These compounds can be useful as photosensitizers for cancer treatment in photodynamic therapy (PDT). One way to synthesize expanded oxophlorins is to synthesize a dipyrroyl- $\alpha$ ,  $\beta$ -unsaturated ketone. This can then be combined with a dipyrromethane in a MacDonald-type synthesis. Since the dipyrroyl- $\alpha$ ,  $\beta$ -unsaturated ketones are unknown, much of our research has been focused on the synthesis of these compounds. We have been using aldol condensation in this synthesis. While aldol condensation has not been effective, a longer multi-step synthesis has been used to synthesize a dipyrroyl- $\alpha$ ,  $\beta$ -unsaturated ketone. However, because the reaction scale was too small, the MacDonald-type synthesis could not be attempted. Further studies must be performed by increasing the reaction scale.

**Hamm, S.A. and Cicimurri, D.J., Campbell Geology Museum, MICRO SELACHIAN FAUNA FROM THE OZAN FORMATION (MIDDLE CAMPANIAN) IN EAST TEXAS.** A diverse vertebrate fauna was recovered from a phosphatic red zone contacting the Gober Chalk of the Austin Group and the Ozan Formation of the Taylor Group in Fannin County Texas. This zone is bounded by the middle Campanian ammonite *Menabites delawarensis* and occurs within the *Inoceramus balticus* zone and may represent an initial transgressive deposit of the Taylor Group on top of the Austin Group. Bulk sampling has yielded a new fauna dominated by thousands of elasmobranch teeth, but also includes the osteichthyans *Enchodus petrosus*, *Stephanodus* and *Anomoedus phaseolus* and a single tooth of the mosasaurid *Globidens alabamaensis*. Twenty-two elasmobranch species are identified including 2 hybodont, 9 lamniforme, 1 heterodontid, 1 hexanchid, 3 orectolobiformes, 5 sclerorhynchids and 1 myliobatiforme. The majority of the elasmobranch teeth are less than 1 cm in size and show no signs of wear or abrasion, indicating they were not transported far and quickly buried. The exposure is of limited areal extent and has not been located above or below strike of the study locality. This fauna adds to the biostratigraphy and paleobiogeography of the Western Interior Seaway and the Mississippi embayment.

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**Han, D., and Sievert, L., Emporia State University.** THE EFFECT OF TEMPERATURE ON ACTIVITY OF THE DIGESTION AND HOPPING BEHAVIOR OF *ANAXYRUS WOODHOUSII*. *Anaxyrus woodhousii* occupies an extensive range of habitats in the United States. However, as an ectotherm, temperature regulation plays a critical role in digestive physiology of *A. woodhousii*. We were interested in whether temperature affects the rate of a toad's digestion. To test that, we used 20 male and female Woodhouse's toads individually acclimated in stable temperature chambers at  $16 \pm 1^\circ\text{C}$ ,  $21 \pm 1^\circ\text{C}$ ,  $26 \pm 1^\circ\text{C}$  and  $31 \pm 1^\circ\text{C}$ , we fed toads crickets with a different colored bead at 12:00pm for 7 days. Each toad was acclimated and tested at the 4 different temperatures. Every day we gave each toad 2 crickets and one bead. We checked toads 3 times every day to find the beads until we found all 7 beads.

**Hanson, C.A. and Maricle, B.R., Department of Biological Sciences, Fort Hays State University.** INFLUENCES OF DROUGHT AND DISTURBANCE REGIMES ON SUBALPINE FOREST IN THE ROCKY MOUNTAIN NATIONAL PARK: COMPARISONS BETWEEN 2001 AND 2018. Subalpine forests are impacted by three major disturbance regimes: fire, beetles, and blow down. Disturbances, both human-induced and natural, shape forest systems by influencing their composition, structure, and functional processes. The objective of this study was to analyze changes in subalpine forests during disturbances in Rocky Mountain National Park following years of prolonged drought and increasing temperatures. Subalpine forest composition was compared in 2001 to current composition. Stand age, structure, and composition were measured, as well as visible damage, which included beetles, blowdown, and visible causes of standing dead. Past data were collected from the National Park Service Vegetation Inventory Database, USGS, NASA, and the United States Forest Service Rocky Mountain Region beetle survey data. Rings on tree cores were counted and used to determine the disturbances that may have affected the stand being studied, like fire scars. Each plot was monitored for beetle damage to correlate with satellite defoliation research to determine characteristics that beetles might be selecting for. 397 adult trees and 355 saplings were sampled, for a total of 752 trees. Beetle presence was correlated with larger DBH, but no other measured variables were significant. Using Enhanced Vegetation Indices, we can compare photosynthetic rates between the different plots to determine if the beetle activity is impacting the photosynthetic rates of the trees. Understanding the relative importance of these disturbance regimes and climate change on subalpine forest succession is important for conservation because knowing how these forests respond to disturbance can help develop management techniques in the future.

**Hardgrove, C., and Morris, E., Department of Biology and Chemistry, Baker University.** ANALYZING MITOCHONDRIAL GENE CYTOCHROME OXIDASE I (COI) AND CYTOCHROME B (CYTB) IN 13-YEAR PERIODICAL CICADAS. The Great Southern Brood (Brood XIX) is a 13-year brood of periodical cicadas that was last seen in 2011. The Brood consists of four species; *M. tredecim*, *M. neotredecim*, *M. tredecassini*, and *M. tredecula*. Samples were collected from two sites in Missouri, then regions of two genes were sequenced to investigate population characteristics. Cytochrome B (CytB) has been used to understand genetic variation within a population to understand evolutionary events. Cytochrome Oxidase I (COI) is used across taxa to identify species and uncover evolutionary relationships. The sequence data obtained from cicadas from Brood XIX will be used to build phylogenetic trees to show the relatedness of the cicadas. The CytB sequence data will examine the genetic variation within the Missouri population of cicadas and sequencing the COI gene will identify Missouri cicada species in Brood XIX.

**Harrison, S., and Greer, M.J., Fort Hays State University Department of Biology.** ANALYSIS OF PLANT-SOIL MICROBIOMES SURROUNDING NATIVE AND NON-NATIVE GRASSES ACROSS A PRECIPITATION GRADIENT IN KANSAS. Old World Bluestem (OWB, *Bothriochloa* spp.) is a general term for a group of non-native, warm season, perennial bunchgrasses. These problematic grasses were originally introduced to increase forage for livestock and reduce soil erosion, but are now causing problems for our

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native rangelands as they outcompete native grasses and creating monocultures. Within grasslands, there are a wealth of important microorganisms that have an impact the plant communities they surround. From arbuscular mycorrhizal fungi (AMF) to nitrogen fixing bacteria, parasitic “cheater” mycorrhizae to disease causing bacteria, soil microorganisms have a strong effect on the fitness potential of plants. Our study analyzes non-animal soil microbial community differences (i.e. species richness and community composition) between native and non-native grasses and across the precipitation gradient in Kansas. We collected 195 soil cores from the two invasive bluestem species yellow bluestem (*Bothriochloa ischaemum*) and Caucasian bluestem (*Bothriochloa bladhii*), and two native species little bluestem (*Schizachyrium scoparium*), and big bluestem (*Andropogon gerardii*) at four different sites across Kansas. Soil DNA and RNA will be extracted using Macherey-Nagel Soil DNA Extraction Kit protocol and sequenced. Bray-Curtis dissimilarity will be used to contrast variations in the richness and/or community structure between the grass species and/or across the precipitation gradient. We expect to see lower species richness from soil samples surrounding OWBs than native grasses, and moving East to West across the precipitation gradient. Determining if differences in the microbiome exist between these native and non-native grasses will improve the effectiveness of eradication and restoration efforts.

**Heffren, P., and Schmidt, S., Department of Chemistry, Washburn University.** SCHIFF BASE CYCLIZATION TO FORM A CROSS PROTECTED TETRAAZAMACROCYCLE.

Macrocyclic coordination complexes have been used in radiotherapy and medical imaging for many years. [4<sup>6</sup>] Adamanzane is one such chelator which may have several advantages over current macrocyclic ligands. This is due to the total encapsulation of the metal ion it is expected to provide, protecting the body from exposure to potentially toxic metals. One of the major chemical intermediates in the synthesis pathway for the production of [4<sup>6</sup>] adamanzane is a cross-protected tetraazamacrocycle, however this intermediate has proven difficult to synthesize. Synthesis of one such cross-protected tetraazamacrocycle was achieved using a Schiff base condensation reaction between a linear dialdehyde and diamine. The cross-protected tetraazamacrocycle was also allylated and ring closing metathesis was performed as proof of concept. Finally, novel reaction schemes were also investigated in an endeavor to produce a one-pot synthesis strategy.

**Hoffman, B.L., and Hageman, S.A., Department of Natural and Physical Sciences, Park University.**

PRELIMINARY ANALYSIS OF TEETH OF THE EXTINCT REQUIEM SHARK *PHYSOGALEUS CONTORTUS* (ELASMOBRANCHII: CARCHARHINIFORMES) AS CUTTING TOOLS.

*Physogaleus contortus* teeth are common in Pungo River Formation (Neogene: Miocene) float material from the PCS mine of Aurora, North Carolina. These tiger-like shark teeth have a thick crown with cutting edges and a well-developed distal heel which are serrated, indicating cutting function. The crown is taller and narrower than true tiger sharks (*Galeocerdo* sp.), suggesting grasping function. The mesial cutting edge is warped with serrations changing direction apically. While the evolutionary advantage of this curvature is not immediately apparent, comparison to the cutting edges of various knives and saws are instructive, especially when considering forces exerted on the tooth during prey processing in vertical motion (grasping), horizontal motion (head shaking – cutting/tearing) and rotational motion (cutting/tearing).

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**Hosek, A., and Schmidt, S.E., Department of Chemistry, Washburn University.** ALKYLATION OF NOSYLAMIDE TO FORM AZAMACROCYLCES. Present research is focused on the synthesis of polycyclic cage systems that contain amine functionalities, such as [46] adamantane. Macrocyclic complexes have been used as imaging agents and in radiotherapy. The macrocycles serve as a “host” that carries a metal ion through the body. Previous research done with this macrocycle included generation of the cage structure by allylation of an amine followed by ring closing metathesis to form macrocycles. Deprotection of amines in the macrocycle is necessary, however proved difficult when removing p-toluenesulfonamide (tosylamide) protecting groups. The purpose of this research is to form macrocycles by alkylation of 4-nitrobenzenesulfonamide (nosylamide) followed by ring closing metathesis and deprotection of the amines. Utilizing nosylamide, instead of tosylamide, may allow for full deprotection of the amines in the macrocyclic structures.

**Isidori, T., The University of Kansas.** OVERVIEW ON TIMING DETECTOR: PARTICLE PHYSICS AND APPLICATIONS. During recent years, the world of physics experience a huge grow of interest in timing detectors: detecting devices capable of resolving the time coordinate of the passage of a particle with unprecedented precision. These intensive R&D campaigns resulted in a collateral effects in many other science fields, due to the detectors versatility of application. The presentation gives a brief introduction to the audience on the working principles of these devices, trying to cover the description of their characteristic and proprieties and giving an overview on the most successful example of their use. One of the major focus of attention of the talk will be represented by the work directly performed by our KU group on timing detector: the group is currently active in the development, test and optimization of fast timing prototypes with resolution of the order of tens of picoseconds.

**Jones, R., Physical Science Department, Emporia State University.** EXPERIMENTS WITH AN AUTONOMOUS SOFTWARE AGENT A.S.A. H. We find: 1. Some of the concepts (case vectors) Asa learns are subsymbolic and are not associated with names (words). 2. To “hog” a resource Asa learns to issue an invalid warning call; i.e. a lie. 3. A simulator can only present a robot with that portion of reality that we understand and have modeled. 4. A word/name as a salient feature of a category plays a role in attention. 5. Asa can have a 1-dimensional memory for speech a 2 D memory for images a 3 D memory for agent distribution in space etc. 6. High temperatures and acceleration can serve as pain components. 7. NOT (pain) serves as a component of a case’s vector utility.

**Kjaer, E.L., and Houseman, G.R., Department of Biological Sciences, Wichita State University.** THE EFFECTS OF AGGREGATED SEED ARRIVAL AND SOIL HETEROGENEITY ON PLANT DIVERSITY. When attempting to re-establish native plant communities on degraded lands, seeds are sown or planted using “well-mixed” or uniform mixtures. However, such seed mixtures rarely occur in natural plant communities, where most plants occur near conspecifics due to aggregated seed dispersal. Additionally, soil conditions often vary in unknown ways potentially influencing the establishment success of sown plant species. We tested how seed distributions (uniform versus aggregated) and soil heterogeneity influence species richness in plant communities in a grassland in south-central Kansas. We established 96, 4x4.8 m plots each divided into 120 large-scale patches (0.4x0.4 m) or 480 small-scale patches (0.2x0.2 m). We then excavated, mixed, and redistributed soil within each plot to create either homogenous or heterogeneous soil conditions. Seeds were sown with either one species per patch, to create aggregated species distributions within the plot, or were sown uniformly throughout the plot. After two years, we found that species richness did not vary between plots with homogenous or heterogeneous soils and that the responses were similar in plots with large or small patch sizes. However, plots with aggregated seed sowing had higher species richness than plots with uniform sowing. These results suggest that utilizing aggregated rather than uniform seed dispersal may be important to enhance local species richness when restoring prairie ecosystems.

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**Kolok, J., Truman State University.** **PHYSIOLOGICAL AGE DETERMINATION OF LONE STAR TICK NYMPHS IN MISSOURI.** The lone star tick is a growing health risk across the country. This fact has led to large bodies of work aimed at understanding their lifecycle. The literature and others in the lab have shown that hemoglobin concentrations serve as a good determinant of physiological age. Ticks were collected from field sites during summer 2018. Lone star nymphs were massed and homogenized in Drabkin's reagent and spectrophotometrically measured for hemoglobin content. There is a general downward trend in hemoglobin concentrations over time. Hemoglobin concentrations increase again in early July and remain fairly constant until the end of the sampling season in September. Two hypotheses have been postulated which suggest ticks engage in different behaviors during winter and summer that would either use or conserve hemoglobin at different rates. It is likely that high temperatures and dry conditions during the summer and cold conditions during the winter would stress individual nymphs.

**Kostner, D., Dougherty, M., Schmidtberger, A., Abernathy, O., and Kobayashi, Y., Department of Biological Sciences, Fort Hays State University.** **RELATIONSHIP BETWEEN O-LINKED N-ACETYLGLUCOSAMINE TRANSFERASE (OGT) MRNA EXPRESSION AND NUTRITIONAL STATUS IN THE CHANNEL CATFISH MUSCLE.** Various intracellular "switches" such as O-linked N-acetylglucosamine Transferase (OGT) serve as a nutrient sensor and activate or inactivate numerous intracellular metabolic pathways in response to the nutritional status of an organism. In our previous studies, brain and liver expression of OGT mRNA was influenced by the nutritional status in channel catfish. However, expression of OGT mRNA in response to changes in nutrition is unclear in the muscle. The objective of the current study was to examine the relationship between expression of OGT mRNA and the nutritional status in the muscle of channel catfish. The muscle samples were collected from two different feeding studies. In the first 28 day study, fish were assigned to the control (fed once a day), fasted (no feeding), or refed (fasted for the first 14 days and fed once a day for subsequent 14 days) treatment. For the second separate feeding study, fish were fed once every 48 or 24 hours, or twice every 24 hours for 28 days. Muscle expression of OGT mRNA was measured from the samples collected on day 28 of the respected studies using real-time polymerase chain reaction. Changes in feeding frequency did not influence the expression of OGT mRNA in the muscle, but fasting fish tended to increase the muscle expression of OGT mRNA in channel catfish. The results of this study along with other studies from our laboratory indicate that muscle expression of molecular switch genes such as OGT is somewhat insensitive to the nutritional status.

**Lang, S., and Wilgers, D., McPherson College.** **SPIDER STDs? EXPLORING THE EFFECTS OF *PSEUDOMONAS AERUGINOSA* ON MATING BEHAVIORS IN THE WOLF SPIDER *RABIDOSA PUNCTULATA*.** Expression of different mating behaviors attempts to maximize individual fitness for each of the sexes across different contexts. Mate choice by females attempts to maximize their fitness either indirectly by enhancing offspring quality, or directly through gains that may enhance their personal investment into survival or reproduction. Choice of mates that minimize the risk of parasite or disease transmission should play a large role in female decisions. Male mating behaviors attempt to maximize their fitness through increasing their likelihood to mate with females they encounter. The wolf spider *Rabidosia punctulata* is a cursorial species, which brings it into contact with a common soil-dwelling arthropod pathogen, *Pseudomonas aeruginosa*, commonly causing internal infections that initiate costly immune responses. We artificially infected males with *P. aeruginosa* by inoculating their exoskeleton and subsequently investigated its effects on both female and male mating behaviors. The application of bacteria did not increase overall external bacterial load or internal infection load in males. Mating behaviors of neither the females (mate choice or time spent in association) nor the males (mating tactic expression) were influenced by our male infection treatment. Investigation into any potential transfer of bacteria to females during mating encounters suggested no female costs of this association as

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females in both the treatment and control had similar external bacterial loads. Overall, this suggests that bacterial infections, both external and internal, may not be a driving source of selection on this wolf spider mating system.

**Laney, H., Beaty, M. and Cunningham, J., Biology Department, Johnson County** CHARACTERIZATION OF THE ANTIMICROBIAL ACTIVITY OF A *BURKHOLDERIA* ISOLATE. A soil sample was gathered from a basement dig at a residential neighborhood construction site in suburban Kansas City. The soil sample was then serially diluted, and colonies of bacteria were grown and isolated. Colony 3 was the bacteria chosen for further investigation. Through PCR and DNA sequencing of the 16s rRNA gene, it was determined this bacterium was from the *Burkholderia* genus and the species is yet to be determined. Research has been done to optimize the production of antimicrobial metabolites. This species of *Burkholderia* has been shown to inhibit many types of bacteria, including the human pathogens, *Escherichia coli* and *Staphylococcus aureus*. Further study is planned to isolate and characterize antimicrobial metabolites.

**Lawless, B.L.<sup>1</sup>, Noland, M.A.<sup>1</sup>, Schmidt, C.J.<sup>2</sup>, and Greer, M.J.<sup>1</sup>, <sup>1</sup>Department of Biological Sciences, Fort Hays State University, <sup>2</sup>Sternberg Museum of Natural History, Fort Hays State University.** SMALL SCALE RESTORATION OF THE STERNBERG NATURAL AREA: INFLUENCES ON SMALL MAMMAL COMMUNITIES. Human influences, such as urbanization and land use change, have drastically altered the structure and function of grassland ecosystems. Conservation and restoration of these areas are vital in preserving diversity across the Great Plains. The Howard Reynolds Natural Area, located on the Sternberg Museum property, has undergone numerous restoration efforts (e.g. tree removal, prescribed burning, and forb garden establishment) to increase the ecological integrity of the area as well as appeal to stakeholders for outdoor recreation. Our objective is to determine if these restoration activities are having an influence on the small mammal community. Trapping seasons consisted of four trap nights per season, with five transects each containing twenty Sherman live traps spaced ten meters apart. Preliminary results have shown that both species richness and number of individuals have decreased from the last two consecutive years of trapping. Specifically, hispid cotton rat (*Sigmodon hispidus*) has declined. This cotton rat decline may be due, in part, to the increased precipitation amount and frequent flooding to the area during the late summer months. The decrease in species richness is most likely due to the low number of captures for some species, making them easy to miss in a single trapping season. For future research, a long-term monitoring plan is crucial in determining the small mammal response to restoration activities, as great variability has been seen year to year.

**Lindsey, C., and Royon, C., University of Kansas.** SEARCHING FOR SATURATION AT THE LHC. The proton is one of the most fundamental particles in nature, but it is far from being elementary. Since its discovery in 1920 experiments have continued to probe various aspects in order to further our understanding but there is still much that eludes us. One such property is the behavior of the gluon, which is the particle that holds the proton together, at very high energies. It is theorized to reach a point where the density reaches a saturated state and cannot increase any further. This has never been seen before and I will discuss the possibility of seeing this saturated state by using particle collisions at the Large Hadron Collider.

**Maccarone, A.D., and Harper, A.C., Friends University.** BREEDING PHENOLOGY AND REPRODUCTIVE SUCCESS BY LITTLE BLUE HERONS (*EGRETTA CAERULEA*) IN AN URBAN MIXED-SPECIES COLONY. Little Blue Herons (*Egretta caerulea*) often join other egrets and herons in mixed-species breeding colonies. In June and July 2018, a random sample of 26 Little Blue Heron nests located in an urban colony were monitored during the breeding season. The goals of this study were to characterize nest-activity patterns by attending parents over the course of the breeding cycle and document reproductive success in an urban colony amid human disturbance. Scan samples with 5-min intervals were used to record

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activity during 50 h of observation of 24 study nests. An additional 77 h of focal samples at two other nests documented nesting phenology. Observations made at random times during morning, midday, and evening periods yielded 636 nest-hours across all stages. During incubation, parents mostly sat (63%) or stood (23%) near the nest and spent less time in nest maintenance (5 %) and self-maintenance (5 %). By midway through the breeding cycle, adults spent more time standing (70%) and less time sitting (11%) and in nest maintenance (1%). Toward the end of the breeding cycle, both parents were away from the nest 69% of the time. Of the 26 total nests monitored, 39 chicks fledged ( $1.4 \pm 0.3$  chicks/nest attempt). The 16 successful pairs (61 % of all nests) fledged a mean of  $2.4 \pm 0.2$  chicks. Most unsuccessful nests were taken over by Cattle Egrets (*Bubulbus ibis*), or the chicks eaten by Black-crowned Night-herons (*Nycticorax nycticorax*). We describe sources of disturbance at this colony and its possible effect on breeding success.

**Madeira, B.C., Emporia State University.** REVIEW OF CURRENT CONTROVERSIES IN THE EVOLUTION OF THE GENUS *HOMO*. This research involved the investigation of current controversies in human evolution through a thorough exploration of the literature, covering taxa from the later part of the australopithecine lineage through the entire clade of the genus *Homo*. New fossil and artifact discoveries, as well as new investigative techniques, have been changing the way we view human evolution. The goal was to examine several controversies involved in the origin and evolution of the various species of *Homo*. These controversies include (with my conclusions following): (1) Are *H. habilis* and *H. rudolfensis* the same species? It's possible that all early *Homo* represent one variable species, however, current evidence only suggests to subsume *H. rudolfensis* into *H. habilis*. (2) Are *H. erectus* and *H. ergaster* the same species? Variability demonstrated by specimens at Dmanisi, Georgia, allows the inclusion of *H. ergaster* into *H. erectus*. (3) Which species of *Homo* was the first to use spoken language? Evidence from stone tools, morphologic features, and assumed seafaring culture, suggests *H. erectus* likely was the first species to use human-like language. (4) What is the phylogenetic ancestor of *H. floresiensis*? It's likely that *H. floresiensis* dwarfed from an *H. erectus* ancestor (5) What is the phylogenetic position of *Homo naledi*? Although still uncertain, due to its known age, it's likely to be a descendant of *H. erectus*. (6) Why did Neanderthals become extinct? *Homo sapiens* outcompeted Neanderthals for resources, however, it's unlikely that interactions were hostile, considering evidence of interbreeding.

**Mahr, M.S.<sup>1</sup>, Autz, J.<sup>1</sup>, Buchanan, J.L.<sup>1</sup>, Powell, A.F.L.A.<sup>1</sup>, Sievert, L.M.<sup>1</sup>, Edds, D.R.<sup>1</sup>, Riedle, J.D.<sup>2</sup>, <sup>1</sup>Department of Biological Sciences, Emporia State University, <sup>2</sup>Kansas Department of Wildlife, Parks, and Tourism.** MORPHOLOGICAL VARIATION, GEOGRAPHIC DISTRIBUTION, AND TAXONOMIC BOUNDARIES OF MAP TURTLES (*GRAPTEMYS* SPP.) IN KANSAS. Kansas lies at the western extent of the distributions of four map turtle taxa, the Northern (*Graptemys geographica*), Ouachita (*G. ouachitensis*), Northern False (*G. p. pseudogeographica*), and Mississippi (*G. pseudogeographica kohnii*) map turtles. The presence and geographic distributions of these taxa in the state are poorly documented because many museum specimens lack diagnostic features (e.g. many are only shells and lack soft parts), because of disagreement as to what constitute diagnostic characters, and because of lack of agreement on species limits. Being morphologically and behaviorally similar, these turtles can be difficult to identify in areas where their distributions overlap, resulting in unreliable sightings. Currently, the Ouachita, Northern False, and Mississippi map turtles are treated as an unresolved species complex in the state herpetological literature. To obtain reliable locality records of each map turtle taxon in eastern Kansas, we are conducting visual surveys (using telescope with camera) and catching turtles with baited traps. Our goal is to carefully document and analyze the geographic distribution of morphological variation related to criteria for species and subspecies diagnoses. In 2017–2018, we captured 103 map turtles, all of which were easily identified (None had ambiguous or intermediate morphological features used in taxonomic diagnoses).

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We found the Northern Map Turtle in the Missouri (Blue), Marias des Cygnes, and Neosho river drainages. We detected the Northern False Map Turtle only in the Missouri River. Both the Ouachita Map Turtle and the Mississippi Map Turtle occurred in the Neosho, Verdigris, and Marais des Cygnes river drainages.

**McCowen, P.J., Miller, W.R., and Kimball, S.A., Department of Biology and Chemistry, Baker University.** TARDIGRADES OF NORTH AMERICA: RECORDS OF AQUATIC SPECIES NEW TO THE STATE OF KANSAS, U.S.A. Historically, there has only been one aquatic tardigrade reported from Kansas. After an extensive campaign, we were able to add five species of aquatic water bears to the biodiversity list for the state of Kansas: *Dactylobiotus dispar*, *Dactylobiotus sp.*, *Isohypsibius granulifer*, *Murrayon pullari*, and *Mixibius saracenus*. A key was developed with images of the bodies, mouth parts, and claws to allow researchers to separate and identify the species. Ecological requirements and population observations were also collected to further our knowledge on aquatic tardigrades in Kansas.

**McLoud, J., Gaede, C., and Parris, M., Tabor College.** TESTING DNA BARCODING CRITERIA FOR COMMON AIRBORNE FUNGI: ARE ALL THE ASSUMPTIONS TRUE? Common airborne fungi effect human-health as seasonal allergies and as opportunistic pathogens. The frequency is increasing to use molecular surveying methods to analyze which fungi are present in air samples. The molecular surveying identifies fungi based on their DNA sequences for the ribosomal operon, commonly referred to as DNA barcoding. This ribosomal gene has many copies within each cell, which creates problems for determining the range of DNA sequences that belong to each genus. Moreover, the criteria (commonly used) that a species possesses operational taxonomic units that are 97 % similar was determined using the bacterial model, not fungi. This investigation will identify the DNA sequence similarity of common airborne fungi to test if the 97% criterion is appropriate for the fungal model. Methods to be used in this investigation are culturable sampling, thin layer chromatography (TLC), next generation sequencing, and bioinformatics.

**McPhail, B., and Boyd, L., Department of Biology, Washburn University.** DEVELOPMENT OF A BEHAVIORAL BASELINE OF CAPTIVE *L. ROSALIA* AT THE TOPEKA ZOO. Manipulating environmental conditions or altering groups in controlled experiments is often not possible in zoos. This condition often leaves behavioral observations as one of the primary mechanisms to assess the outcomes of environmental modifications or introductions of new members to exhibits. These observations can often be difficult to interpret without a baseline behavioral reference. Here we intend to establish a baseline behavioral reference for the golden lion tamarins, *Leontopithecus rosalia*, at the Topeka Zoo. *L. rosalia* is an endangered small social primate found in the coasts of Brazil living in groups anywhere from 2-11 individuals. We were primarily interested in gaining a baseline for their interactions with enrichment objects, and social interactions. Additionally, any behavior that could be seen as a sign of stress was noted. Behaviors we recorded were vocalizations (e.g. chirping, trills, squeaks, and whines), grooming, eating, movement, hiding, interactions with components of the exhibit, and any signs of stress. Behavioral observations were obtained using scan sampling at two-minute intervals for one hour. Observations were taken around 10:00-11:00 am and stretched from January 22nd to April 5th. Although their behavior was variable and distinct differences were observed between the two *L. rosalia*, some trends were noticeable. Both *L. rosalia* appeared to interact more with the environment and had little preference when it came to enrichment objects. Additionally, they both appeared to spend more time in the open than in hiding. Overall the results of this study present a baseline to compare their behavior for when something changes.

**Mers, M.R., Emporia State University.** PRELIMINARY ANALYSIS OF ENIGMATIC TRACE FOSSILS FROM LATE CRETACEOUS DEPOSITS OF MONTANA. In eastern Montana lies semi-arid and heavily eroded badlands composed of Late Cretaceous sediments that form the Hell Creek Formation. In 2014, a



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colleague and I discovered small-diameter holes that were the opening to vertical tubes in a sandstone bed of this formation. These tubes occurred in weathered cobbles of manganese oxidized sandstone, as well as in massive channel sandstone blocks. Some tubes were topped by cones of sediment surrounding the opening, which could be a result of weathering. In plain view, the holes were distributed only a few centimeters from one another, and they covered tens of meters in area. The tubes appeared to be trace fossil burrows of some sort. Samples collected of the loose cobbles showed that the burrow diameter ranged from 2 to 5 mm, but within a single burrow it was consistent throughout its length. The complete length of these fossils could not be measured due to the fact that these were from eroded samples. Nothing has been published on burrows within the Hell Creek Formation. An unpublished 2004 Master thesis on the stratigraphy of the Hell Creek and Fox Hills formations by Jennifer Flight at the Montana State University, Bozeman, identified similar burrows as *Skolithos* of the *Glossifungites ichnofacies*, but no descriptions of the fossils were provided, only photos. Further review of the literature indicates the Hell Creek fossils may be *Skolithos linearis* because of the burrows straight vertical trajectory, but this cannot be confirmed without additional study of the site and specimens.

**Morphew, A.R.<sup>1</sup>, Jameson, M.L.<sup>1</sup>, Houseman, G.R.<sup>1</sup>, Jensen, W.E.<sup>2</sup>, Reichenborn, M.M.<sup>1</sup>, Watson, D.F.<sup>1</sup>, and Kjaer, E.<sup>1</sup>, <sup>1</sup>Wichita State University, <sup>2</sup>Emporia State University.** NATIVE BEE RESPONSES TO HABITAT MANAGEMENT OF RESTORED GRASSLANDS IN THE GREAT PLAINS. Loss of grasslands in the Great Plains has displaced native bee species through the conversion of nesting and foraging habitat to cropland. The federally-supported Conservation Reserve Program (CRP) converts marginal cropland to restored grasslands that can serve as reservoirs for native species, but few studies have examined the success of these lands in supporting native bee communities. We sampled bee and floral communities on 108 CRP fields spanning 650 km and a precipitation gradient of 43-109 cm annually. Our research included a grazing treatment and a restoration treatment incorporating a low-diversity planting (CP2) and a higher-diversity, forb-focused planting targeting the development of pollinator and wildlife habitat (CP25). We examined the effects of: 1) restoration and grazing treatments and 2) flowering forb cover and species richness on bee abundance and genus richness. Using multi-model inference, we determined the relative importance and effect of these predictors on each bee community measure. In 2018 we collected 4,299 bees in 31 genera associated with 105 forb species. Overall, floral cover was the most important predictor for both bee abundance and richness (relative variable importance=1) and had significant, positive effects ( $p < 0.05$  for both). Bee abundance was significantly greater on CP25 fields, ( $p < 0.05$ ), floral richness positively and significantly affected bee richness ( $p = 0.02$ ), and grazing did not affect either bee measure. Preliminarily, our results suggest that native bee communities would benefit from increased flowering forb cover and richness in restored grasslands, thus enhancing pollination services to native species and adjacent croplands in predominately agricultural landscapes.

**Morris, B., and Hong, W., Sterling College.** A PRELIMINARY STUDY OF AN EXTREMELY HALOPHILIC ARCHAEA ISOLATED FROM SALT MARSH AT QUIVIRA NATIONAL WILDLIFE REFUGE, KANSAS. The obligately halophilic archaea, generally regarded as those which require at least 12% NaCl for growth, were found in the salt marsh of Quivira National Wildlife Refuge, Kansas. The isolates were found on tryptic soy agar media containing 15% table salt two weeks after isolation. They were phenotypically red in color and cluster on top of the salt. Colonies were slow in growth but can stay alive on the solid media for at least a year in lab. Since the optimal salt concentration needed for growth is 15 to 25%, they were considered extreme halophiles and presumptively identified as members of the family Halobacteriaceae. Using the same techniques, none of these could be found at another wetland refuge, Cheyenne Bottoms. One isolate, GPA13 was used for further analysis. This strain was Gram negative, coccoid and small cluster forms, motile and catalase positive. 16S rRNA will be applied for further analysis.

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**Nelson, S., McPherson College.** THE ANTI-BACTERIAL PROPERTIES OF *TAGETES PATULA* AND LEYLAND CYPRESS. Natural products are a common source for discovering new drugs. Plants produce a wide array of compounds that have medicinal benefits. Some compounds extracted from plants have antibacterial properties. Essential oils are natural products that show antibacterial properties. This study utilized steam distillation to extract essential oils from the leaves, stems, and flowers of *Tagetes patula* and the branches and needles of Leyland cypress. The essential oils collected were studied for their antibacterial activity against *Staphylococcus aureus* and *Escherichia coli* using the disc diffusion method. *Tagetes patula* essential oils showed antibacterial activity against *Staphylococcus aureus*, and it was not active against *Escherichia coli*. Leyland cypress showed antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*. An analysis of the compounds was done using GC-MS. The major compounds found in Leyland cypress were alpha-pinene, 3-carene, and alpha-cedrol. *Tagetes patula* was found to have D-Limonene, dihydrotagetone, piperitone, piperitenone, and caryophyllene oxide

**Nonnenmacher, H., Biology Department, Pittsburg State University.** INSECT FORAGERS ON TALL THISTLE, *CIRSIUM ALTISSIMUM* (L.) SPRENG., AND LATE BONESET, *EUPATORIUM SEROTINUM* MICHX., IN CHEROKEE COUNTY, KANSAS. Tall thistle, *Cirsium altissimum* (L.) Spreng., and late boneset, *Eupatorium serotinum* Michx. (Asteraceae) are native species blooming from August to October in southeast Kansas. In 2014, three sites in Cherokee County, Kansas were used to observe and collect foragers on tall thistles located amidst populations of late boneset. Pollen washes of foragers were made with ethanol and then stained with Calberla's fluid to study pollen load compositions as part of an ongoing study of forager guilds and annual changes in their representations of oligolectic or polylectic foraging. During September, 34 foragers in Orders Hymenoptera (bumblebees) and Lepidoptera were collected from tall thistle and washed. As tall thistle blooming phenology ended by September 25th, late boneset blooming phenology began and continued through October 21st. Bumblebee foraging was not observed but other forager diversity and abundance increased and included Orders Hymenoptera, Coleoptera, Mecoptera, and Lepidoptera.

**Osterhaus, D., and Jensen, W., Emporia State University.** DOES ACTIVITY OF WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) VARY BETWEEN HUMAN-HUNTED AREAS AND REFUGES? Hunting by humans impacts behaviors of targeted species, similar to what is observed in other predator-prey systems. Managed wildlife areas commonly have refuges where hunting is prohibited. Deer (family Cervidae) are commonly hunted species and their behavior might differ between such refuges and areas outside refuges where deer hunting is permitted. We predicted that white-tailed deer detections would be higher in refuges than in hunting areas as populations seek refugia from hunting, and that detections would be greatest at night in hunting vs. refuge areas. Using camera traps in refuge and hunting areas on two public wildlife areas in eastern Kansas, we calculated detections of individual deer per hour and categorized days into four time periods (dawn, day, dusk, night). Detection rates of deer overall (sexes pooled) did not vary significantly between refuges and hunting areas. Unexpectedly, male detection rates were higher in hunting areas than refuges. Differences in deer detection rates among time periods were marginally significant for deer overall with detection rates being higher during dawn than daytime, apparently driven by activity of females. Sizes of the refuges in our study might not have been large enough to negate the effects of hunting pressure on deer behavior. Despite standardization of habitat characteristics, habitat differences between refuge and hunting areas may have also affected deer behavior. It is also possible that hunting pressure during our study (18 October – 15 November 2018) was not high enough to alter deer behavior. Future study is warranted to account for these variables.

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**Pascual, C.<sup>1</sup>, Lambert, S.<sup>1</sup>; Hodges, C.<sup>2</sup>, and Bailey, M.M.<sup>1</sup>, <sup>1</sup>Emporia State University, MSFS Program, <sup>2</sup>Kansas Bureau of Investigation.** THE IMPACT OF STORAGE CONDITIONS, SAMPLE VOLUME, AND COLLECTION TECHNIQUE ON BLOOD ALCOHOL CONCENTRATION IN NON-DECOMPOSED DEFIBRINATED SHEEP'S BLOOD. After attending this presentation, attendees will have a better understanding of the long-term effects of collection technique, time, temperature, sample volume, and the presence of excess glucose on the blood alcohol concentration (BAC) in non-decomposed defibrinated sheep's blood. The potential of encountering a blood sample from a person with elevated blood glucose due to type 1 or type 2 diabetes or other metabolic disorders is relatively high in the US, with an estimated 30 million or more US citizens having been diagnosed with diabetes as of 2015. To date, the effect of excess glucose on blood ethanol concentrations in stored blood samples has not been studied. Blood samples in DUI cases are also stored for various lengths of time before analysis depending on the agencies policies, backlog, and testing resources. This presentation would impact the forensic science community because it would demonstrate how the percentage of ethanol is affected when the blood sample is collected and stored under various conditions over a 5-month period, including how the presence or absence of excess glucose (>240 mg/dL) affects the BAC over time. The results indicate that the presence of excess glucose and collection method do not significantly affect ethanol concentrations. The other results of this study were consistent with other studies in that sample volume and storage temperature had small effects on ethanol concentration over time, although they were not forensically significant (most changes <0.02 g/dL).

**Patterson, J.D., and Turner, J., Johnson County Community College.** SOLAR ENERGETIC PARTICLE COMPOSITION GRADIENTS OVER TWO SOLAR CYCLES. We present the compositional variation in the Solar Energetic Particle (SEP) population in the inner heliosphere over two solar cycles using data from the Ulysses HISCALE and ACE EPAM instruments. Ulysses flew between late 1990 to mid-2009 in a heliopololar orbit inclined by 80° between 1.3 AU and 5.4 AU. The ACE mission has been active since late 1997 in a halo orbit about L1 providing 27 years of continuous observation and 12 years of simultaneous observation with Ulysses. Several ion species including He, O, and Fe are identified through a unique technique utilizing data from the PHA system of both instruments enabling new science from old instruments. The O/He and Fe/O ratios change significantly between the maximum and minimums of Cycles 23 and 24. These ratios also show significant latitudinal and radial variations. These observed differences in composition provide insight to the acceleration and transport processes differentially affecting solar energetic ions.

**Picking, T.J., and Maricle, B.R., Department of Biological Sciences, Fort Hays State University.** ANTIMICROBIAL PROPERTIES OF SECONDARY METABOLITES FROM PLANTS IN KANSAS WETLANDS. Antimicrobial resistance is a multifaceted, global problem. To combat drug-resistant pathogens, the array of available antibiotics must be expanded; however, little effort has gone into the discovery of new antimicrobial drugs. A possible source to explore for new antibiotics might be plants. Plants defend themselves from pathogenic attacks by producing secondary metabolites, a broad range of compounds including terpenes, phenolics, and nitrogen-containing compounds. There is potential for these compounds to be utilized as antimicrobial agents. The objective of this research is to survey plants from wetlands in Kansas for antimicrobial properties by using aqueous and ethanolic extracts from different anatomical structures of the plant. Plants found in aquatic regions are of special interest to this research, as they must acclimate to pathogens found above-ground, in soil, and in aquatic biofilms. The extracts were tested with a disc diffusion assay against Gram positive *Staphylococcus aureus* and Gram negative *Escherichia coli*. Eighteen species of plants have been tested for antibiotic potential from three locations in Kansas, each of which were collected from wetland regions. Of these, four species have shown bactericidal or bacteriostatic activity, including *Rumex verticillatus*, *Veronia baldwinii*, *Artemesia ludovicana*, and *Solidago canadensis*. This research could assist in developing

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new antimicrobial drugs, which is especially important with the rise of antibiotic resistance. Additionally, this research could further our understanding of plant-microbe interactions, including ecological and evolutionary applications, both of which remain understudied.

**Pittenger, M.S., and Stark, W.J., Department of Biological Sciences, Fort Hays State University.**

**GROUND BEETLE DIVERSITY IN NATIVE, INVASIVE, AND ENCROACHING PLANT COMMUNITIES.**

Ground beetles (Carabidae) are commonly used as ecological indicators in studies regarding land use because they are ubiquitous, react quickly to environmental change, have a well-understood taxonomy, and can be trapped with ease. While the effects of various plant communities on ground beetle diversity is relatively well-known, past studies have operated within the scope of specific biomes and have not placed much emphasis on the effects of native and nonnative species. To test this, three woody plant species were selected as representatives of native (*Populus deltoides*), nonnative (*Tamarix gallica*), and encroaching (*Prunus angustifolia*) plant communities. 8 pitfall trap arrays were placed within each community type at Quivira National Wildlife Refuge during the summer of 2018. Vegetation surveys were also conducted in the four cardinal directions around each pitfall trap array, assigning percent cover classes and species diversity indices. It was hypothesized that native plant communities would house the most diverse ground beetle populations, and that areas with more aerial cover would contain more individuals. Identification to species level is currently underway for carabids, but other coleopteran families will be considered as well if time allows. Preliminary summaries indicated that the highest relative abundance occurred in the nonnative treatment; however, many of these individuals are from generalist species. The native treatment yielded fewer individuals but more specialist species. The encroaching treatment yielded the fewest individuals but also comprised several specialist species. Results from this study will aid in management decisions at Quivira National Wildlife Refuge.

**Quellhorst, H.<sup>1</sup>, Athanassiou, C.G.<sup>2</sup>, and Morrison III, W.R.<sup>3</sup>, <sup>1</sup>Department of Entomology, Kansas State University, Manhattan, KS, <sup>2</sup>Department of Agriculture, Plant Production and Rural Environment, University of Thessaly, Greece, <sup>3</sup>USDA-ARS Center for Grain and Animal Health Research, Manhattan, KS.**

**COMPETITION OF THE STORED PRODUCT INSECTS, *PROSTEPHANUS TRUNCATUS* (COLEOPTERA: BOSTRICHIDAE) AND *SITOPHILUS ZEAMAI* (COLEOPTERA: CURCULIONIDAE), ON MAIZE IN DIFFERENT TEMPERATURES.** Every year 10-30% of cereal crops, such as maize, are lost due to insects after harvest. In Africa, maize is of particular importance for human consumption. The two major stored product insects of maize that often co-occur are the larger grain borer (*Prostephanus truncatus*) and maize weevil (*Sitophilus zeamais*). As a result of the importance of maize, and the fact that it is a global staple, it is important to understand 1) the optimum temperature conditions for each species alone, and 2) whether the outcome of competition between the two species varies with temperature, and by extension, climatic zone. In this context, we evaluated single species or mixed species colonies on a fixed amount of grain every 5°C between 20-35°C over a 65 d period. At the end of the period, we evaluated the number of progeny, number of insect-damaged kernels, weight of frass, and weight of the kernels. We found that single species colonies of *P. truncatus* caused more severe damage to maize compared to *S. zeamais*. In mixed colonies, the damage more closely resembled that of single species *P. truncatus* colonies. Damage was increased with temperature. Overall, these results provide insight into the damage that can be caused by these two insect pests at different temperatures. As a changing climate shifts the ranges of insects, the historically tropical *P. truncatus* may likely invade new temperate regions of the world, and from our data, it is likely to be the superior competitor if subjected to coexistence and competition with locally established competitors, such as *S. zeamais*.

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**Quispe, N.C., Elliott, J.E., Kobayashi, Y., and Maricle, B.R., Department of Biological Sciences, Fort Hays State University.** EFFECT OF SULFIDE, LACTIC ACID, AND ETHANOL ON RESPIRATION ENZYME ACTIVITIES IN CATFISH TISSUES. Cellular respiration is influenced by various chemicals. Effects of sulfide on cellular respiration are well characterized. Previous studies also have shown that lactic acid and ethanol influence cellular respiration, but specific mechanism(s) that affect enzymes involved in cellular respiration have not been characterized. The objective of this study was to characterize effects of sulfide, lactic acid, and ethanol on the activity of two enzymes essential for cellular respiration: cytochrome *c* oxidase (CytOx) and lactate dehydrogenase (LDH). Activity of both enzymes was measured in catfish muscle and liver homogenates in the presence of increasing concentrations of sulfide (0 to 20  $\mu\text{M}$ ), lactic acid (0 to 100 mM), and ethanol (0 to 100 mM). CytOx activities in catfish liver samples were as high as 6.98  $\mu\text{mol g}^{-1} \text{min}^{-1}$ , while LDH activities in catfish muscle samples were as high as 176.8  $\mu\text{mol g}^{-1} \text{min}^{-1}$ . Increasing sulfide concentration significantly decreased CytOx activity but not LDH activity. Increasing lactic acid concentration significantly decreased activity in both CytOx and LDH. The inhibition constant of CytOx in sulfide was 500,000 times lower than in lactic acid. Activities of both enzymes decreased to a similar degree with increasing lactic acid concentration, whereas exposure to ethanol did not affect the activity of either enzyme, regardless of concentration. Our results indicated that sulfide and lactic acid differently inhibited activities of enzymes critical for cellular respiration. Differential response to sulfide and lactic acid on different enzymes may have potentially influenced evolutionary and physiological function of different enzymes involved in fish respiration.

**Rindom, K.J.<sup>1</sup>, Van Stratton, M.J.<sup>2</sup>, Ballester, J.<sup>3</sup>, and Bailey, M.M.<sup>1</sup>, <sup>1</sup>Emporia State University, Department of Biological Sciences, Master of Science in Forensic Science Program, Emporia, KS, <sup>2</sup>Van Stratton, Winer, & Associates, Topeka, Kansas, <sup>3</sup>Emporia State University, Department of Physical Sciences, Emporia, Kansas.** MEASUREMENT DETERMINATION OF BLOOD SPATTER ON A HORIZONTAL SURFACE. One of the abilities of an expert blood spatter analyst is to be able to determine in a three-dimensional space the area of origin when blood is impacted, and the resulting spatter stains are deposited onto a vertical surface. The impact spatter that is deposited on the vertical surface is a well-documented type of pattern that has been determined to be consistently reproducible (4). Little has been published on the area of origin method being utilized to determine the origin of impact of patterns placed on a horizontal surface. To create reproducible impact patterns on horizontal surfaces a hammer was used to strike a 1ml pool of defibrinated sheep's blood that was deposited on a target laid out on the floor. Resulting individual blood stains were then selected for measurement that had a well-defined elliptical shape and directionality. Each had length and width measured with a digital microscope. A laser measuring device was used to measure from the leading edge of each of the selected spatters to the area of convergence. The data obtained was used to determine if the area of origin methods that are commonly applied to impact patterns on a vertical surface can be applied to impact patterns deposited on a horizontal surface. Early results show that the area of origin can be determined on a horizontal surface when the individual measured spatters are utilized within the first meter which begins at the leading edge of the spatter closest to the area of convergence. 4. Bevel, Tom, and Ross M. Gardner. Bloodstain Pattern Analysis: With an Introduction to Crime Scene Reconstruction. CRC Press, 2008.

**Roberts, E.K., Emporia State University.** A PRELIMINARY ANALYSIS OF A JUVENILE *TRICERATOPS* SKULL AND LOWER JAW MATERIAL AND COMPARISON OF JUVENILE CERATOPSIAN CHARACTERISTICS. A juvenile *Triceratops* partial skull and lower jaw from the Upper Cretaceous Hell Creek Formation near Jordan, Montana, was collected in 2014. Having been collected near the top of the upper third of the Hell Creek, the fossil material likely belonged to *Triceratops prorsus*, according to Scannella and others. Main elements from the skull (Emporia State University Paleontology Collection specimen number ESU 2014-1) include the parietal, the right postorbital horn, partial left postorbital horn, the left maxilla, a partial of the right maxilla, and a left nasal. Both left and right dentaries were collected along with the prementary.

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The size of the skull material and the posteriorly curving brow horn indicate that this was an older juvenile specimen. The growth stages of *Triceratops* are as follows: baby, juvenile, subadult, and adult. Comparisons among *Triceratops* juveniles and comparisons between juveniles of other ceratopsian species focused on ontogenetic features. According to Horner and Goodwin, characteristics of juvenile *Triceratops* are posteriorly curving brow horns, large orbits in comparison to the skull, delta shaped epoccipitals, and unfused nasals. In babies, the horn had a straight orientation and in subadults the tip transitioned to an anterior angle. A survey of the literature revealed that besides the size of the individual, common characteristics for juvenile ceratopsians include larger orbits, unfanned and/or scalloped frills, striated bone texture, unfused nasals, and unfused skull sutures.

**Rodrigues de Queiroz, A., and Maricle, B.R., Department of Biological Sciences, Fort Hays State University.** INFLUENCE OF SHADED CONDITIONS IN DEVELOPMENT OF ASTERACEAE SPECIES NATIVE TO KANSAS. Due to the heterogeneity of habitats, all plants are exposed to at least some degree of shade during their lifetime. Reduced light intensity, drops in R:FR ratio, and limited blue light are cues for plants to perceive competition; the shade avoidance syndrome (SAS) is common for grassland species and shade tolerance (ST) is common for forest species when competition is perceived. SAS is characterized by elongation of stems and petioles, reduced branches, decreased leaf area, decreased shoot biomass, and increased number of ramets. ST is characterized by little elongation of stems and petioles, high chlorophyll content and high chlorophyll a/b ratio in leaves, low root-shoot ratio, and thinner leaves. In this study, germination of six native Asteraceae species were tested against 10%, 50%, and 100% of natural light in a greenhouse. Measurements of growth and reproduction were made in two species under the same light conditions. Shaded conditions decreased germinabilities of seeds in all species that were tested. Increased light conditions resulted in increased growth for both species. When exposed to shaded conditions, both species displayed several traits that are related with shade tolerance modifications such as little elongation of stems and petioles, higher specific leaf area, and higher chlorophyll a/b ratio, reduced leaf area and root/shoot biomass, and fewer and thinner leaves. In summary, plants displayed unexpected strategies and great resilience to grow and develop under shaded conditions.

**Ruelas-Aranda, S.<sup>1</sup>, Allison, N.<sup>2</sup>, Groom, M.<sup>1</sup>, Sargent, C.<sup>3</sup>, Schumacher, J.<sup>4</sup>, Tanis, M.<sup>2</sup>, Noland, M.<sup>3</sup>, Schmidt, C.<sup>3</sup>, Greer, M.<sup>3</sup>, Adams, A.M.<sup>3</sup>,** <sup>1</sup>Department of Nursing, <sup>2</sup>Kansas Academy of Mathematics and Sciences, <sup>3</sup>Department of Biological Sciences, <sup>4</sup>Department of Agriculture; Fort Hays State University. MONITORING THE EFFECTIVENESS OF POND RESTORATION EFFORTS THROUGH THE MACROINVERTEBRATE COMMUNITY. Environmental degradation due to urbanization is a common theme around the world and restoration of natural areas is increasingly implemented and important. Restoration efforts cost time and money and it is vital to measure if these efforts provide the anticipated benefits. The Sternberg Natural Area in Hays, KS was created in 2010 for environmental education and has been subject to restoration efforts over the past three years, which includes monitoring of numerous biological communities. A key feature of the natural area is a pond and stream. This body of water is important for maintaining the wildlife diversity of the area, both terrestrial and aquatic. This aquatic system has built up excess sediment and debris; caused by increased runoff from surrounding urbanized areas. In July 2019, we will restore the pond and stream by removing sediment to expose the native rocky substrate. We will conduct pre- and post-restoration monitoring of the aquatic invertebrate community. We predict that invertebrate species richness and/or relative abundance will increase after restoration. Our goal is to evaluate the effectiveness of this restoration project to better inform future restoration activities and identify biological indicators for when management action may be necessary again.

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**Santoso, M. and Holcroft, N., Biology Department, Johnson County Community College.** EXPLORING ORGANISMAL BIOLOGY THROUGH ART: BRINGING UNFAMILIAR ORGANISMS TO LIFE THROUGH SCULPTURE. Three-dimensional models are often used to facilitate active learning in courses focusing on organismal biology. Sculpted models make the microscopic visible to the naked eye and lend permanence to otherwise-ephemeral or inaccessible specimens. However, commercial models are extremely expensive, costing hundreds or thousands of dollars. Furthermore, the selection of particular organisms available as models is limited to commonly used species. The goal of this project was to provide additional 3D models of organisms studied in courses offered in JCCC's Organismal Biology Program (BIOL 125: General Botany, BIOL 127: General Zoology, and BIOL 150: Biology of Organisms). In addition, through the sculpting of these models, I was personally able to explore in more depth the organisms' anatomy, life cycles, evolution, and ecology, building on concepts learned in Biology of Organisms. Candidate specimens were evaluated and selected using criteria that included complexity/feasibility and opportunity to introduce viewers/students to unusual, uncommon, or under-appreciated organisms. Two to four target organisms were identified with some organisms including multiple representations or components. The organisms were sculpted with Hearty Air-dry Clay and individually painted using Liquitex Acrylic Paint and then mounted to a board. A short accompanying biography describing basic biology was written for each specimen.

**Sargent, C.<sup>1</sup>, Perryman, H.<sup>1</sup>, Allison, N.<sup>2</sup>, Groom, M.<sup>3</sup>, Ruelas-Aranda, S.<sup>3</sup>, Schumacher, J.<sup>4</sup>, Tanis, M.<sup>2</sup>, Schmidt, C.<sup>1</sup>, Greer, M.<sup>1</sup>, Adams, A.M.<sup>1</sup>,** <sup>1</sup>Department of Biological Sciences, <sup>2</sup>Kansas Academy of Mathematics and Sciences, <sup>3</sup>Department of Nursing, <sup>4</sup>Department of Agriculture; Fort Hays State University. BATS? USE OF NATURAL AREAS IN AN URBAN LANDSCAPE. Bats are ecologically and economically important especially in regions of intense agricultural farming since they are the primary predators of nocturnal insects. There are 16 species of bats known to occur in Kansas with eight documented in Ellis county. Urban green areas are important refuges for biodiversity especially when housing a body of water. The Sternberg Natural Area in Hays KS is an important location for outdoor exploration and activities and is a valuable resource for environmental education. This year marks the beginning of a long-term study of the bats in this region. We will use bat detectors to passively monitor bats throughout the year at four locations: a residential site an agricultural site and two sites at the Sternberg Natural Area (aquatic and terrestrial). Our goal is to understand how bats use this urban landscape and we predict that we will have higher bat activity and foraging in the Natural Area compared to the surrounding residential and agricultural areas. We also predict that overall bat activity and foraging will be higher over the pond compared to the surrounding trail system. We expect that some species will be more sensitive to urbanization and even these small urban green areas are vital for maintaining local biodiversity.

**Schafer, J., Puga, T., Harris, P., Strasser, N., Branum, G., and Agbedanu, P.N., Friends University.** INVESTIGATING INCREASED CO<sub>2</sub> CONCENTRATION ON THE pH OF VARIOUS PLANT SPECIES. The concept of bioremediation is quickly becoming the norm in the resolution of environmental issues. The steady increase in CO<sub>2</sub> levels, as documented by NASA, inspired scientists with the thought to engineer plants to absorb excess CO<sub>2</sub> from the atmosphere to decrease the amount of CO<sub>2</sub> as pollutant in the air. Here, we have explored the consequences of the uptake of excess CO<sub>2</sub> by select plants. Because CO<sub>2</sub> dissolves in H<sub>2</sub>O to produce H<sub>2</sub>CO<sub>3</sub>, which dissociates to yield H<sup>+</sup> ions, we hypothesized that increased CO<sub>2</sub> absorption results in decrease in pH of plant sap. Plants including *Byophyllum pinnatum*, and two species of lettuce: Romaine and Nevada, exposed to increased CO<sub>2</sub> concentrations (15%), demonstrated a consistent increase in pH towards alkalinity compared to control plants. Based on the outcome being opposite to what we have hypothesized, our results suggest *Byophyllum pinnatum*, Romaine lettuce and Nevada lettuce, all have a unique homeostatic system to prevent over-absorption of CO<sub>2</sub>.

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**Schwindt, C. <sup>1</sup>, Stark, N. <sup>1</sup>, Pfannenstiel, B. <sup>1</sup>, Stark, W. <sup>2</sup>, and Maricle, K. <sup>1</sup>, <sup>1</sup>Thomas More Prep-Marian High School, Hays, KS, <sup>2</sup>Fort Hays State University, Hays, KS. ASSESSING WATER QUALITY OF BIG CREEK IN ELLIS COUNTY, KANSAS.** Big Creek is a Kansas stream that originates in Gove County and empties into the Smoky Hill River in Russell County. Within Ellis County, Big Creek is a subject for concern when considering overall water quality since it can be influenced by agricultural and urban runoff. Therefore, the objective of this study was to determine the water quality at three locations along Big Creek in Ellis County. For our study, one location in Yocemento represented a portion of Big Creek subject to agricultural runoff, one location in Hays represented a portion of Big Creek subject to urban runoff, and one location in Hays represented a portion of Big Creek that was downstream of agricultural and urban runoff. Measures of nitrate, phosphate, pH, and turbidity were taken at each location in August, September, and October 2018. General trends indicate higher phosphate at locations near agricultural and urban runoff with higher nitrate downstream of these locations, but this largely depended on the time of sampling. For example, following a major rainfall event in early October, measures indicated high turbidity at all sites along with decreased pH, nitrate, and phosphate. Overall, these results indicate that agricultural and urban runoff may influence the overall concentrations of nitrate and phosphate in Big Creek, but can also influence water quality downstream. Looking ahead, plans are to continue measurements at these locations in the spring and summer to broaden our understanding of how these locations vary in water quality at different periods throughout the year.

**Sempertegui-Sosa, C., Romine, D., Schrier, J., and Connolly, M., Truman State University.** PRESENCE OF *RICKETTSIA MONTANENSIS* AND *EHRlichIA CHAFFEENSIS* AND ABSENCE OF *ANAPLASMA PHAGOCYTOPHYLUM* INFECTIONS AMONG ADULT TICKS COLLECTED IN CONSERVATION AREAS AND PRIVATE LANDS OF ADAIR COUNTY, MISSOURI. We detected the presence of *Rickettsia montanensis* (instead of *R. rickettsii*) and *Ehrlichia chaffeensis* and the absence of *Anaplasma phagocytophyllum* infections among ticks collected in conservation and private areas of Adair County, Missouri. These findings stress the importance of continuous monitoring and study of vector populations in the region. Such monitoring can contribute to risk assessment of ehrlichiosis, Rocky Mountain spotted fever, and anaplasmosis, which are considered endemic in the region.

**Skelton, M.C.<sup>1</sup>, Cordes, Z.<sup>1</sup>, and Riedle, D.<sup>1</sup>, <sup>1</sup>Kansas Department of Wildlife, Parks, & Tourism, <sup>2</sup>Department of Biological Sciences Fort Hays State University.** A COMPARISON OF REPTILE AND AMPHIBIAN OCCURRENCES BETWEEN LARGE AND SMALL HABITAT PATCHES IN EASTERN KANSAS. Oak/ hickory forests in Kansas represent the westward extent of hardwood forest habitat in the eastern United States. Threats to these habitats in Kansas include invasive species, habitat loss/degradation, and fragmentation. Extensive surveying for the Broad-headed Skink, a state threatened species, was conducted between 2015-17. In 2017, large patches of oak/hickory forest were mapped to provide a visualization of connectivity of Broad-headed Skink habitat in eastern Kansas. In 2018, a series of 50m x 50m plots were surveyed within these large patches of contiguous forest and adjacent habitat fragments. Sixty-six plots were surveyed in large habitat patches and 57 in the smaller patches. Each plot was surveyed 4 times. While the surveys focused on Broad-headed Skinks, we wanted to assess the observations of the additional 24 species of herpetofauna in terms of presence/absence and abundance. 22 species were observed in the large patches, 19 species were observed in the small patches, 16 of the 25 species were captured in both habitat types. A Sorenson's measure of similarity indicated that the site types were similar. However, at a more refined scale, there are differences in presence/absence and the abundances of the species encountered.



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**Skelton, M.C.<sup>1</sup>, Noland, M.A.<sup>1</sup>, Schmidt, C.J.<sup>2</sup>, Stark, W.J.<sup>1</sup>, Adams, A.M.<sup>1</sup>, and Greer, M.J.<sup>1</sup>, <sup>1</sup>Department of Biological Sciences Fort Hays State University, <sup>2</sup>Sternberg Museum of Natural History.** PRE-RESTORATION ASSESSMENT OF A WATERWAY WITHIN AN URBAN GREEN SPACE AT THE STERNBERG NATURAL AREA, HAYS, KS. Urban green spaces such as parks and natural areas, play a critical role in facilitating outdoor activities for people as well as providing habitat to urban wildlife. The Sternberg Natural Area in Hays, Kansas, provides opportunities for outdoor classroom activities and for biological research of aquatic and terrestrial communities that include fish, macroinvertebrates, herpetofaunal, small mammals, insects, plants, and soil microbes. Restoration of aquatic habitats support biodiversity and improves ecosystem health by attempting to return the ecosystem to a more natural state that has been altered by anthropogenic modifications. A restoration project of the pond and stream segment at the Sternberg Natural area is scheduled to take place July 2018. The project will remove debris and silt to expose the native rocky substrate in the inundated portion of the waterway. Prior to this restoration, the pond was electroshocked with a boat mounted electrofisher to determine fish species richness and relative abundance. Species collected October 2018 were: 76-Green Sunfish, 22-Black Bullheads, 29-Golden Shiners, and 1-Black Crappie. Our long-term goal is to compare species richness, abundance, and size/age classes pre- and post-restoration. Post restoration, this survey will be repeated to determine if pond restoration improved the health of the aquatic ecosystem.

**Smith, N.E.G., Tooley, E. G., and Maricle, B.R., Fort Hays State University.** EFFECTS OF NITROGEN FERTILIZER ON SALT-STRESSED MILO (*SORGHUM BICOLOR*). This project aimed to investigate whether increased fertilizer would increase salt tolerance in milo. Previous studies have found that increased salt tolerance correlates to increased nitrogen fertilizer in some plants, so it was hypothesized that increased fertilizer would increase salt tolerance in milo. In this study, three nitrogen treatments (0, 50, and 150 lbs N acre<sup>-1</sup>) and four salinity treatments (0, 40, 80, and 120 mM salt) were tested on milo plants. Weekly measures of chlorophyll concentration, height, stomatal conductance, and photosynthesis were measured for four weeks of treatment. Biomass was measured following four weeks of treatment. Plant biomass and height were reduced by increasing salinity. Any salinity above 0 mM reduced the height of plants, regardless of fertilizer concentration. Plant biomass was increased at 50 lbs N acre<sup>-1</sup> but was decreased at 150 lbs N acre<sup>-1</sup>. Contrary to the hypothesis, increased nitrogen decreased many aspects of growth and performance in milo. There was a statistical interaction between salt and fertilizer for physiological measures like photosynthesis, stomatal conductance, and chlorophyll concentration. All physiological measures in 0 mM salt remained high across all fertilizer treatments. All physiological measures in 120 mM salt remained low across all fertilizer treatments. Physiological measures in 40 and 80 mM salt treatments were high in low fertilizer concentrations and became lower in high fertilizer concentrations. This indicates that increased fertilizer does not always increase salt tolerance in crop plants, as evidenced by milo.

**Steffen D.J., and Stark, W.J., Fort Hays State University.** THE EFFECT OF VEGETATIVE STRUCTURE ON NEST-BURROW SELECTION BY THE WESTERN BURROWING OWL: COMPARING TRADITIONAL DATA COLLECTION METHODS TO PHOTOGRAMMETRY WITH IMAGERY OBTAINED BY AN UNMANNED AERIAL SYSTEM. Shortgrass prairies in the United States have been reduced to 52% of their historical extent, contributing to reduced habitat for native species. One such species is the Western Burrowing Owl (*Athene cunicularia hypugaea*), which is listed as a Species of Special Concern in Kansas. The objective of this study was to determine if remote sensing technology aboard an unmanned aerial system could effectively classify the vertical structure of vegetation in a shortgrass prairie at Smoky Valley Ranch, Kansas. Vegetative structure and its effect on burrow selection in Burrowing Owl was measured in two ways. First, structure was quantified with a traditional Daubenmire cover classification scheme. Subsequently, structure was quantified with a photogrammetric technique in which aerial imagery, acquired by an unmanned

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aerial system, was used to generate three-dimensional models of the vegetation. Visual obstruction by vegetation was estimated with these models. Burrowing Owl presence increased with bare ground cover ( $Z = 2.29$ ,  $df = 23$ ,  $p = 0.022$ ) and decreased with forb cover ( $Z = -2.54$ ,  $df = 23$ ,  $p = 0.011$ ). Unoccupied burrows had significantly more obstruction than occupied burrows ( $X^2 = 266$ ,  $df = 9$ ,  $p < 0.001$ ). The results of this study suggest that imagery collected by UAS can be used as an effective and efficient method of characterizing vegetative structure and significantly reduce the amount of time and money required to evaluate wildlife and habitat.

**Still, M.B., and Crupper, S.S., Emporia State University Master of Science, Forensic Science Program.** THE MOUSE THANATOMICROBIOME AND POST MORTEM INTERVAL ESTIMATION. Determining an accurate postmortem interval (PMI) is a critical piece of information needed to gain a thorough understanding of the circumstances surrounding a death. Since microbes are ubiquitous and play a significant role in decomposition, examining changes in microbial succession patterns may provide an alternative method to establishing a more reliable PMI. In this study, we utilized a mouse model system to examine microbial succession patterns in the liver postmortem. Mice were sacrificed by CO<sub>2</sub> asphyxiation and separated into four groups; a control group (zero-day postmortem), seven, fifteen, and twenty-one day postmortem groups. At the indicated PMI, livers were removed, and total DNA was isolated from each liver sample. Subsequently, the V3 hypervariable region of the 16S rRNA gene was amplified and sequenced on an Illumina MiSeq platform. Our results indicate *Clostridium* species dominated in all three groups whereas *Lactobacillus* species accounted for only a small proportion of the total thanatomicrobiome. However, in two of the twenty-one-day PMI mice where the total percentage of *Clostridium* species was significantly lower, *Lactobacillus* species accounted for the majority of the genera identified. The Shannon Species Diversity Index, which measures species richness, significantly increased from approximately .021 in the control groups to 0.78 - 2.4 in the seven to twenty-one day PMI groups, illustrating that decomposition is mediated by a wide variety of microbes. In total, results obtained are in agreement with previous human cadaver thanatomicrobiome studies which have noted a “*Clostridium* Postmortem Effect”.

**Stramel, D.A., and Greer, M.J., Department of Biological Sciences, Fort Hays State University.** A STUDY OF THE ALLELEPATHIC EFFECTS OF TWO SPECIES OF OLD WORD BLUESTEM. Invasive species have become a major ecological problem worldwide. Invasive plants are moving into new habitats and displacing native plants, often to the detriment of these native ecosystems. Two grasses commonly called Old World Bluestems, (OWBs), *Bothriochloa ischaemum* and *B. bladhii*, were introduced into the central and southern Great Plains in the last century and have become problematic invaders. Once established OWBs tend to eliminate, potentially through allelopathic mechanisms, all other plants, effectively becoming monocultures. Our research intends to study the allelopathic effects of these two species of OWB on the germination of each other's seeds and the seeds of one native grass, *Andropogon gerardii*. Leachate will be produced using whole plant tissues of each of the OWBs and the native grass. These leachates will then be added to seeds of each of the three species. Combinations of seeds and leachates will be grown in a growth chamber to observe effects on germination of the seeds. We hypothesize that leachates of OWBs will inhibit the germination of the native species but will not inhibit the germination of each other's seeds. This study could lead to strategies for controlling the spread and establishment of OWBs and aid in restoration of native grasslands.

**Taylor, O., University of Kansas, Department of Ecology and Evolutionary Biology, University of Kansas.** MONARCH BUTTERFLIES: PAST, PRESENT AND FUTURE. The pending petition before the Department of Interior to declare the monarch butterfly a threatened species requires that we do everything we can to understand the population dynamics of this species. The monarchs' history is lengthy and details are few, but it's clear that this species has survived an extremely variable climatic history. The responses of monarchs to weather events in the last two decades provide insights as to both the size of past and future monarch populations. This

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population dynamic has played out against a background of human driven changes in habitats across the landscapes of eastern North America and Mexico. Unfortunately, landscapes that support monarchs are continuing to decline rapidly as a result of agricultural practices, development and warming climates. These changes not only involve the loss of milkweeds and nectars sources needed to sustain reproduction and migration but extend to the persistence of the forests in Mexico that sustain the overwintering population. Will the monarch migration become a victim of climate change? Probably. Can we keep this from happening? Yes.

**Thomas, B.C., Washburn University.** EFFECTS OF NEARBY SUPERNOVAE IN THE EARLY PLEISTOCENE. Recent measurements of iron-60 in ocean sediment, FeMn crust, and FeMn nodules have strongly confirmed that multiple supernovae happened at distances of about 150-300 light years, consisting of two main events: one at 1.7 to 3.2 million years ago, and the other at 6.5 to 8.7 million years ago. I will review recent work by our group in which we model the effects of supernovae at 150 light years, including effects from both electromagnetic and charged particle (cosmic ray) radiation. We find a small effect on terrestrial organisms from visible light, and that high energy (x-ray) photons do not deliver enough energy to cause significant changes. Cosmic rays, however, are greatly enhanced and have significant impacts. In particular, atmospheric ionization is increased by an order of magnitude or more, especially in the lower atmosphere, lasting thousands of years. Increased ionization in the upper atmosphere causes depletion of stratospheric ozone with moderate increase in damaging UVB radiation. Lower atmosphere ionization is likely connected to lightning rates and may have a connection to changes in climate and biome types, as well as a minor mass extinction, around the Pliocene-Pleistocene boundary.

**Thomas, B., and Oberle, J., Washburn University.** BIOLOGICAL IMPACT OF OZONE DEPLETION AT THE END-PERMIAN. Around 250 million years ago, 70-90% of life on Earth went extinct. The likely cause is massive, long-lived volcanic activity. One important result of this activity was the destruction of stratospheric ozone, which normally protects life on Earth from UV radiation from the Sun. We ask, how much UV was life exposed to and how much damage did this cause? To answer this question, we gathered data from other researchers who have recreated the atmospheric conditions of the End-Permian. Using the acquired ozone data, we used the Tropospheric Ultraviolet and Visible radiation model to calculate various parameters under different possible conditions. Major destruction of ozone leads to much more UV on the surface of Earth. This leads to increased damage to both plant and animal life. Visible light is also shown to change as ozone is destroyed, altering photosynthetic capabilities of life. Understanding how life is impacted by varying levels of ozone will help us better understand the End-Permian.

**Thurber, N.A., Jones, M.F., and Beard, K.C., Emporia State University.** NEW SPECIMENS OF *CHIROMYOIDES* (MAMMALIA: PLESIADAPIDAE) FROM THE LATE PALEOCENE SHED LIGHT ON THE EVOLUTION AND BIOGEOGRAPHY OF THE GENUS. Plesiadapids are small to medium-sized lemur-like mammals typically among the most common found in Paleocene faunas from North America and Europe. They are related to early primates. One of the lesser known plesiadapids is the genus *Chiromyoides*, six species of which have been described from the Tiffanian and Clarkforkian of western North America. In contrast, only the genotypic species *Chiromyoides campanicus* and the recently described *Chiromyoides mauberti* are known from upper Paleocene deposits of Europe, specifically the Paris Basin of northern France. Recent phylogenetic analyses of *Chiromyoides* species yielded a basal polytomy, providing no resolution of relationships within the genus. Based on a review of previously collected material and a wealth of newly collected *Chiromyoides* specimens, we report new fossils of *Chiromyoides* major from southwestern Wyoming and *Chiromyoides gigas* from western Colorado. At least one new species of *Chiromyoides* is described from the late Tiffania of southwestern Wyoming and southwestern Texas. A character analysis based on this new material

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identifies previously undescribed autapomorphies in the newly described species and *C. major*, indicating that the evolution of *Chiromyoides* was more complicated than simple stratophenetic interpretations have implied. Within *Chiromyoides*, there is strong character support for a clade that includes the European *C. campanicus* and *C. mauberti* and the two youngest (Clarkforkian) North American species, *C. major* and *Chiromyoides gingerichi*. Available data therefore suggest that *Chiromyoides* originated in North America and dispersed to Europe relatively late in the Paleocene, perhaps sometime near the Tiffanian-Clarkforkian boundary.

**Titus, C., Milam, C., and Agbedanu, P.N., Friends University.** INVESTIGATING THE MOST EFFICIENT CAFFEINE DOSING TECHNIQUE. Caffeine, a drug able to provide its users with desired effects such as alertness and wakefulness, has been the most widely used substances in the western world. As a central nervous system stimulant, caffeine, as with other drugs, must have a most effective method of oral administration. Here, we have explored the effects of caffeine dosages within various time intervals. A set of the model organism, planaria was exposed to a single dose of 0.02g caffeine/50 mL DH<sub>2</sub>O; and another set exposed to two incremental doses of 0.01g caffeine/50mL DH<sub>2</sub>O. The motility of both sets of planaria were recorded for 30 minutes. We found a significant decrease in planarian motility (activity) when caffeine was administered in one large dose compared to when administered in smaller incremental doses over short intervals of time. Our result suggests that the most effective way to use caffeine is in incremental doses over a period of time. Caffeine users should be aware that the best central nervous system.

**Tribble, M.<sup>1</sup>, Stone, R.<sup>1</sup>, and Yearout, K.<sup>2</sup>, <sup>1</sup>Wichita State University, <sup>2</sup>Zbar Ranch, Turner Enterprises.** ASSESSING THE DIVERSITY AND ABUNDANCE OF DUNG BEETLES (COLEOPTERA: SCARABAEOIDEA) OF A BISON RANCH ECOSYSTEM IN THE KANSAS RED HILLS. Information on Kansas dung beetle species, abundance, and seasonal activity is lacking. This study aims to provide valuable information for maximizing dung beetle health in Kansas, and provide insight into the poorly studied area of bison-scarab interactions. The diversity and abundance of dung beetles (Coleoptera: Scarabaeoidea) were studied on ranches in the Red Hills of Kansas. Study sites included a bison ranch (Z Bar Ranch) and a cattle ranch (Deerhead Ranch), both located near Medicine Lodge, Kansas. Dung beetles were collected between April 2018 and December 2018 using baited pitfall traps at both ranches. In total, 227,335 scarab beetles were collected and identified, representing 18 total species (18 present at Deerhead Ranch and 16 present at Z Bar Ranch). Large numbers of the minute dung beetle *Onthophagus pennsylvanicus* were collected, and accounted for >68% of individuals in the study. The invasive dung beetle *Digitonthophagus gazella* was present at both sample sites, but over 67% of the individuals were collected at the bison ranch (Z Bar Ranch). Seasonal data shows *Digitonthophagus gazella* was absent in early-season collections, with an abundance that peaked in late September to early October. Dung beetles were collected between April 2018 and December 2018 using baited pitfall traps at both ranches. In total, 227,335 scarab beetles were collected and identified, representing 18 total species (18 present at Deerhead Ranch and 16 present at Z Bar Ranch). Analysis of the data in R provided values of richness, evenness, Shannon-Weiner species diversity index, and effective species number.

**Turner, J., and Patterson, J., Johnson County Community College.** COMPOSITIONAL VARIATION OF SOLAR ENERGETIC PARTICLES OVER TWO SOLAR CYCLES. We present the compositional variation in the Solar Energetic Particle (SEP) population in the inner heliosphere over two solar cycles using data from the Ulysses Heliospheric Instrument for Spectra, Composition, and Anisotropy at Low Energies (HISCALE) and Advanced Composition Explorer (ACE) Electron Proton Alpha Monitor (EPAM). The Ulysses mission was active from late 1990 to mid-2009 in a heliopolar orbit inclined by 80° with a perihelion of 1.3 AU and an aphelion of 5.4 AU. The ACE mission has been active since its launch in late 1997 and is in a halo orbit about L1 providing 27 years of continuous observation in the inner heliosphere and 12 years of simultaneous observation.

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**Turner, R., and Hong, W., Sterling College.** ANALYSIS OF A PEDIGREE TREE IN A FAMILY WITH HIGH MELANOMA PREVALENCE. A family of 32 members has been investigated using a pedigree tree of melanoma and atypical moles. These phenotypes have been identified in 17 members of the family. Familial melanoma is a type of skin cancer that may be inheritable due to the genetic mutation CDKN2A which causes the p16 protein, an active tumor suppressor, to be dysfunction. Our studies indicated that melanoma is inheritable in this family and the occurrence is indeed related to the Fitzpatrick Skin Type Scale (focused on skin color, hair color, eye color, freckling, and susceptibility to sunburn). Furthermore, the occurrence and susceptible of melanoma and atypical mole syndrome of this family may be related to the latitude of United States and their careers. Further research on genotype including the identification of CDKN2A mutation in this family line is needed.

**Urban, A., and Houseman, G., Department of Biological Sciences, Fairmount College of Liberal Arts and Sciences.** THE DISTRIBUTION OF LEGUME SPECIES ACROSS THE PRECIPITATION GRADIENT OF KANSAS. Legume species are important for fixing atmospheric nitrogen, facilitating nutrient cycling, and increasing plant and habitat diversity, yet the distribution of legumes is not well understood. To examine the distribution of legume species across the precipitation gradient of Kansas, we used the USDA database to quantify how legume species richness varied across the state. Specifically, we related legume species occurrences in each of the 105 counties in Kansas to annual precipitation data and also assessed whether these patterns varied for native and non-native legume species. Legume diversity was strongly correlated with annual precipitation ( $r^2=0.56$ ), as species richness more than doubled across Kansas, increasing from 23 to 54 species. However, this change in legume diversity varied depending on whether legumes were historically native or non-native. We found a sharp increase in the proportion of non-native species as precipitation increased, from 8 to 22%. The significant correlation between the proportion of non-native legume species and precipitation was remarkably high ( $r^2=0.7$ ), suggesting that this pattern is highly reliable across counties in Kansas. These strong patterns suggest that the number and presence of both native and non-native legume species are linked with precipitation regimes in the Great Plains, most likely due to variance in drought tolerance among species. However, additional observational and experimental work is needed to clearly distinguish between the importance of soil properties, land management, and plant community composition on legume distributions across the precipitation gradient of Kansas.

**Waite, E.S.<sup>1</sup>, Jameson, M.E.<sup>1</sup>, Houseman, G.R.<sup>1</sup>, Jensen, W.E.<sup>2</sup>, Reichenborn, M.M.<sup>1</sup>, Watson, F.<sup>1</sup>, Morphew, A.R.<sup>1</sup>, and Kjaer, E.L.<sup>1</sup>, <sup>1</sup>Wichita State University, <sup>2</sup>Emporia State University.** HOW DO GROUND BEETLES (COLEOPTERA: CARABIDAE) RESPOND TO CONSERVATION RESERVE PROGRAM MANAGEMENT PRACTICES AND ENVIRONMENTAL FACTORS? Grasslands of the Great Plains have declined over 70% since European settlement due to conversion of natural habitats to cropland and urban centers. The federally supported Conservation Reserve Program (CRP) was created to improve water quality, reduce soil erosion, and increase native habitats for wildlife. Within these restored grassland ecosystems, ground beetles (Coleoptera: Carabidae) are a keystone invertebrate group that fill several crucial niches and serve as bioindicators of successful land management strategies. Using pitfall traps at 108 CRP sites across Kansas, we examined how beetle richness and abundance responded to an initial planting treatment including a low (CP2) and relatively high diversity (CP25) seeding, grazing treatment (grazed or ungrazed), precipitation (46 to 108 cm annually), and bare ground over two field seasons. Despite a very large sample size (5,072 individuals representing 48 species), these explanatory factors did not have a detectable effect on species richness or abundance. However, we did find evidence for associations between some species and short or tall grass prairie habitats. This suggests that, despite similarities in diversity and abundance across continuous habitat and precipitation gradients, species composition and turn-over are influenced by extremes within the ecosystem.

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**Watson, D.F.<sup>1</sup>, Houseman, G.<sup>1</sup>, Jameson, M.L.<sup>1</sup>, Jensen, W.<sup>2</sup>, Reichenborn, M.<sup>1</sup>, Morphey, A.<sup>1</sup>, and Kjaer, E.<sup>1</sup>, <sup>1</sup>Wichita State University, Department of Biological Sciences, <sup>2</sup>Emporia State University, Department of Biological Sciences.** EFFECT OF GRAZING AND PLANTING PRACTICE ON CRP VEGETATION COMPOSITION AND STRUCTURE ACROSS KANSAS. The Conservation Reserve Program (CRP) aims to restore perennial plant communities on former cropland to reduce erosion, improve water quality, and enhance wildlife habitat. Nationwide, CRP comprises 23.5 million acres, yet few studies have examined these plant communities or the habitats they create across large spatial scales. We collected vegetation data from 108 CRP sites across the longitudinal precipitation gradient in Kansas to determine the effects of planting practice (CP2 and CP25) and periodic cattle grazing on plant communities. Collectively, we found 226 plant species representing 10% of Kansas plant diversity. Species richness was positively correlated with average precipitation, resulting in a two-fold increase in richness across the gradient. Eastern and western Kansas plant communities differed from one another with the central region being intermediate. The ratio of forb to grass cover increased with precipitation and at a greater rate in the higher diversity planting (CP25 compared with CP2), suggesting greater establishment success of forb species in the eastern region. Grazing resulted in multivariate differences in the plant communities in 2018, but not 2017. These differences were subtle and did not correspond to an increase in non-natives, a shift in floristic quality, or a consistent change in dominant grass abundance. Grazing also increased structural heterogeneity of the vegetation across the precipitation gradient, which may be important for wildlife habitat. These results suggest grazing can enhance plant structural heterogeneity in CRP grasslands while causing minimal change in plant community composition, at least over two years of moderate grazing.

**Wilkins, R.V., and Morrison III, W.R., Department of Entomology, Kansas State University, Center for Grain and Animal Health Research.** LIFE STAGE-SPECIFIC DIFFERENCES IN MOBILITY OF *TROGODERMA VARIABLE* (COLEOPTERA: DERMESTIDAE) AFTER EXPOSURE TO LONG-LASTING INSECTICIDE NETTING. *Trogoderma variable*, is a secondary pest of stored products. In earlier studies, long-lasting insecticide netting (LLIN) proved effective in controlling the spread of malaria by killing mosquitoes, but there's little research of the effects on stored product insects, including *T. variable*. In this study, movement and dispersal of adult and larval stages of *T. variable* were studied after exposure to LLIN. Distance and velocity of individuals were tracked after 1, 5, and 10 min exposure to control netting or LLIN. For the dispersal assay, adults or larvae were introduced to dispersal apparatuses after 5-min exposure to control or LLIN. Individuals were given 48 h to disperse to a novel food source. There was a significant, sustained decrease in the movement and dispersal capacity of both stages after exposure to LLIN, with adults more susceptible than larvae. Overall, LLIN is a promising tool for reducing the risks of infestations by stored product insects.

**Williams, D., Environmental Science Department, Johnson County Community College.** CULTURAL TABOOS AS A FACTOR IN THE PARTICIPATION RATE OF NATIVE AMERICANS IN STEM. Native Americans are underrepresented in science, technology, engineering, and mathematics (STEM). We investigated whether having to violate cultural taboos might be a factor in the decisions of some Native Americans not to pursue STEM degrees. Many STEM faculty likely know very little about Native Americans' historical experiences with an education system that has been used to forcibly acculturate them and so may not be aware of the threat many Native Americans perceive from curricula that claim cultural neutrality yet require Native Americans to violate strongly held cultural beliefs. Increasing Native American participation in STEM requires that their cultural concerns regarding STEM curricula be acknowledged and addressed. This is important for several reasons. First, Native Americans have the highest poverty rate of all racial/ethnic groups, while STEM graduates have higher employment rates and salaries than non-STEM graduates. Second, increasing diversity in STEM supports cognitive growth and critical thinking, benefits problem solving, and contributes to increasing

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productivity, creativity, and global competitiveness. Third, there is a long history of exploitation of Native Americans and their lands by scientists and engineers, so it is particularly important to increase Native American participation so that their interests are represented in these professions. Many Native Americans' concerns can be proactively and reasonably accommodated to provide a more respectful and welcoming learning and working environment and increase their participation in STEM, to everyone's benefit.

**Wolters, P., McPherson College.** MEASURING THE RELATIONSHIP BETWEEN BODY CONDITION AND BODY COMPOSITION IN TWO KANSAS SPIDER SPECIES. Energy is stored by organisms in one of three forms: proteins, carbohydrates, or lipids. This energy is used to perform the actions necessary for an organism to survive. An individual's body condition is a summary accounting for both the ability to acquire resources and properly allocate them. Ecologists use a variety of indices to estimate the body condition of an organism. In this study, two species of Kansas spider were caught in the wild and analyzed for body composition and body condition. These spiders have two distinct foraging types; one being a web-builder, *Neoscona crucifera*, and the second a ground hunter, *Rabidosa punctulata*. The body composition of these spiders differed as might be expected with two very different foraging styles. *N. crucifera* contained a higher fat content, and *R. punctulata* contained a higher percent protein and water weight by mass. The only significant relationship between a body condition index and a measure of any energy macromolecule was found between lipid percentage and the body condition residuals in *R. punctulata*.

**Yacoub, M., Apfl, A., and Katie Burgess, K., Department of Biology, Avila University.** HISTONE ACETYLATION DIMINISHES PLANARIAN REGENERATION. Planarian flatworms have an amazing ability to regenerate---extremely small pieces of tissue can form an entire flatworm. Neoblasts, the totipotent adult stem cells of planarian, are the source of new cells that allow regeneration after amputation. Epigenetics has been shown to play an important role in stem cell self-renewal and cell fate. Environmental stimuli and cell fate decisions affect the chemical modification of histone tails. Histone deacetylase (HDAC) activity is required for in vivo organ regeneration. Planarian regeneration provides a model system to study the role of epigenetics and histone acetylation in whole organismal regeneration. Planarian were treated with Trichostatin A (TSA), an inhibitor of HDAC that results in increased histone acetylation and thus looser chromatin structure and changes in gene expression. Two doses of TSA, 25nM and 50nM, were tested. Exposure to 50nM TSA resulted in decreased regeneration of planarian and malformations of the new tissue. TSA affected the regeneration of planarians' head, shown through regenerating one eye spot or no eye spots regeneration, no auricles regeneration, disintegration of the head, and exhibiting a coiled-fashion movement of the head. Worms exposed to TSA demonstrated a 1.5mm decrease in worm body length compared to the worms under control condition which grew 0.5mm. Current work is analyzing additional inhibitors of HDAC to confirm these findings. As exposure to TSA affects chromatin remodeling and causes abnormal expression of genes in neoblasts, our future work will focus on identifying genes involved in anterior regeneration in planaria.





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Mark LaBarge and Lori Slavin,  
Co-chairs for the 151<sup>st</sup> KAS and the 95<sup>th</sup> KES Annual Joint Meeting



