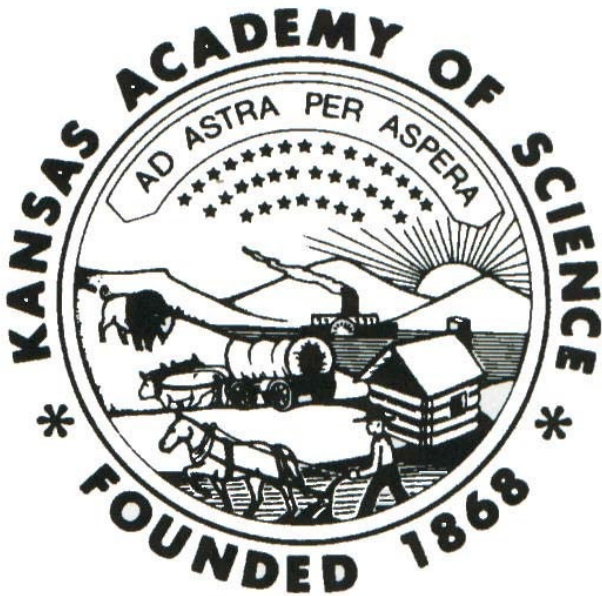


Joint Meeting of  
**Kansas Academy of Science**  
(148<sup>th</sup> Annual)  
&  
**Kansas Entomological Society**  
(92<sup>nd</sup> Annual)

McPherson College  
April 1-2, 2016



Program & Abstracts



## Welcome to McPherson College!

If you have any questions while you are here, please contact one of our host committee members:

Dr. Dustin Wilgers  
Dr. Jonathan Frye  
Dr. Allan van Asselt  
Dr. Allan Ayella  
Dr. Manjula Koralegedara



# McPherson

## COLLEGE



The following meeting events will be held in these buildings (numbered on the map)

**Oral and Poster Paper Presentations:** Melhorn Hall – Building 15

-Oral Presentations will occur in classrooms in basement and 1<sup>st</sup> floor

-Poster Presentations will occur in the hallways of the 2<sup>nd</sup> floor

**Keynote Speakers, Friday Dinner & Saturday Lunch:** Mingenback Theatre – Building 9

## 2016 Meeting Schedule Overview

### Friday, April 1

1:30 p.m.	Leave for Maxwell Wildlife Refuge field trip	Melhorn Hall (West Entry)
2:30 p.m.	Leave for Hospira/CHS field trip	Melhorn Hall (West Entry)
5:00 – 7:15 p.m.	Registration	Melhorn Hall (1 <sup>st</sup> floor)
6:00 – 7:15 p.m.	Dinner Banquet	Mingenback Theatre
7:30 – 8:30 p.m.	Keynote: Dr. Devin Schrader <i>“Meteors: Past, Present, &amp; Future”</i>	Mingenback Theatre
8:45 – 9:45 p.m.	KAS Executive Council Meeting	Melhorn Hall (Rm 101B)

### Saturday, April 2

7:00 – 10:00 a.m.	Registration	Melhorn Hall (1 <sup>st</sup> Floor)
7:00 – 8:30 a.m.	Breakfast	Mingenback Theatre
8:00 – 8:20 a.m.	Welcome	Mingenback Theatre
8:30 – 9:50 a.m.	Oral Paper Session 1	Melhorn Hall
9:50 – 10:30 a.m.	Poster Session	Melhorn Hall (2 <sup>nd</sup> Floor)
9:50 – 10:30 a.m.	Morning Break	
10:30 – 12:10 a.m.	Oral Paper Session 2	Melhorn Hall
12:15 – 1:10 p.m.	Lunch Banquet	Mingenback Theatre
1:10 – 2:10 p.m.	Keynote: Dr. Jonathan Pruitt <i>“From Individuals, to populations, to communities, to extinction: when does personality matter?”</i>	Mingenback Theatre
2:20 – 3:20 p.m.	Oral Paper Session 3	Melhorn Hall
3:20 – 3:40 p.m.	Afternoon Break / Snacks	Mingenback Theatre
3:40 p.m.	Award Presentations	Mingenback Theatre
4:00 – 5:00 pm	KES Business Meeting	Melhorn Hall (Rm 112)

# Keynote Talks

Friday Evening: 7:30 – 8:30 pm

## **Meteors: Past, Present, and Future**



**Dr. Devin Schrader**

Assistant Director of Center for Meteorite Studies  
Arizona State University

Saturday Afternoon: 1:45 – 2:45

## **From individuals, to populations, to communities, to extinction: when does personality matter?**



**Dr. Jonathan Pruitt**

Assistant Professor, Department of  
Ecology, Evolution & Marine Biology  
University of California – Santa Barbara

## **Oral Presentation Sessions Location & Schedule**

(Presenting Author in *Italics*)

(Student Competitors: (1) = Undergraduate, (2) Masters, (3) Doctoral)

Concurrent Paper Session 1 (Saturday 8:30-9:50 AM)

### Paleontology Symposium (Moderator: Michael Everhart) – Melhorn 112

8:30 ***Buskuskie, T.R. (2), and Wilson, L.E. Department of Geosciences, Fort Hays State University.***

OSTEOHISTOLOGY OF NIOBRARASAURUS COLEII.

8:50 ***King, J.L. (2), and Barrick, R. Department of Geosciences, Fort Hays State University.***

USING INNER EAR MORPHOLOGY AS AN INDICATOR OF TROPHIC LEVEL WITHIN THERIZINOSAURS (DINOSAURIA: THERIZINOSAURIA).

9:10 ***King, S. Curator of Collection, Museum of World Treasures.***

COMPARING TWO METHODS FOR ESTIMATING THE LIVE MASS OF DINOSAURS.

9:30 ***Everhart, M.J. Sternberg Museum of Natural History, Fort Hays State University.***

GIVING CREDIT WHERE CREDIT IS DUE: WHO DISCOVERED THE TYPE SPECIMENS OF FOSSILS FROM THE KANSAS CRETACEOUS?

### Ecology & Organismal Biology: Entomology (Moderator: Robert Hagen) – Melhorn 111

8:30 ***Anderson, S. E. (1), and Hagen, R. H. Department of Environmental Studies, University of Kansas.***

RESPONSE OF PERIODICAL CICADAS TO A FRAGMENTED LANDSCAPE.

8:50 ***Khalidi, A.M. (1), Wilgers, D, and Frye, J. Department of Natural Sciences, McPherson College.***

THE EFFECTS OF LIGHT ENVIRONMENT ON THE DEVELOPMENT OF EYE PIGMENTS IN *DROSOPHILA MELANOGASTER*.

9:10 ***Simon, S. (1), Wilgers, D.J., and Ayella, A. Department of Natural Sciences, McPherson College.***

EFFECTS OF FEMALE MATING STATUS ON THE EXPRESSION AND SUCCESS OF MALE MATING TACTIC IN THE WOLF SPIDER *RABIDOSA PUNCTULATA*.

9:30 ***Buschman, L.L. Department of Entomology, Kansas State University.***

FIELD GUIDE TO WESTERN NORTH AMERICA FIREFLIES (LAMPYRIDAE): FOCUS ON KANSAS.

Ecology & Organismal Biology 2 (Moderator: Gretchen Sassenrath) – Melhorn 113

- 8:30 **Martin, N.M., Kobayashi, Y., and Maricle, B.R. Department of Biological Sciences, Fort Hays State University.**  
SPECIES-SPECIFIC ENZYMATIC TOLERANCE OF SULFIDE TOXICITY IN PLANT ROOTS AND COMPARATIVE SUSCEPTIBILITY BETWEEN PLANT AND CATFISH TISSUE
- 8:50 **McCampbell, B.C. (2), and Maricle, B.R. Department of Biological Sciences, Fort Hays State University.**  
ORGANISMAL COMPOSITION AND PHOTOSYNTHETIC TRAITS OF BIOLOGICAL SOIL CRUSTS IN PRAIRIE ECOSYSTEMS OF THE GREAT PLAINS.
- 9:10 **Schouten, O.S. (2), and Houseman, G.R. Department of Biological Sciences, Wichita State University, Wichita, KS.**  
THE INFLUENCE OF SOIL HETEROGENEITY ON THE SPATIAL STRUCTURE OF AN ASSEMBLING PRAIRIE PLANT COMMUNITY.
- 9:30 **Sassenrath, G.F.<sup>1</sup>, Hsiao, C.-H.<sup>1</sup>, Alarcon, V.J.<sup>2</sup>, Mueller, T.G.<sup>3</sup> 1. Southeast Research and Extension Center, Kansas State University, 2. Universidad Diego Portales, Santiago, Chile, and 3. John Deere, Inc., Des Moines, IA.**  
AGRICULTURAL PRODUCTION IN SOUTHEAST KANSAS: TRANSITIONING TO SUSTAINABILITY.

Concurrent Paper Session 2 (Saturday 10:30 AM – 12:10 PM)

Paleontology Symposium – Continued (Moderator: Michael Everhart) – Melhorn 112

- 10:30 **Williams, D.R. Department of Biology, University of Saint Mary.**  
SCAVENGERS OR HUNTERS? EVIDENCE IN THE AGE DISTRIBUTION OF COMMON RAVENS (*CORVUS CORAX*) FROM NATURAL TRAP CAVE.
- 10:50 **Wilson, P.J. (2), and Zhang, C. Department of Geosciences, Fort Hays State University.**  
STABLE ISOTOPE DIET ANALYSIS OF *TELEOCERAS FOSSIGER* FROM THE HIGH PLAINS OF KANSAS AND COMPARISON BETWEEN TWO SPECIES.
- 11:10 **Whitenack, W.B. McPherson Museum and Arts Foundation.**  
J.Z. GILBERT - PREACHER, TEACHER, PIONEER PALEONTOLOGIST.
- 11:30 **Barnett, J.R. (2). Department of Geosciences, Fort Hays State University.**  
FOSSIL PREPARATION IN A SMALL LAB: A CASE STUDY OF PREPARATOR TRAINING AT THE STERNBERG MUSEUM OF NATURAL HISTORY IN HAYS, KANSAS.
- 11:50 **Jorgensen, D.D. (2). Geosciences Department, Fort Hays State University.**  
THE CORRELATION AMONG SUTURE COMPLEXITY, SHELL FORM, AND STRATIGRAPHY IN CRETACEOUS AMMONITES IN THE WESTERN INTERIOR SEAWAY.

Cell Biology & Genetics (Moderator: Erin Morris) – Melhorn 102

- 10:30 **Alderman, C. (1), Sehlaoui, A., and Yang, Y. Emporia State University.**  
THE *IN VITRO* AND *IN VIVO* EFFECTS OF MIRNA-15a ON HUMAN MALIGNANT MELANOMA AND THE NEWLY DISCOVERED TARGET GENE OF MIRNA-15A.
- 10:50 **Fraser, T. (1), and Frye, J. Department of Natural Sciences, McPherson College.**  
OSMOTIC STRESS SURVIVAL AND THERMAL TOLERANCE IN *SACCHAROMYCES CEREVISIAE*.
- 11:10 **Yu, C. (2), and Yang, Y. Department of Biological Sciences, Emporia State University.**  
THE EFFECT OF ULTRA-VIOLET LIGHT ON THE EXPRESSION OF P53 DOWNSTREAM GENES.
- 11:30 **Mukherjee, L. (2), Hendry, I.R., and Hendry, W.J. Department of Biological Sciences, Wichita State University.**  
DETERMINATION OF DIFFERENTIAL PROTEOMIC EXPRESSION OF CD44, CD133 AND C-KIT/CD117 IN OVARIAN CANCER CELL LINES.
- 11:50 **Hu, C.K. (2), and Yang, Y. Department of Biological Sciences, Emporia State University.**  
SYNERGISM OF DAM, MUTH, AND MUTS OF METHYL-DIRECTED MISMATCH REPAIR IN *ESCHERICHIA COLI*.



Ecology & Organismal Biology 3 (Moderator: Dixie Smith) – Melhorn 111

- 10:30 **Caudle, K.L.<sup>1</sup> (2), Hilt, C.J.<sup>1</sup>, Smart, C.M.<sup>1</sup>, Urban, A.D.<sup>1</sup>, Kramer, D.L.<sup>1</sup>, Martin, N.M.<sup>1</sup>, Baer, S.G.<sup>2</sup>, Johnson, L.C.<sup>3</sup>, and Maricle, B.R.<sup>1</sup>** 1. Department of Biological Sciences, Fort Hays State University, 2. Department of Plant Biology, Southern Illinois University, 3. Division of Biology, Kansas State University.  
DOES ENVIRONMENT OR GENETICS INFLUENCE LEAF LEVEL PHYSIOLOGY? MEASURING PHOTOSYNTHETIC RATES OF NATIVE BIG BLUESTEM (*ANDROPOGON GERARDII*) GROWN IN COMMON GARDENS ACROSS A PRECIPITATION GRADIENT.
- 10:50 **Martino, M. (2), and Beck, J.B.** Department of Biological Sciences, Wichita State University.  
ARE CYTOTYPES NON-RANDOMLY DISTRIBUTED IN THE GIANT GOLDENROD *SOLIDAGO GIGANTEA*?
- 11:10 **Konrade, L.A.** Biological Sciences Department, Wichita State University.  
EVALUATING RANGE GENETICS IN BLACK CHERRY (*PRUNUS SEROTINA* EHRH.) WITH AN EXPANSIVE SET OF HERBARIUM SPECIMENS.
- 11:30 **Reichenborn, M.M.<sup>1</sup> (2), Houseman, G.R.<sup>1</sup>, and Hughes, D.T.<sup>2</sup>** 1. Department of Biological Sciences, Wichita State University, 2. Department of Anthropology, Wichita State University.  
EXAMINING THE RELATIONSHIP BETWEEN TOPOGRAPHY AND THE DISTRIBUTION OF *SERICEA LESPEDEZA* (*LESPEDEZA CUNEATA*) THROUGH SPATIAL ANALYSIS.
- 11:50 **Heil, J.A. (2), Smith, D.L., and Jayawardhana, A.** Pittsburg State University.  
A MEASUREMENT OF HISTORICAL AND CONTEMPORARY FUNCTIONAL DIVERSITY ON THE MONAHAN RECLAIMED GRASSLAND.

Ecology & Organismal Biology 4 (Moderator: Joe Arruda) – Melhorn 113

- 10:30 **Schillo, C.<sup>1</sup> (I), Hagen, R.H.<sup>1</sup>, and Fox, L.J.<sup>2</sup> 1. Environmental Studies Program, University of Kansas, 2. Kansas Department of Wildlife, Parks, and Tourism.**  
WHITETAIL DEER POPULATIONS AT THE UNIVERSITY OF KANSAS FIELD STATION.
- 10:50 **Stultz, C.J. (I), and Williams, D.R. Department of Biology, University of Saint Mary.**  
INFLUENCE OF MARMOTA MONAX ON URBAN ENVIROMENTS.
- 11:10 **Fleming, L. (I), and Wilgers, D.J. Department of Natural Sciences, McPherson College.**  
HOW DO FACTORS RELATED TO LIMESTONE ROAD RUNOFF AFFECT GROWTH AND DEVELOPMENT OF FRESHWATER MUSSELS.
- 11:30 **Tibbs, L.E.<sup>1</sup> (I), Cortes, B.W.<sup>1</sup>, and Miller, W.R.<sup>2</sup> 1. Biology Department, Benedictine College, 2. Department of Biology and Chemistry, Baker University.**  
TARDIGRADES IN THE CANOPY: THE DILEMMA BETWEEN THE GENERA *ITACUASCON* AND *ASTATUMEN*.
- 11:50 **Miller, W.R.<sup>1</sup>, Gray, J.F.<sup>2</sup>, Gregory, M.M.<sup>3</sup>, Emanueles, A.F.<sup>1</sup> and Lowman, M.D.<sup>4</sup> 1. Baker University, 2. Unity College, 3. Piedmont College, 4. California Academy of Science.**  
TARDIGRADES IN THE CANOPY: VARIATION IN THE GENUS *MILNESIUM*.

Concurrent Paper Session 3 (Saturday 2:20 – 3:20 PM)

Ecology & Organismal Biology 5 (Moderator: Leland Russell) – Melhorn 112

- 2:20 **Maccarone, A.D.<sup>1</sup> and Brzorad, J.N.<sup>2</sup> 1. Biology Department, Friends University, 2. Reese Institute for Conservation of Natural Resources, Lenoir-Rhyne University.**  
INTRASPECIFIC AND INTERSEXUAL VARIATION IN THREE SPECIES OF WADING BIRDS.
- 2:40 **Renken, R.C., Thompson, J.A., and Maccarone, A.D. Biology Department, Friends University.**  
FORAGING MICROHABITAT SELECTION BY LONG-LEGGED WADING BIRDS AT AN ARTIFICIAL WEIR.
- 3:00 **Tuck, R.<sup>1</sup>, Adhikari, S.<sup>2</sup>, and Russell, F.L.<sup>1</sup> 1. Department of Biological Sciences, Wichita State University, 2. Department of Land Resources and Environmental Sciences, Montana State University.**  
APICAL MERISTEM MINING, SEED DISPERSAL PHENOLOGY AND OFF-SPRING PERFORMANCE IN TALL THISTLE (*CIRSIMUM ALTISSIMUM*).

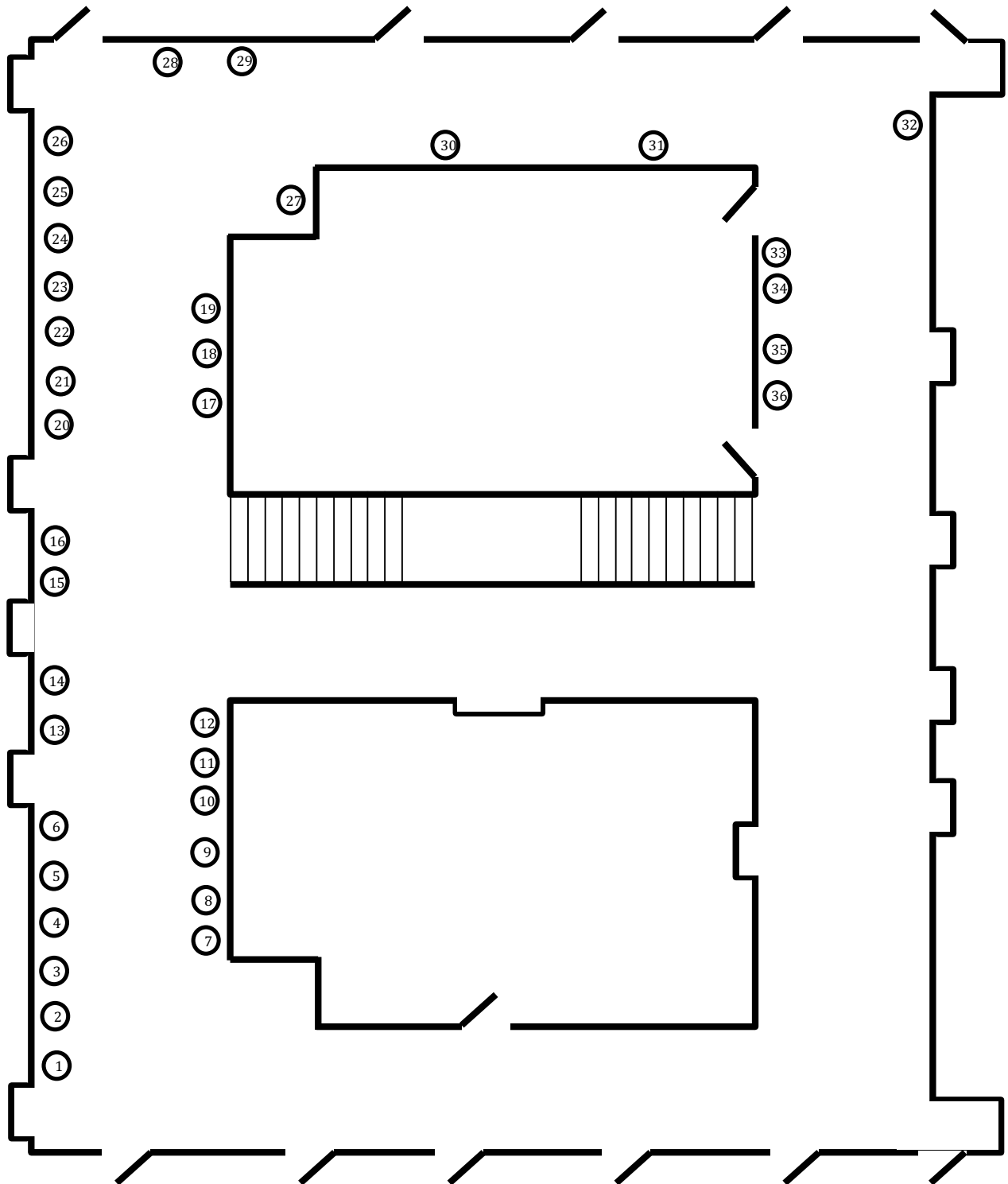
Health & Medicine (Moderator: Jacob Lutgen) – Melhorn 111

- 2:20 **Qian, H. (2), Yan, Y., and Yang, Y. Department of Biological Sciences, Emporia State University.**  
EFFECTS OF VITAMIN C ON HUMAN MALIGNANT MELANOMA.
- 2:40 **Zimmerman, W.<sup>1</sup> (1), Koralegedara, M.<sup>1</sup>, and Wimalasena, K.<sup>2</sup> 1. Department of Natural Science, McPherson College, 2. Department of Biochemistry, Wichita State University.**  
CELL TOXICITY STUDIES TO UNDERSTAND NEURODEGENERATIVE PARKINSON'S DISEASE.
- 3:00 **Long, A. (1), and Koralegedara, M. Department of Natural Sciences, McPherson College.**  
THE EFFECT OF PROTECTIVE AGENTS ON THE DEMINERALIZATION OF HUMAN TOOTH ENAMEL.

Soil & Geology (Moderator: Anthony Layzell) – Melhorn 113

- 2:20 **Moore, K. (2), and Gillock, E. T. Fort Hays State University.**  
ISOLATION OF SOIL *BACILLUS* SPP WITH INHIBITORY ACTIVITY AGAINST METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA)
- 2:40 **Smith, J.J.<sup>1</sup>, Ludvigson, G.A.<sup>1</sup>, Layzell, A.<sup>1</sup>, Stotler, R.<sup>2</sup>, and Möller, A.<sup>2</sup> 1. Kansas Geological Survey, 2. University of Kansas.**  
SCIENTIFIC DRILLING IN THE CENOZOIC STRATA OF THE HIGH PLAINS OF WESTERN KANSAS.
- 3:00 **Layzell, A.L., and Mandel, R.D. Kansas Geological Survey, University of Kansas.**  
VARIABILITY OF STREAMBANK EROSION IN NORTHEAST KANSAS: THE IMPORTANCE OF LITHO- AND SOIL-STRATIGRAPHY.

# Poster Presentations Location



## **Poster Presentations**

(Presenting Author in *Italics*)

(Student Competitors: (1) = Undergraduate, (2) Masters, (3) Doctoral)

1. ***Aber, J.S.<sup>1</sup>* and *Aber, S.W.<sup>2</sup>*** 1. Department of Physical Sciences, Emporia State University, and 2. Science and Math Education Center, Emporia State University, Kansas.  
KANSAS WIND ENERGY—2016 UPDATE.
2. ***Aber, S. W.<sup>1</sup>*, and *Retta, A.<sup>2</sup>*** 1. Emporia State University, and 2. Ethiopian Amber, Addis Ababa, Ethiopia.  
INSECT-BEARING NATURAL-GREEN AMBER FROM ETHIOPIA: A PRELIMINARY REPORT.
3. ***Abudu, T. (1)*, *Peters, M. (1)*, and *Peak, M.M.*** Pittsburg State University.  
ANALYZING THE GUT MICROBIOME OF HUMAN POPULATIONS IN CRAWFORD COUNTRY.
4. ***Barta, J.*, *Klish M.*, and *Welch, W.*** Derby High School.  
PRELIMINARY ACOUSTICAL BAT SURVEY OF DERBY KS.
5. ***Becker, E. (1)*, *Hiatt, N.*, and *Hong, W-F.*** Department of Natural Sciences and Mathematics, Sterling College.  
IDENTIFICATION OF *ALTERNARIA* SPP. ON COTTONWOOD TREES IN THE KANSAS AREA.
6. ***Caudle, K.L. (2)*, and *Gillock, E.T.*** Department of Biological Sciences, Fort Hays State University.  
PHYLOGENETIC DISTRIBUTION OF AN ENDOGENOUS STRAIN OF DAHLIA MOSAIC VIRUS IN MEMBERS OF ASTERACEAE.
7. ***Chapman, C.<sup>1</sup> (1)*, *Edison, B.<sup>1</sup>*, *Johnson, E.<sup>1</sup>*, *Harman, M.<sup>1</sup>*, *Zayyad, N.<sup>1</sup>*, *Seybert, J.<sup>1</sup>*, *Watters, C.<sup>1</sup>*, *R. Emme, R.<sup>1</sup>*, *Sliva, T.<sup>1</sup>*, *Vila, E.*, *Sivron, R.<sup>1</sup>*, *Miller, W.R.<sup>2</sup>*, *Russell, D.<sup>2</sup>*, and *Al-Kofahi, M.<sup>1</sup>*** 1. Department of Physics, Baker University, and 2. Department of Biology, Baker University.  
USE OF ARDUINO MEGA 2560 R3 BOARD IN THE AUTOMATION OF A GREEN HOUSE.
8. ***Emanuels, A.<sup>1</sup> (1)*, *Villella, J.<sup>2</sup>*, *Carey, G.<sup>2</sup>*, *Miller, J.E.D.<sup>3</sup>*, *Young, A.<sup>1</sup>* and *Miller, W.R.<sup>1</sup>*** 1. Biology, Baker University, 2. The Biodiversity Research Collective, 3. University of Wisconsin - Madison.  
TARDIGRADES IN THE CANOPY: LIVING WITH RED TREE VOLES IN OREGON.
9. ***Engelken, P.J. (1)*, *Leddy, C.D.*, and *Mercader, R.J.*** 1. Department of Biology, Washburn University.  
EFFECTS OF AN OUTBREAKING SPECIALIST HERBIVORE, *OMPHALOCERA MUNROEI*, ON THE PATCH DYNAMICS OF THE COMMON PAW-PAW FOLLOWING AMUR HONEY SUCKLE REMOVAL.

10. **Gaeddert, A.K. (1), Conard, J., Johnson, R., and Buckwalter, N.R. Department of Biology, Sterling College.**  
A COMPARISON OF URBAN AND RURAL PRAIRIE DOG DENSITIES.
11. **Garrett, M.<sup>1</sup>, Wilgers, A.<sup>1</sup>, Buckwalter, L.<sup>1</sup>, Mettling, A.<sup>1</sup>, Lopez, M.<sup>1</sup>, Waters, K.<sup>1</sup>, Smith, M.<sup>1</sup>, Oswald, P.<sup>1</sup>, Dickerson, R.<sup>1</sup>, Pitschmann, J.<sup>1</sup>, Buckwalter, N.<sup>1</sup>, Carey, C.<sup>1</sup>, Chiang, C-H.<sup>2</sup>, and Hong, W-F.<sup>1</sup> Department of Natural Sciences and Mathematics, Sterling College, 2. Da-Yeh University, Taiwan.**  
EFFECTIVENESS OF FUNGICIDE USE UPON WHEAT PRODUCTON IN CENTRAL AND SOUTHERN KANSAS .
12. **Glynn, J.M.<sup>1</sup>, Carter, J.J.<sup>1</sup>, Hickman, K.R.<sup>2</sup>, and Greer, M.J.<sup>1</sup> 1. Department of Biological Sciences, Fort Hays State University, 2. Department of Natural Resource Ecology and Management, Oklahoma State University.**  
MAKING THE BEST OF A BAD SITUATION: INVASIVE GRASS EXUDATES MAY HAVE ANTI-BACTERIAL AND/OR ANTI-FUNGAL PROPERTIES.
13. **Haller, R.M. (1), and Leung, S.H. Department of Chemistry, Washburn University.**  
PROGRESS TOWARD THE SYNTHESIS OF DIPYRROLYL- $\alpha,\beta$ -UNSATURATED KETONES.
14. **Heffren, P.M. (1), and Schmidt, S.E. Department of Chemistry, Washburn University.**  
ISOLATION OF THE AZAMACROCYCLES FORMED FROM THE DETOSYLATION OF CYCLIC TOSYLAMIDES.
15. **Higdon, N.B.A. (1), Cork, G.K., Chavez, O.R., DeHart, S.L., Bjerke, S.L. Department of Biology, Washburn University.**  
ANALYZING PROTEIN INTERACTIONS OF THE HERPES SIMPLEX VIRUS TYPE 1 UL34 PROTEIN.
16. **Hummert, A.M. (1), and Adem, S. Department of Chemistry, Washburn University.**  
ANALYSIS AND DETECTION OF MELAMINE IN SOLID PET FOOD SAMPLES USING HPLC AND SURFACE PLASMON RESONANCE.
17. **Jones, R. Department of Physical Sciences, Emporia State University.**  
SCIENCE IS NOT VALUE FREE.
18. **Kramer, D.L.<sup>1</sup> (1), Caudle, K.L.<sup>1</sup>, Hilt, C.J.<sup>1</sup>, Martin, N.M.<sup>1</sup>, Urban, A.D.<sup>1</sup>, Baer, S.G.<sup>2</sup>, Johnson, L.C.<sup>3</sup>, and Maricle, B.R.<sup>1</sup>, 1. Department of Biological Sciences, Fort Hays State University, 2. Department of Plant Biology and Center for Ecology, Southern Illinois University, and 3. Division of Biology, Kansas State University.**  
MORPHOLOGICAL DIFFERENCES IN ECOTYPES OF BIG BLUESTEM (*ANDROPOGON GERARDII*) GROWN IN COMMON GARDENS ACROSS A PRECIPITATION GRADIENT.

19. **Lutgen, J.D.<sup>1,2</sup>(1), Boese, L.I.<sup>1,2</sup>, and Maricle, B.R.<sup>2</sup>, 1. Kansas Academy of Mathematics and Sciences, Fort Hays State University, 2. Department of Biological Sciences, Fort Hays State University.**  
EFFECT OF TRICLOSAN CONCENTRATION ON PHYSIOLOGY OF *LEMNA MINOR*.
20. **Mayes, D.M. (3) and Smith, D.R. Department of Ecology and Evolutionary Biology, University of Kansas.**  
DIVERSITY OF TRAP-NESTING BEES AND WASPS WITHIN REMNANT AND RESTORATION TALLGRASS PRAIRIES IN EASTERN KANSAS.
21. **Mayes, D.M.<sup>1</sup> (3), Bhatta, C.<sup>1</sup>, Brown, J.C.<sup>2</sup>, 1. Department of Ecology and Evolutionary Biology, University of Kansas, 2. Department of Geography, University of Kansas.**  
OBSERVATIONS OF THE AFRICAN HONEY BEE *APIS MELLIFERA SCUTELLATA* IN DEFORESTED AND FORESTED LOCATIONS ACROSS RONDONIA, BRAZIL.
22. **McElroy, A.P. (2), and Wehrbein, R.L. Emporia State University.**  
EVIDENCE OF THE OLDEST HEALED LIMB FRACTURE IN A PROBABLE AMNIOTE.
23. **Nieves, A.C. (1), and Greer, M.J. Department of Biological Sciences, Fort Hays State University.**  
REMOVAL OF OLD WORLD BLUESTEM THROUGH SOIL SOLARIZATION: EFFECTS ON THE SOIL MICROBIAL COMMUNITY.
24. **Pittenger, M.S.<sup>1</sup> (1), Caudle, K.L.<sup>1</sup>, Baer, S.G.<sup>2</sup>, Johnson, L.C.<sup>3</sup>, and Maricle, B.R.<sup>1</sup> 1. Department of Biological Sciences, Fort Hays State University, 2. Department of Plant Biology and Center for Ecology, Southern Illinois University, 3. Division of Biology, Kansas State University.**  
HERBIVORY PREFERENCES AMONG ECOTYPES OF BIG BLUESTEM (*ANDROPOGON GERARDII*).
25. **Sleezer, L.J.<sup>1</sup> (1), Kraft, C.D.<sup>2</sup>, and Sleezer, R.O.<sup>2</sup> 1. Department of Biological Sciences, Emporia State University, 2. Department of Physical Sciences, Emporia State University.**  
GIS AND REMOTE SENSING ANALYSIS OF BOVINE TRAILS AT THE TALLGRASS PRAIRIE NATIONAL PRESERVE.
26. **Stoehr, K., and Nonnenmacher, H. Pittsburg State University.**  
OBSERVATIONS OF INSECT FORAGERS ON TALL THISTLE, *CIRSIUM ALTISSIMUM* (L.) SPRENG. WITH ANALYSIS OF THEIR POLLEN LOADS.
27. **Tamang, T.M.<sup>1</sup> (2), Alsdurf, J.<sup>2</sup>, Johnson, L.C.<sup>2</sup>, Baer, S.G.<sup>3</sup>, and Maricle, B.R.<sup>1</sup> 1. Department of Biological Sciences, Fort Hays State University, 2. Division of Biology, Kansas State University, 3. Department of Plant Biology and Center for Ecology, Southern Illinois University.**  
DETERMINATION OF EVOLUTIONARY HISTORY OF BIG BLUESTEM ECOTYPES THROUGH CHLOROPLAST DNA ANALYSIS.

28. **Tauber, G.O.<sup>1</sup> (1), Campbell, M.L.<sup>1</sup>, and Greer, M.J.<sup>2</sup> 1. Kansas Academy of Math and Science, Fort Hays State University, 2. Department of Biological Sciences, Fort Hays State University.**  
A STORY OF CHEMICAL WARFARE IN NATURE, CHAPTER 2: DO CLOSELY RELATED INVASIVE GRASS SPECIES WITH SIMILAR EVOLUNTARY HISTORIES POSSESS ANALOGOUS ALLELOPATHIC PROPERTIES?
29. **Toth, S.P. (1), and Leung, S.H. Department of Chemistry, Washburn University.**  
FURTHER ADVANCEMENT AND OPTIMIZATION IN THE SYNTHESIS OF DIPYRROMETHANES WITH A  $\beta$ -AZO LINKAGE TO SUBSTITUTED BENZENES.
30. **Trump, E.L., and Alrashed, M. Department of Chemistry, Emporia State University.**  
THE USE OF COAL FLY ASH AS A CATALYST SUPPORT FOR THE FABRICATION OF CARBON NANOTUBES.
31. **Urban, A.D. (1), Kobayashi, Y., and Maricle, B.R. Department of Biological Sciences, Fort Hays State University.**  
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# Abstracts

Organized Alphabetically

**Aber, J.S.<sup>1</sup> and Aber, S.W.<sup>2</sup>** **1. Department of Physical Sciences, Emporia State University, and 2. Science and Math Education Center, Emporia State University, Kansas.** KANSAS WIND ENERGY—2016 UPDATE. The first large wind farm in Kansas was constructed in 2001. By the end of 2011, Kansas had 11 large wind projects with a total nominal generating capacity of 1.27 GW. Spurred by tax and financial incentives, rapid growth took place since 2012. Currently installed wind-generating capacity is 3.77 GW, a three-fold increase, which places Kansas sixth among states for wind-energy production. By 2017, the number of large wind projects is projected to reach 30, and the total nominal generating capacity is estimated to surpass 4.5 GW. Original target regions for wind-power development were the High Plains, Blue Hills, and Flint Hills, which have the best wind-energy potential (>8.0 m/sec average wind speed at 80 m height). During the period 2012-2016, most construction of new wind projects took place in the High Plains and Blue Hills. Existing wind farms were expanded and many new wind farms developed in these regions. Further wind-energy growth has been curtailed in the Flint Hills, however, because of the Heart of the Flint Hills Area exclusion zone. Farther east, the Osage Cuestas has seen recent construction of a large wind farm on the drainage divide between the Missouri and Arkansas basins, which has the best wind-energy potential in the eastern portion of the state (7.5 m/sec average wind speed at 80 m height). In addition to this wind-power infrastructure, Kansas consumers now have the option to purchase all or part of their electricity from renewable (wind or solar) sources for a small surcharge.

**Aber, S. W. <sup>1</sup> (1), and Retta, A.<sup>2</sup>** **1. Emporia State University, Emporia, Kansas, and 2. Ethiopian Amber, Addis Ababa, Ethiopia.** INSECT-BEARING NATURAL-GREEN AMBER FROM ETHIOPIA: A PRELIMINARY REPORT. Amber is hardened, fossilized tree resin that has lost volatile components over time during burial in sediment. The best-known amber is found in the Baltic region in northern Europe, and amber has been discovered on every other continent except Antarctica. Common natural colors are yellow, brown, and orange. Amber is scientifically valuable as it may contain remains of insects, other small animals and plant debris, as well as bubbles of ancient air. Ethiopian amber was first reported in 2010. It is found in Amhara and Oromia states in the Northern Shoa region. By law, only local citizens in this region can mine the amber and specimens are obtained directly from these miners. This amber is mostly yellowish- and reddish-brown in color with some rare green specimens. Some pieces of Ethiopian amber contain plant matter and insects. Whole insects are well preserved including various ants, wasps, spiders, bees, and other unidentified types. The amber is contained within siltstone and sandy limestone. According to local geologists, it is just below volcanic rocks, and the amber-bearing strata is Miocene in age. Specimens of green amber are demonstrated, and study of insect remains is underway.

**Abudu, T. (1), Peters, M. (1), and Peak, M.M.** **Pittsburg State University.** ANALYZING THE GUT MICROBIOME OF HUMAN POPULATIONS IN CRAWFORD COUNTRY. Human microbiota is the collection of microbes living in and on our body. Microbial cells outnumber human cells by 10 to 1 in a healthy human body. Previous studies demonstrated the gut microbiome from human samples correlate with disease, diet, and other human characteristics. Three microbe families that are prevalent are *Bacteroidaceae*, *Prevotellaceae*, and *Lachnospiraceae/Ruminococaceae*. Even though studies have found a link between microbiome and health, the role in chronic diseases has yet to be elucidated. To determine the type of bacteria in the human microbiome, 16S rRNA gene sequence data is isolated and examined from human DNA. Wastewater serves as a source for human microorganisms. DNA is extracted from the microorganisms and isolated so the 16S rRNA is tagged and fragmented. Bacterial genome libraries are available to provide descriptions to match laboratory results of the unidentified sequenced DNA to known and labeled bacterial sequences. Studies have been conducted in many cities and have identified diseases that correlate with human samples of microorganisms. There is interest in the gut microbiome of the residents in Crawford County, the role of the microbiome in chronic diseases, and the significant impact on human health. In our study, we will collect the influent wastewater from Pittsburg, KS, and surrounding communities, and analyze the gut microbiome.

**Alderman, C. (1), Sehlaoui, A., and Yang, Y.** **Emporia State University.** THE *IN VITRO* AND *IN VIVO* EFFECTS OF MIRNA-15a ON HUMAN MALIGNANT MELANOMA AND THE NEWLY DISCOVERED TARGET GENE OF MIRNA-15A. MiRNAs can affect behaviors of tumor cells by modulating the expression of the target genes that involve tumor growth, invasiveness and death. The goal of this research is to examine the effects of

miRNA-15a on the proliferation and invasiveness of malignant melanoma cells in vitro, as well as the therapeutic effect of miRNA-15a in a mouse melanoma model. MiRNA-15a displayed inhibitory effects on proliferation and invasiveness of SKMEL-28 and CRL-2808 human malignant melanoma cells. MiRNA-15a also caused cell cycle arrest at G1 phase. MiRNA-15a down-regulated the expressions of CDCA4 and AKT-3 in melanoma cell lines. In vivo experiment showed that miRNA-15a significantly retarded the growth of melanoma tumors in the mouse model. CDCA4 was shown to be the bona fide target of miRNA-15a by a miRNA target validation assay. In conclusion, miRNA-15a suppressed the growth and invasiveness of melanoma cells, suggesting that miRNA-15a may represent a viable miRNA-based therapy against melanoma.

**Anderson, S. E. (1), and Hagen, R. H. Department of Environmental Studies, University of Kansas.**

RESPONSE OF PERIODICAL CICADAS TO A FRAGMENTED LANDSCAPE. Habitat fragmentation is the phenomenon in which a continuous habitat is divided into smaller, isolated areas separated by human-altered land cover. The periodical cicada's 17-year life span makes it an ideal candidate for examining the long-term effects of habitat fragmentation. During the 2015 emergence *Magicicada cassini* were collected from the Kansas Fragmentation Experiment at the University of Kansas Field Station. The experiment is set up as a matrix of different size patches undergoing succession to woody vegetation; succession has proceeded faster on large patches and patches nearest the forest edge. Our results are based on data from 311 permanent plots within the large and small habitat patches. Studies in 1998 revealed that cicada oviposition was greatest in large patches and in patches nearest the forest edge. In 2015, we found that distribution of emerging cicadas differed from the oviposition pattern: cicada density was highest in patches far from the forest edge, consistent with higher survival of nymphs at those sites. Body mass of newly molted adult cicadas is correlated with metatibia length of their exuvia. We used this relationship to look for differences in cicada growth by measuring 1,086 cicada exuviae collected from the plots. Cicadas were significantly larger in patches far from the forest edge, but mean size did not differ between large and small patches. Survival and growth of cicada nymphs during their 17 years underground appears to be sensitive to the rate of woody plant succession.

**Barnett, J.R. (2). Department of Geosciences, Fort Hays State University.** FOSSIL PREPARATION IN A SMALL LAB: A CASE STUDY OF PREPARATOR TRAINING AT THE STERNBERG MUSEUM OF NATURAL HISTORY IN HAYS, KANSAS. The process of fossil preservation is exhaustive, meticulous, and demands knowledgeable specialists. In small museums, the preparation staff can often be limited by the absence of tools, funds, and experience. This case study highlights the development and field-testing of preparatory resources to train students at the Sternberg Museum of Natural History. The Sternberg Museum has a backlog of fossils requiring preparation and a need for volunteers trained in fossil preparation, making it an ideal location. At the start of training, student volunteers were provided with a workbook containing guidelines, common mistakes, and tips on preparatory techniques. A teaching manual was also compiled, detailing lesson plans to guide the trainer through a series of workshops and pedagogical techniques. Over the course of four two-hour sessions, students learned techniques for assessing fossils and matrix, how to determine the appropriate tools, proper use of materials and tools, and molding and casting techniques. Qualitative assessments were based on final prepared specimens, knowledge of methods, and a final self-assessment. At completion, students could satisfactorily prepare a variety of specimens. The course material successfully trained the beginnings of a preparation corps of volunteers and allowed for greater engagement with the public by consistently populating the preparation laboratory. The simplistic and methodical nature of the materials produced educated students with ample time for practice, assessment, and improvement. The versatility and scope of the materials provide an easily downloadable and free resource for museums of any size to train and educate new preparators in proper fossil preparation techniques.

**Barta, J., Klish M., and Welch, W. Derby High School.** PRELIMINARY ACOUSTICAL BAT SURVEY OF DERBY KS. An acoustical bat survey to determine bat species presence was conducted during the period from May 2, 2015 – September 28, 2015, in the city limits of Derby KS. The survey combined the results of two different acoustical approaches; stationary point survey and a mobile transect survey. The acoustical bat detector (Echometer Touch) and auto-id software were able to detect the presence of at least one member of the following bat species: Evening Bat (*Myotis myotis*), Big Brown Bat (*Eptesicus fuscus*), Leconte's Free-tailed Bat (*Tadarida brasiliensis*), Little Brown Bat (*Myotis lucifugus*), Eastern Red Bat (*Lasiurus borealis*), Silver-haired Bat (*Lasionycteris noctivagans*), and Tricolored Bat (*Perimyotis subflavus*). All identified bat calls were verified using a comparison of the Echometer Touch recorded sonograms from this study with known sonograms from the North American Bat Monitoring Program (NABat). This study verified the presence of these bat species during the study period (May 2, 2015 – September 28, 2015) in Derby KS. Due to the limited

data set acquired as well as the restrictions set by the hardware and software used, the activity patterns and population dynamics of the bat species could not be determined or inferred. This study can serve as a baseline for long-term ecological research monitoring of bats in Derby, KS.

**Becker, E. (1), Hiatt, N., and Hong, W-F. Department of Natural Sciences and Mathematics, Sterling College.** IDENTIFICATION OF *ALTERNARIA* SPP. ON COTTONWOOD TREES IN THE KANSAS AREA. The Cottonwood Species, *Populus deltoids*, was declared the state tree of Kansas in 1937, and is also a staple of Kansan environs. However, in the summer of 2015, a disease outbreak in the Eastern Cottonwood trees was observed at the Sterling Lake, in Rice County, Kansas. The culprit, *Alternaria* species, a genus of Ascomycete fungi, causing the leaf blight was found and isolated from the Cottonwood. To identify pathogenicity, the isolated species were collected from the leaves and two different inoculation tests were performed to complete the Koch's Postulates procedure. It is now confirmed that *Alternaria* species, a primary pathogen, is responsible for leaf blight in these Eastern Cottonwoods. Species identification and pathogenicity test for the other crops are underway.

**Buschman, L.L. Department of Entomology, Kansas State University.** FIELD GUIDE TO WESTERN NORTH AMERICA FIREFLIES (LAMPYRIDAE): FOCUS ON KANSAS. I will discuss the "Field Guide to Western North America Fireflies" which is posted on the web site of the Department of Entomology, Kansas State University. This field guide is intended for the naturalist who is interested in the natural world. The 2015 edition was posted last year and the 2016 edition will be posted by the KAS/KES meeting. At this time I have worked mostly with Kansas and Colorado fireflies, but I will be expanding the field guide to include other western states over the next few years. I am providing information on bioluminescent behavior, how to identify fireflies and specific locations where different species can be viewed. I am also seeking information from the public on additional sites where fireflies can be viewed in western NA—particularly sites with public access. The field guide currently includes information for 2 dark fireflies, 1 glowing firefly and about a dozen flashing fireflies (ca. 5 *Photuris*, ca. 4 *Photinus*, and 3 *Pyraclomena*). There are many more species that are known from museum specimens and reported in the literature and they will be added as they are located in the field.

**Buskuskie, T.R. (2), and Wilson, L.E. Department of Geosciences, Fort Hays State University.** OSTEOHISTOLOGY OF NIOBRARASAURUS COLEII. Osteohistology is a powerful tool in determining the metabolism and life histories of many vertebrates. Few studies have investigated the osteohistology and ontogeny of nodosaurids (Dinosauria: Nodosauridae) due to the fragmentary nature of many nodosaur fossils. This study presents new research into the bone histology and ontogeny of nodosaurids by examining two specimens of *Niobrarasaurus coleii* from the Late Cretaceous Smoky Hill Chalk of Kansas. The holotype, FHSM VP-14855, is represented by four nearly complete limbs, most of the pelvic girdle, and numerous osteoderms. The second specimen, FHSM VP-13985, consists of only the right radius and ulna of an individual half the size of the holotype. Previous studies consider FHSM VP-13985 a juvenile *N. coleii* based on size and similar morphology to the holotype. The right radius and ulna from both specimens were selected for this study. All the elements possess longitudinal vascular canals, while the FHSM VP-13985 ulna has both longitudinal and reticular canals in the cortex. The FHSM VP-14855 radius and ulna possess secondary osteons and a highly cancellous medullary region. In contrast, the majority of the cortex in both the radius and ulna of FHSM VP-13985 consists of primary osteons. None of the sectioned elements display any evidence of an external fundamental system, indicating that neither specimen was a skeletally mature individual. Comparison of the two specimens' osteohistology supports previous claims that FHSM VP- 13985 is a juvenile, while FHSM VP-14855 is a more skeletally mature individual.

**Caudle, K.L. (2), and Gillock, E.T. Department of Biological Sciences, Fort Hays State University.** PHYLOGENETIC DISTRIBUTION OF AN ENDOGENOUS STRAIN OF DAHLIA MOSAIC VIRUS IN MEMBERS OF ASTERACEAE. Dahlia Mosaic Virus (DMV) is a double-stranded DNA viral pathogen. A newly discovered strain of this virus called DMV-D10 was first observed in *Dahlia variabilis*. DMV-D10 does not induce visible symptoms of infection in the host plant, and is classified as an endogenous pararetrovirus. These viruses have the ability to integrate their viral sequences into the host plant genome, which can be transmitted vertically to offspring. Currently, no studies have examined the host range of DMV-D10. Because DMV-D10 has only been observed in *Dahlia*, the objective for this study was to determine if presence of DMV-D10 follows an evolutionary relationship among species closely related to *Dahlia*. It was hypothesized species in the same tribe (Coreopsideae) as *Dahlia*, such as *Cosmos*, were more likely to be infected with DMV-D10 compared to species within other tribes in the Asteraceae family. PCR results for a movement protein gene indicate DMV-D10 is more widely spread across Asteraceae than in *Dahlia* species. DMV-D10 was present in *Callistephus*

*chinensis* (Astereae tribe), *Centaurea cyanus* (Cardueae tribe), and *Dahlia variabilis* (Coreopsideae tribe), but not in *Tagetes erecta* (Tageteae tribe) or *Cosmos bipinnatus* (Coreopsideae tribe). Therefore, phylogenetic relationship in host plants does not necessarily determine presence or absence of DMV-D10. This leads to questions of how this virus can move to other species in other tribes. Future work will further explore host range, and if there are physiological symptoms associated with DMV-D10 infection.

**Caudle, K.L.<sup>1</sup> (2), Hilt, C.J.<sup>1</sup>, Smart, C.M.<sup>1</sup>, Urban, A.D.<sup>1</sup>, Kramer, D.L.<sup>1</sup>, Martin, N.M.<sup>1</sup>, Baer, S.G.<sup>2</sup>, Johnson, L.C.<sup>3</sup>, and Maricle, B.R.<sup>1</sup>. 1. Department of Biological Sciences, Fort Hays State University, 2.**

**Department of Plant Biology, Southern Illinois University, 3. Division of Biology, Kansas State University.** DOES ENVIRONMENT OR GENETICS INFLUENCE LEAF LEVEL PHYSIOLOGY? MEASURING PHOTOSYNTHETIC RATES OF NATIVE BIG BLUESTEM (*ANDROPOGON GERARDII*) GROWN IN COMMON GARDENS ACROSS A PRECIPITATION GRADIENT. Big bluestem (*Andropogon gerardii*) is a native tallgrass species that has a wide west to east geographic distribution. There are several putative ecotypes within big bluestem, each hypothesized to be locally adapted to their native climatic regions, largely distinguished by precipitation. This study sought to determine if genetics (ecotype) or environment influenced photosynthetic rates, a useful tool in detecting water stress, in big bluestem ecotypes. Photosynthetic measures were made with a LI-6400XT portable photosynthesis system during June and July of 2014 at four sites including Colby, Hays, and Manhattan, KS, as well as Carbondale, IL across a range in mean annual precipitation from 500-1200 mm/yr. Reciprocal gardens at each site contained five ecotypes of big bluestem. Across all ecotypes, plants growing in Hays, KS (582 mm/yr) had the highest photosynthetic rates among sites, potentially in response to rainfall during the early 2014 growing season. Plants growing in Manhattan, KS (872 mm/yr) had the lowest photosynthetic rates. This is likely due to poor nutrient availability in soil, because rainfall was higher than in Hays, KS. Ecotypes originating from the driest regions, central Kansas (from Hays, KS) and Sand bluestem, had the highest photosynthetic rates across all sites. Knowing which ecotypes of big bluestem are adapted to decreased water availability could help shape understanding of how native tallgrass vegetation could respond to increased aridity.

**Chapman, C.<sup>1</sup> (1), Edison, B.<sup>1</sup>, Johnson, E.<sup>1</sup>, Harman, M.<sup>1</sup>, Zayyad, N.<sup>1</sup>, Seybert, J.<sup>1</sup>, Watters, C.<sup>1</sup>, R. Emme, R.<sup>1</sup>, Sliva, T.<sup>1</sup>, Vila, E., Sivron, R.<sup>1</sup>, Miller, W.R.<sup>2</sup>, Russell, D.<sup>2</sup>, and Al-Kofahi, M.<sup>1</sup> 1. Department of Physics, Baker University, and 2. Department of Biology, Baker University.** USE OF ARDUINO MEGA 2560 R3 BOARD IN THE AUTOMATION OF A GREEN HOUSE. With the expansion of the undergraduate research programs at Baker University (BU), Kansas, a need for data to student research projects was identified. A simple and inexpensive data capture system in the BU greenhouse could support multiple projects required by different departments. The Physics Department was challenged to develop the system. The Arduino Mega 2560 R3 was selected as the central micro controller to monitor and control soil moisture, PH, light intensities, and temperature. The effect of these parameters on the growth of plants is documented live through video/ image capture of the plants of interest at preset periods of time. Measured parameters were recorded on an Arduino Data Logging Shield equipped with a memory card, and the data is transmitted wirelessly live with an XBee Pro 60mW Wire Antenna - Series 1 (802.15.4) to a base station computer housed in the Biology Department. The system focuses on monitoring changes in the parameters of interest and on data collection. Control for watering the plants used electromechanical solenoid valves and another Arduino board while control for light intensities and temperature inside the greenhouse used grow lamps. The full project was planned and implemented by a team of students for their senior projects, a requirement for graduation from the physics department at Baker University. Complete documentation of algorithms, materials used, methods, programming, and integration of the whole project are available upon request. All stated objectives were achieved and now both biology and physics students can conduct experiments.

**Emanuel, A.<sup>1</sup>(1), Villella, J.<sup>2</sup>, Carey, G.<sup>2</sup>, Miller, J.E.D.<sup>3</sup>, Young, A.<sup>1</sup> and Miller, W.R.<sup>1</sup> 1. Biology, Baker University, 2. The Biodiversity Research Collective, 3. University of Wisconsin - Madison.** TARDIGRADES IN THE CANOPY: LIVING WITH RED TREE VOLES IN OREGON. Red Tree Voles (*Arborimus longicaudus*) (RTV) are small reddish-brown rodents with white bellies, black tails, and rounded ears. They build intricate nests on branches within the live crown of Douglas fir (*Pseudotsuga menziesii*) trees. RTVs eat the leaves (needles) of the Douglas fir, leaving the two leaf veins (resin ducts) of each needle uneaten and amassed into fluffy nests. The nests are secured to branches using strands of tardigrade habitat (lichens), which helps camouflage the nests. Forty-three nests, 22 inactive and 21 active, were sent to Baker University REU students for analysis. 167 tardigrades were found in 28 (65%) nests with the mature, inactive nests containing 78% of the tardigrades. These data suggest both vertical and horizontal dispersal of tardigrades by Red Tree Voles during nest building. Twelve species of tardigrade were found, representing seven genera:

Echiniscus, Milnesium, Hypsibius, Ramazzottius, Pilatobius, Macrobiotus, and Murryon. Seven species are new records for Oregon, raising tardigrade diversity by 30% from 23 to 30. The new records suggest habitat suitability for some species of tardigrades but exclusion of others. Nest height ranged from 5 to 40 meters, the highest a tardigrade has ever been recorded above the ground. This canopy study represents a substantial contribution to understanding regional distribution and biodiversity of phylum Tardigrada.

**Engelken, P.J.<sup>1</sup> (1), Leddy, C.D., and Mercader, R.J. 1. Department of Biology, Washburn University.** EFFECTS OF AN OUTBREAKING SPECIALIST HERBIVORE, *OMPHALOCERA MUNROEI*, ON THE PATCH DYNAMICS OF THE COMMON PAW-PAW FOLLOWING AMUR HONEY SUCKLE REMOVAL. Mitigation efforts to reduce the impact of invasive plant species, such as the Amur honeysuckle, *Lonicera maackii*, often involve rapid removal of the invasive to allow native plants to recolonize. This situation is likely to stimulate rapid growth of both native plants and their herbivores, potentially leading to local herbivore outbreaks. However, little is known regarding the effects of outbreaks of plant feeding insects specializing on non-dominant plant species on population dynamics of host plants. Removal of *L.maackii* from a site in Shawnee Co, KS led to localized rapid growth of the common pawpaw, *Asimina triloba*. At this site in 2012 a population outbreak of the asimina webworm moth, *Omphalocera munroei*, was detected causing large-scale defoliation of *A. triloba*. Since 2012, defoliation and stem diameters of *A. triloba* were recorded on nine pawpaw patches at this site and 2015 damage levels on three additional reference sites in eastern Kansas. Damage levels increased from 2012-2013 to almost complete defoliation, but decreased in 2014. Results indicated that damage incurred during initial stages in 2012 continued to affect the growth of trees in the following years and damage led to over 25% mortality in 3 years. While damage occurring in the outbreak site decreased from 2014-2015, the overall damage levels were still higher than that in satellite areas. Defoliation estimates at all four sites indicated that *O. munroei* preferred attacking larger *A. triloba* specimens. Together these results indicate strong potential for *O. munroei* to significantly impact patch dynamics of this understory clonal plant.

**Everhart, M.J. Sternberg Museum of Natural History, Fort Hays State University.** GIVING CREDIT WHERE CREDIT IS DUE: WHO DISCOVERED THE TYPE SPECIMENS OF FOSSILS FROM THE KANSAS CRETACEOUS? Edward Cope and Othniel Marsh are the famous paleontologists we usually associate with the fossils discovered in Kansas from the 1860s onward. Together with Joseph Leidy and Samuel Williston, they are the professional paleontologists who described and named dozens of extinct animals from Cretaceous rocks in the state. For the most part, however, these well recognized figures are not the discoverers of those fossils. Many type specimens from the Pierre, Niobrara, Carlile, Greenhorn and Dakota formations were discovered by amateurs, and many of these are significant additions to paleontology. Since the 1860s, this includes many important specimens from Kansas: the giant predatory fish, *Xiphactinus audax* by Dr. George M. Sternberg; the first known elasmosaur, *Elasmosaurus platyrus* by Dr. Theophilus Turner; the first mosasaur, *Tylosaurus proriger* (State Fossil) by Col. John B. Conyngham; the first known polycotyloid plesiosaur, *Polycotylus latipinnis* by William E. Webb; the first specimen of the toothed bird, *Ichthyornis dispar*, and the first remains of the huge filter feeding fish, *Bonnerichthys gladius*, by Professor Benjamin Mudge; the elasmosaur, *Styxosaurus snowii*, by the 80-year-old retired judge, Elias P. West; the polycotyloid, *Dolichorhynchops osborni*, by seventeen-year-old George F. Sternberg; the type specimen of the nodosaurian dinosaur, *Niobrarasaurus coleii*, by oil field geologist Virgil Cole; the nodosaur, *Silvasaurus condrayi*, by landowner Warren Condray; the pliosaur, *Megacephalosaurus eulerti*, by teenagers **Robert and Frank Jennrich**; and the rare mosasaur, *Selmasaurus johnsoni*, by **Steve Johnson**. **Sometimes having good eyes in the right place at the right time is more important than being the expert.**

**Fleming, L. (1), and Wilgers, D.J. Department of Natural Sciences, McPherson College.** HOW DO FACTORS RELATED TO LIMESTONE ROAD RUNOFF AFFECT GROWTH AND DEVELOPMENT OF FRESHWATER MUSSELS. Human activity is having an overwhelming affect on the environment and the organisms that depend on it. The construction of dirt roads not only bisects terrestrial environments, but can also dramatically affect aquatic environments through runoff and erosion. Limestone gravel roads are common in Kansas due to the abundance of the mineral, runoff from these roads may increase water hardness, while at the same time increase turbidity. This study investigated the effect of elevated hardness and turbidity levels on the growth and development of an important indicator of aquatic ecosystem health, freshwater mussels. We used three experimental tanks (control, Hardness and turbidity, and hardness) to look at the effects of calcium and suspended sediment on the shell growth and biomass of Fat Mucket mussels (Species Name here). It was found that elevated hardness levels resulted in slightly but not-significantly greater shell growth, while mussels in the elevated turbidity groups had significantly lower biomass

production. This data suggests that elevated turbidity levels from limestone road runoff are a detriment to the aquatic mussel community and likely nullify any potential benefit of increased water hardness.

**Fraser, T. (1), and Frye, J. Department of Natural Sciences, McPherson College.** OSMOTIC STRESS SURVIVAL AND THERMAL TOLERANCE IN *SACCHAROMYCES CEREVISIAE*. *Saccharomyces cerevisiae* (yeast) is a single-celled eukaryotic model organism, often used to study more complex eukaryotic systems. When exposed to a stressor, yeast cells can respond in a variety of ways including the expression of various Heat Shock Proteins (HSPs) and the initiation of the MAP and HOG pathways. This study tested whether selection by one environmental stress improves the ability of yeast to thrive in subsequent stressful environments. Stressors included hyperosmotic and hyperthermic conditions. The yeast's responses were monitored by comparing the absorbance values that were measured in the Spectronic Genesys 2 spectrophotometer. Results revealed that there was an increased absorption difference (ie: growth rate) in the cells that experienced the 1.8 M osmotic stressor followed by the temperature stressors at 27°C and 35°C. This shows that yeast cells have similar response mechanisms for different environmental stressors, and that, therefore, selection for resistance to one stressor may inadvertently select for resistance to another.

**Gaeddert, A.K. (1), Conard, J., Johnson, R., and Buckwalter, N.R. Department of Biology, Sterling College.** A COMPARISON OF URBAN AND RURAL PRAIRIE DOG DENSITIES. Prairie dogs (*C. ludovicianus*) are a type of burrowing ground squirrel that have been diminishing due to poisoning, trapping, and hunting by people who view them as pests. Plague is also a very large problem with no known treatment. Black-footed ferrets are a major predator of the prairie dog, but there are not any ferrets known to be present in the areas that were studied. Some researchers believe that prairie dogs, along with the already endangered ferret, should be classified as an endangered species because of their large role in the narrow niche of the ferret. In this study, differences in population densities (maximum averages) and burrow densities between relatively predator-free (urban) colonies and colonies with a higher predation risk (rural) were analyzed. Maximum average was calculated by taking the highest number of prairie dogs observed in each plot and dividing by the number of plots within each colony. Burrow density was calculated by using a GPS unit to mark and count each active burrow within a plot. We found that in urban populations the maximum average was higher than in rural areas; possibly due to habitat fragmentation. Burrow densities were slightly higher in rural colonies. When comparing maximum averages and burrow densities, rural colonies showed a positive correlation because as the maximum average increased the burrow density also increased. Urban colonies showed no correlation between maximum average and burrow density.

**Garrett, M.<sup>1</sup>, Wilgers, A.<sup>1</sup>, Buckwalter, L.<sup>1</sup>, Mettling, A.<sup>1</sup>, Lopez, M.<sup>1</sup>, Waters, K.<sup>1</sup>, Smith, M.<sup>1</sup>, Oswald, P.<sup>1</sup>, Dickerson, R.<sup>1</sup>, Pitschmann, J.<sup>1</sup>, Buckwalter, N.<sup>1</sup>, Carey, C.<sup>1</sup>, Chiang, C-H.<sup>2</sup>, and Hong, W-F.<sup>1</sup> Department of Natural Sciences and Mathematics, Sterling College, 2. Da-Yeh University, Taiwan.** EFFECTIVENESS OF FUNGICIDE USE UPON WHEAT PRODUCTON IN CENTRAL AND SOUTHERN KANSAS . To understand the effectiveness of spraying fungicide on wheat fields and their impact upon revenue and to observe the effects of fungicide use upon different wheat varieties, a 3 year survey of more than 500 fields from Central and South Central Kansas was conducted during year 2011 to 2015. When yields are compared among fields sprayed with fungicide and those without fungicide, it was found that an average of 7.69 more bushels per acre was gained in fields sprayed with the fungicide. This indicates that spraying fungicide plays an important role in curbing diseases in these areas. Given a cost of \$12.00 per acre to apply fungicide and a selling price of \$5.00 per bushel of wheat, there is a greater than 96% confidence level (T-test) that the farmer will increase profits by applying the fungicide. In addition, when compared the effects of the protection of fungicide on different wheat varieties, no conclusive data indicated that spraying fungicide over Everest wheat was more advantageous than spraying fungicide over other kinds of wheat.

**Glynn, J.M.<sup>1</sup>, Carter, J.J.<sup>1</sup>, Hickman, K.R.<sup>2</sup>, and Greer, M.J.<sup>1</sup> 1. Department of Biological Sciences, Fort Hays State University, 2. Department of Natural Resource Ecology and Management, Oklahoma State University.** MAKING THE BEST OF A BAD SITUATION: INVASIVE GRASS EXUDATES MAY HAVE ANTI-BACTERIAL AND/OR ANTI-FUNGAL PROPERTIES. There are an estimated 298,000 extant plant species. Humans have been using plants and plant products for healing purposes for centuries; it is likely that we have barely scratched the surface of the potential medicinal power that plants possess. *Bothriochloa ischaemum* and *B. bladhii* both of which are non-native grasses, have been planted onto millions of hectares in the Great Plains and have escaped their original planting sites resulting in their invasion into native rangelands. *Bothriochloa spp.* invasion is aided by their ability to alter the soil microbial community, specifically the bacteria and fungi. Our proposed research looks to determine if plant exudates from *Bothriochloa spp.* have

anti-bacterial and/or fungal properties that could benefit the human population. Aqueous exudate solutions were produced by soaking freshly collected plant biomass in double-deionized water. To remove small debris, soil particles, any bacteria, and other microbes the solutions were passed through a #4 Whatman® filter and then through a sterile 0.22µm anti-microbial syringe filter and stored at 4 °C until use. To test the antimicrobial properties of the exudates from each grass we used a Kirby-Bauer Disk Diffusion Susceptibility Test on various bacterial and fungal species. Preliminary results show that *B. ischaemum* promoted the growth of two species of bacteria (*Pseudomonas fluorescens* and *Lactococcus lactis*), contrary to our hypothesis. All other bacterial and fungal species appear to be unaffected by initial 5µl exudate additions. Future research will focus on increasing the amount of exudate added and on additional bacterial and fungal species.

**Haller, R.M. (1), and Leung, S.H. Department of Chemistry, Washburn University.** PROGRESS TOWARD THE SYNTHESIS OF DIPYRROLYL- $\alpha,\beta$ -UNSATURATED KETONES. The goal of this project is to synthesize a dipyrrolyl- $\alpha,\beta$ -unsaturated ketone that will be used as one of the precursors to an expanded oxophlorin. An expanded oxophlorin potentially can act a photosensitizer in photodynamic therapy (PDT) for cancer because it is expected to absorb visible light at a relatively longer wavelength than a typical oxophlorin or porphyrin. Previously we attempted to use aldol condensation reactions to synthesize a dipyrrolyl- $\alpha,\beta$ -unsaturated ketone but without success. Currently we are exploring the use of the Wittig reaction to accomplish this synthesis. Here we report the progress of the synthesis.

**Heffren, P.M. (1), and Schmidt, S.E. Department of Chemistry, Washburn University.** ISOLATION OF THE AZAMACROCYCLES FORMED FROM THE DETOSYLATION OF CYCLIC TOSYLAMIDES. Azamacrocycles are used in medical imaging and treatment. The synthesis of these structures requires that the amine groups in the structure be protected from side reactions. The deprotection from tosylamide to amine is problematic in either the reaction or the isolation from crude product. In order to study the isolation, diethylenetriamine was selected as a model for extraction from a simulated crude aqueous reaction mixture. The efficacies of several organic solvents were examined by extracting known amounts of diethylenetriamine from aqueous phase using a separatory funnel. Dichloromethane and chloroform were determined to recover the greatest percentage of diethylenetriamine from the aqueous solution, but produce only 3-4% efficiency. By titrating diethylenetriamine with hydrochloric acid, the pK values were determined. This was done to ensure that the extraction procedures were producing a deprotonated amine, leaving it uncharged and easier to extract. Finally, a liquid-liquid continuous extractor was shown to further increase recovery to 29% after 5 days of continuous extraction.

**Heil, J.A. (2), Smith, D.L., and Jayawardhana, A. Pittsburg State University.** A MEASUREMENT OF HISTORICAL AND CONTEMPORARY FUNCTIONAL DIVERSITY ON THE MONAHAN RECLAIMED GRASSLAND. In 1984 a portion of the Monahan, a PSU Biology field site, was reclaimed to establish a native grassland community and to prevent runoff of acidic groundwater. In the years since then, several student projects have analyzed the vegetation community on the site, estimating the biodiversity found there. In this study, conducted in 2014, the biodiversity of the Monahan was measured using four indices of function diversity. Functional diversity describes the variety of ecological functions in a community; functional diversity indices measure and describe these functions instead of individual species. Results from two past graduate theses were compared to the 2014 findings. This comparison showed that the Monahan reclaimed grassland had generally increased in functional diversity (and by extension biodiversity) over time, but the dominant facets of diversity have been variable in each sample. In the first samples taken after the reclamation (Vickers, 1989) the community became more functionally even and divergent; that is, the species found were evenly spread across the community's functional groups. A sample taken in 1994 revealed that the grassland had become less functionally even and divergent but more functionally dispersed, or were more widely spread across the functional groups (Yates, 1996). The survey conducted for this thesis in 2014 revealed that the grassland is at the highest level of functional richness ever recorded, but is less functionally diverse than 1994 by all other indices. Overall, since the *initial* 1984 reclamation, the grassland has actually increased in all areas of functional diversity.

**Higdon, N.B.A. (1), Cork, G.K., Chavez, O.R., DeHart, S.L., Bjerke, S.L. Department of Biology, Washburn University.** ANALYZING PROTEIN INTERACTIONS OF THE HERPES SIMPLEX VIRUS TYPE 1 UL34 PROTEIN. Herpes Simplex Virus-1 (HSV-1) is easily communicable and infection can present in many ways including cold sores, genital herpes, herpes whitlow, and more. HSV-1 proliferates within the host cell nucleus. Once replication is completed the virus exits the nucleus. Viral protein UL34 is essential for the virus to begin

exiting the cell. It is unknown which nuclear proteins U<sub>L</sub>34 is interacting with during this step. U<sub>L</sub>34 is a highly conserved protein in all human herpesviruses and an ideal candidate for future drug treatments. Understanding interactions between U<sub>L</sub>34 and host nuclear proteins could potential lead to a drug that prevents herpesviruses from leaving the nucleus of infected cells. To determine interaction partners for U<sub>L</sub>34, pulldown assays were performed. In a pulldown assay, purified U<sub>L</sub>34 protein is mixed with HEp-2 cell lysate, and then U<sub>L</sub>34 and any binding partners are removed from the mixture. Our results showed some potential U<sub>L</sub>34 binding partners, but future steps will include alteration of the protocol to strengthen binding during the assay. Once stronger protein interactions occur we will perform isolation experiments to identify binding proteins.

**Hu, C.K. (2) and Yang, Y. Department of Biological Sciences, Emporia State University.** SYNERGISM OF DAM, MUTH, AND MUTS OF METHYL-DIRECTED MISMATCH REPAIR IN *ESCHERICHIA COLI*. DNA mismatch repair (MMR) is a critical mutation surveillance system for recognizing and repairing erroneous insertion, deletion, and disincorporation of base. Major components of mismatch repair system consist of MuthH, MutL, and MutS. Dam methylates adenine on parent DNA strands to distinguish newly synthesized daughter strands from the parent strands. We hypothesize that, since MutS recognizes the mismatched site, which is the first step of mismatch repair process, the defect in MutS results in more mutations than the defect in MuthH. Employing a tyrosine-auxotrophic E. coli FX-11 strain, the mutation frequency can be calculated by determining the number of tyrosine revertants and the cell viability of FX-11. Therefore, the mutation frequencies of tyrosine auxotrophic FX-11 carrying different defects in mismatch repair system can be determined. Our data shows that MutS defect leads to higher mutation frequency than MuthH. Interestingly, double defects in Dam and MutS synergistically produce a much higher mutation frequency than the summation of mutation frequency caused by defect in MutS and Dam individually. Therefore, we conclude that the defect in MutS cause a higher mutation frequency than defect in MuthH, and Dam may work with MuthH and MutL to partially recognize the sites of mismatch.

**Hummert, A.M. (1), and Adem, S. Department of Chemistry, Washburn University.** ANALYSIS AND DETECTION OF MELAMINE IN SOLID PET FOOD SAMPLES USING HPLC AND SURFACE PLASMON RESONANCE. In recent years it has been found that melamine has been intentionally added to pet foods in order to boost apparent protein content and therefore increase the market value of these foods. When ingested, melamine-contaminated food combines with cyanuric acid to cause renal complications and even death in many pets. In this study, a sensitive, repeatable and rapid method was developed for melamine detection in solid pet foods using reversed phase high performance liquid chromatography (HPLC). A limit of detection of 0.36 ppm was obtained in food matrix samples, which is well below the threshold set by the United States Food and Drug Administration. The percent recovery of food samples that were spiked with known amounts of melamine range from  $92.7 \pm 1.9$  -  $107.6 \pm 2.8\%$  (n = 6). The presence of melamine was also confirmed using colorimetric biosensors based on surface plasmon resonance of gold nanoparticles. In the presence of melamine, the gold nanoparticles aggregate, showing a noticeable color change from wine red to purple that can be detected by naked eye observation. These results can be confirmed by observing a distinct change in the absorption band using UV-Vis analysis. To assess the selectivity of the method to melamine, over 20 common food interferences were tested against the gold nanoparticle solution with only melamine causing a change in the absorption spectrum. The gold nanoparticles produce immediate results and may be adapted for use in a field-portable setting without the need for expensive laboratory equipment.

**Jones, R. Department of Physical Sciences, Emporia State University.** SCIENCE IS NOT VALUE FREE. We look at the world with our senses and observe what it is like. We have some record of how the world evolves, what actions we can perform, and what our actions do. We use a value system to decide what is best to do at any given moment. All models of cognition require a value function. (a dopamine circuit in humans) The goal of any intelligence will be to maximize rewards. This is also true of an intelligence which is doing nothing but science. Some value system defines and measures the "rewards." Science can't be value free. If it were you couldn't decide what theory to believe or use, what experiment to do next, or even what to think next. (i.e., Should you keep reading this poster? Which books should I buy? Do I have enough data/evidence on this topic? How important is some result?) Of course some of what you value might be things like logic, evidence, consistency/coherence, knowledge, observation, experience, objectivity, reliability/repeatability, testability, skepticism/criticism, accuracy, precision, generality, simplicity, novelty, open communication, etc. How intelligent you are depends upon how good your value system is. If you have bad values you make bad decisions and get fewer rewards. Doing science promotes and develops these values which we then apply elsewhere in life.



**Jorgensen, D.D. (2). Geosciences Department, Fort Hays State University.** THE CORRELATION AMONG SUTURE COMPLEXITY, SHELL FORM, AND STRATIGRAPHY IN CRETACEOUS AMMONITES IN THE WESTERN INTERIOR SEAWAY. Throughout their evolution, ammonite suture patterns grew increasingly more complex. However, the use of these immovable joints has long been debated among researchers. The purpose of this study is to quantify the sutures of the ammonites to determine if there is a significant difference in complexity between shell forms. The ammonites come from the Pierre, Kiowa, Carlile, Graneros, Hartland, and Pfifer formations and are housed at the Sternberg Museum of Natural History (FHSM). The scope of this study includes only evolute and orthocone shell forms and is limited to organisms with ammonitic sutures. Box counting fractal analysis was used to quantify the sutural complexity. This complexity was then compared to the shell form and stratigraphy using an ANOVA statistical test. If coiled ammonite shells show more complex suture patterns, then it indicates that the suture patterns aid in the formation of coiled shells.

**Khalidi, A.M. (1), Wilgers, D, and Frye, J. Department of Natural Sciences, McPherson College.** THE EFFECTS OF LIGHT ENVIRONMENT ON THE DEVELOPMENT OF EYE PIGMENTS IN *DROSOPHILA MELANOGASTER*. *Drosophila melanogaster*, commonly called fruit flies, have complex, compound eyes that have been extensively studied and continue to be an area of interest for visual system research. Wild-type fruit flies have seven different photopigments that are each receptive to different wavelengths of light. The way that these flies interact and respond to light has led to the question of whether the developmental light environment affects the type and abundance of photopigments in adult flies. To investigate this, we exposed fruit flies to six different wavelengths of light (no light, white light, red light, blue light, green light, or UV light) during the first 14 days of their life cycle. The eyes of the adult fruit flies were then extracted and the type and amount of photopigments were analyzed using paper chromatography and fluorescence spectrophotometry. Two pigment bands were seen in the chromatograms, orange and blue-green, but there was no difference in the retention factors of these main bands. However, the emission intensity of these two bands were found to be significantly different across the light treatments. Specifically, between those flies developing in the green light environment and those developing in the UV light environment. This finding suggests that *D. melanogaster* eye development is not based purely on genetics, but instead is relatively malleable and depend on their developmental environment to some degree.

**King, J.L. (2), and Barrick, R. Department of Geosciences, Fort Hays State University.** USING INNER EAR MORPHOLOGY AS AN INDICATOR OF TROPHIC LEVEL WITHIN THERIZINOSAURS (DINOSAURIA: THERIZINOSAURIA). The diet of a vertebrate is frequently inferred by the external cranial anatomy but the endocranial anatomy – specifically the semicircular canal shape – is rarely, if ever, considered. Semicircular canals, which help maintain a sense of balance in an organism, have been hypothesized to change shape and become less exaggerated as therizinosaurs shifted towards a herbivorous diet. This change in shape is indicative of a lifestyle that no longer required a keen sense of balance – unlike their agile carnivorous ancestors. In order to test the link between semicircular canal shape and diet, rostral semicircular canals (RSC) of three therizinosaurs – *Falcarius utahensis* (UMNH 15000), *Nothronychus mckinleyi* (AZMNH-2117), and *Erlíkosaurus andrewsi* (IGM 100/111) – were compared to the RSCs of an emu, ostrich, and a cassowary to determine how the canal morphology changed through dietary shifts. This study grouped the specimens into two separate categories – omnivores (*F. utahensis*, emu, and ostrich) and herbivores (*N. mckinleyi*, *E. andrewsi*, and cassowary). The therizinosaurs and palaeognathes were divided up based on diet, had their respective RSC inner canals plotted with 70 semilandmarks with ImageJ, and were then analyzed with a principal component analysis (PCA). The PCA showed that as omnivores shifted towards herbivory, their semicircular canal shape changed from an exaggerated, subtriangular shape to a more circular, ovaloid morphology. This indicates that the sense of balance in *F. utahensis*, emus, and ostriches may have lessened as their respective lineages adapted to more specialized diets such as herbivory (*N. mckinleyi* and *E. andrewsi*) or frugivory (cassowary).

**King, S. Curator of Collection, Museum of World Treasures.** COMPARING TWO METHODS FOR ESTIMATING THE LIVE MASS OF DINOSAURS. There are two general methods for estimating the live mass of an extinct animal: calculate or model the volume of the animal and multiply by an estimated density or use an allometric model that compares a simple measurement to live mass. Both methods make certain assumptions that are very difficult or impossible to independently verify. A method using a polynomial equation for calculating volume is compared to an allometric equation that relates live mass to the circumference of the humerus and femur. These two methods were used to estimate the masses of several modern and dinosaur skeletons to test if they produce similar results. Not only can such comparisons provide information about the

precision of the methods used, it also sheds light on subjects such as bipedalism versus quadrupedalism and the impact of lungs or air sacs on body density.

**Konrade, L.A. Biological Sciences Department, Wichita State University.** EVALUATING RANGE GENETICS IN BLACK CHERRY (*PRUNUS SEROTINA* EHRH.) WITH AN EXPANSIVE SET OF HERBARIUM SPECIMENS. To date no study has addressed basic range-genetics hypotheses in a widespread eastern North American plant species with a truly comprehensive set of samples. These hypotheses include isolation by distance, the number/location of major genetic discontinuities, and the comparative amounts of genetic diversity in glaciated/unglaciated regions. While certain studies have analyzed large sets of samples, these are typically drawn from a relatively small number of locations and/or from a subset of the total species range. This lack of sampling is due to feasibility – the time and expense involved in fieldwork of this scale quickly becomes limiting. We therefore know relatively little about the geographic structure of genetic variation in widespread North American plant species, among them economically important forest trees. We aim to test basic range-genetics hypotheses in eastern black cherry (*Prunus serotina* Ehrh. susp. *serotina*), a widespread eastern North American forest tree that is important both ecologically and as a timber source. Eastern black cherry's range covers much of the eastern half of North America, and densely field-collecting samples across this expansive area is simply not feasible. However, we will bypass this limitation by extracting DNA from ca. 500 herbarium specimens representing all portions of the *P. serotina* range. Our current sample set includes 381 samples obtained from 22 herbaria during 2014 and 2015. Preliminary analysis of microsatellite variation in these specimens indicate a significant but extremely weak pattern of isolation by distance, suggesting that large-scale gene flow is a powerful homogenizing force in black cherry.

**Kramer, D.L.<sup>1</sup> (1), Caudle, K.L.<sup>1</sup>, Hilt, C.J.<sup>1</sup>, Martin, N.M.<sup>1</sup>, Urban, A.D.<sup>1</sup>, Baer, S.G.<sup>2</sup>, Johnson, L.C.<sup>3</sup>, and Maricle, B.R.<sup>1</sup>, 1. Department of Biological Sciences, Fort Hays State University, 2. Department of Plant Biology and Center for Ecology, Southern Illinois University, and 3. Division of Biology, Kansas State University.** MORPHOLOGICAL DIFFERENCES IN ECOTYPES OF BIG BLUESTEM (*ANDROPOGON GERARDII*) GROWN IN COMMON GARDENS ACROSS A PRECIPITATION GRADIENT. Environmental variables and genetics influence morphology, both within the lifetime of a plant and over evolutionary time. Big bluestem (*Andropogon gerardii*) is a dominant, native, tallgrass species that has a wide geographical range with several genetically-distinct ecotypes, each adapted to local conditions in their native habitat. It was hypothesized drought-adapted ecotypes of *A. gerardii* would be short with wide leaves and thick stems, whereas ecotypes adapted to mesic environments would be tall with narrow leaves and stems. Morphological measurements were taken from four genetically-distinct ecotypes of *A. gerardii* across a precipitation gradient at three common garden sites in Colby, Hays, and Manhattan, Kansas. Measurements were conducted three times during the 2014 growing season, and rainout shelters were used to reduce rainfall by half to determine the role of precipitation on morphological characters. The Illinois ecotype, adapted to mesic conditions, had the highest maximum leaf width, stem width, and leaf count across sites. The Kaw cultivar had the tallest vegetation at arid sites in Colby and Hays. While there were genetic differences between ecotypes that influenced morphology, environmental influences between common garden sites also appear to be a driving factor concerning morphology in *A. gerardii*. Reduced precipitation from rainout shelters resulted in decreased leaf width, stem width, height, and leaf count in Hays. There was less effect of reduced rainfall in Manhattan, likely a result of limiting soil nutrients. Depending on specific conditions of a geographical region, genetics or environment can be the primary factor driving differences in morphological characters.

**Layzell, A.L., and Mandel, R.D. Kansas Geological Survey, University of Kansas.** VARIABILITY OF STREAMBANK EROSION IN NORTHEAST KANSAS: THE IMPORTANCE OF LITHO- AND SOIL-STRATIGRAPHY. Sediment contributions from streambank erosion have resulted in significant reductions of reservoir water-storage capacity in Kansas, particularly in the eastern half of the state. In northeastern Kansas, deposits of fine-grained Holocene alluvium comprising streambanks have been assigned to a single lithostratigraphic unit, the DeForest Formation. Distinct differences in erodibility, measured in terms of critical shear stress ( $\tau_c$ ) by a submerged jet-test device, were observed between the different members of the DeForest Formation in three northeastern Kansas watersheds. The most erodible and resistant units are the Camp Creek and Gunder Members, respectively. Variability in erodibility between and within the members of the DeForest Formation is attributed to the magnitude of post-depositional soil-forming processes, including the presence of buried soils, as well as the inherent natural variability in the different parent materials. A weak positive correlation was found between clay content and  $\tau_c$ . Resistance to erosion by fluid flow was found to be significantly greater where clay contents exceed 28%. Although the Camp Creek Member was found to be the most erodible, it always occurs, stratigraphically, as the uppermost member. Available bankfull stage indicators

suggest that bankfull discharges rarely attain elevations sufficient to erode Camp Creek Member deposits. Therefore, other members of the DeForest Formation are able to exert some control on the rate of bank erosion by hydraulic flow. Litho- and soil-stratigraphic relationships, therefore, have important implications for streambank erodibility and are crucial for accurately determining areas prone to streambank erosion in alluvial settings.

**Long, A. (1), and Koralegedara, M. Department of Natural Sciences, McPherson College.** THE EFFECT OF PROTECTIVE AGENTS ON THE DEMINERALIZATION OF HUMAN TOOTH ENAMEL. Enamel demineralization is caused by food and beverages reducing the mineral phase of the enamel. Protective agents, such as fluoride, are believed to minimize enamel demineralization. This *in vitro* study focused on the effectiveness of commercial protective agents against demineralization. Seventy-two human teeth and five protective agents were used in the study with soda as the demineralization agent. The change in calcium concentration of soda solutions before and after was used as the indication of demineralization. The protective agents were applied to the teeth in the treatment groups, while the control group did not receive any protective agents. The analysis of the resultant soda solutions using atomic absorption spectroscopy showed a significant difference in the concentration of calcium ions between the treatment and control groups. Protective agents Voco, MI Paste Plus, and Sparkle V showed a significant difference in calcium concentration between the control group and the treatment group. Orthowash and Prevident did not show a significant difference but showed a decreased amount of calcium concentration in the treatment group between the first and second treatments. These results therefore suggest that protective agents could prevent enamel demineralization by reducing loss of calcium ions.

**Lutgen, J.D.<sup>1,2</sup>(1), Boese, L.I.<sup>1,2</sup>, and Maricle, B.R.<sup>2</sup>, 1. Kansas Academy of Mathematics and Sciences, Fort Hays State University, 2. Department of Biological Sciences, Fort Hays State University.** EFFECT OF TRICLOSAN CONCENTRATION ON PHYSIOLOGY OF *LEMNA MINOR*. Triclosan is a common antibacterial compound in personal care products that frequently becomes an aquatic pollutant. Triclosan disrupts bacterial enoyl-acyl carrier protein reductase (ENR), a critical enzyme in fatty acid synthesis. Survival of all organisms depends on fatty acid production for membranes. In this study, the effect of triclosan exposure on growth of *Lemna minor* (common duckweed) was investigated with percent population change and membrane leakiness as measured results. As *Lemna minor* shares the ENR enzyme with bacteria, it was hypothesized that triclosan exposure would affect the growth rate and membrane integrity of *Lemna minor* in a dose dependent manner. *Lemna* individuals were exposed to triclosan concentrations of 0 parts per billion, 10 ppb, 50 ppb, 100 ppb, 500 ppb, and 1000 ppb, with number of individuals counted each day. Triclosan significantly impacted the growth of *Lemna minor* as early as three days into the study. As the study progressed, triclosan negatively affected *Lemna* growth at concentrations of 500 ppb and above, supporting the hypothesis that *Lemna* would respond to triclosan exposure in a dose dependent manner. Membrane integrity of *Lemna minor* was also significantly affected by triclosan concentration, with increased ion leakage from cells following triclosan exposure. These results illustrate some applications of fatty acid synthesis in plants, the sensitivity of aquatic plants to triclosan, and indicate *Lemna minor* could be used as a marker for triclosan concentrations in aquatic ecosystems.

**Maccarone, A.D.<sup>1</sup> and Brzorad, J.N.<sup>2</sup> (1) Biology Department, Friends University, (2) Reese Institute for Conservation of Natural Resources, Lenoir-Rhyne University.** INTRASPECIFIC AND INTERSEXUAL VARIATION IN THREE SPECIES OF WADING BIRDS. Intraspecific and intersexual morphological variation is common in many groups of birds, but few data regarding such differences exist for Ardeids. Since 2008, we have trapped long-legged wading birds in Kansas and along the East Coast for telemetry studies. Captured individuals are weighed and several measurements taken before they are released. Beginning in 2013, a blood sample was collected from each bird, which was used to determine its sex. Measurements of 103 birds of three species were used to examine relationships among mass, culmen length, and tarsus length, and to determine whether males of each species differ from females in these values. Great Blue Herons (1702-2859 g), Great Egrets (1769-1300 g), and Snowy Egrets (349-539 g) all showed high variation both in body weights and morphometric measurements. For all three species, weight was correlated significantly both with culmen and tarsus lengths, which were themselves strongly associated. For Great Egrets and Snowy Egrets, males were significantly heavier than females and also had longer culmen and tarsus lengths (all  $P < 0.003$ ). Sample size for Great Blue Herons was not large enough to compare male and female birds. We discuss the possible implications of intraspecific variation and sexual differences in Ardeids.

**Martin, N.M., Kobayashi, Y., and Maricle, B.R. Department of Biological Sciences, Fort Hays State University.** SPECIES-SPECIFIC ENZYMATIC TOLERANCE OF SULFIDE TOXICITY IN PLANT ROOTS AND COMPARATIVE SUSCEPTIBILITY BETWEEN PLANT AND CATFISH TISSUE. Sulfide is a potent metabolic toxin; activities of numerous enzymes are inhibited by sulfide. Cytochrome *c* oxidase, which catalyzes the terminal step of aerobic respiration, appears extremely sensitive to sulfide toxicity. Despite this, some salt marsh plants live in sulfide-rich sediments on tidal mudflats. We hypothesized flooding-tolerant plants might be more tolerant of sulfide compared to upland plants. We also hypothesized the greater respiration rates in animal tissue would make them more sensitive to sulfide compared to plant tissue. Enzyme activities in plant and catfish tissues were measured in 0, 5, 10, 15, and 20  $\mu\text{M}$  sodium sulfide. Activities of alcohol dehydrogenase and cytochrome *c* oxidase were both reduced by increasing sulfide concentration, but to different degrees. Cytochrome *c* oxidase activities in flooding-sensitive plants were decreased to nearly undetectable at 5  $\mu\text{M}$  sulfide, whereas activities in some flooding-tolerant plants were not decreased until 10  $\mu\text{M}$  sulfide. Alcohol dehydrogenase activities were more tolerant of sulfide, as they were reduced by approximately 50 percent of untreated controls at 20  $\mu\text{M}$  sulfide. Cytochrome *c* oxidase activities in some salt marsh plants were low even in the absence of sulfide, perhaps an adaptation to avoid sulfide vulnerability in their native, sulfide-rich habitat. These results illustrate the potent metabolic effects of sulfide, and variability in sulfide toxicity among plants. Cytochrome *c* oxidase activities in catfish tissues were much higher than those measured in plant roots, but were much more sensitive to increasing sulfide concentrations.

**Martino, M. (2) and Beck, J.B. Department of Biological Sciences, Wichita State University.** ARE CYTOTYPES NON-RANDOMLY DISTRIBUTED IN THE GIANT GOLDENROD *SOLIDAGO GIGANTEA*? Autopolyploidy is an under-recognized evolutionary phenomenon in angiosperms, creating cryptic patterns of reproductive isolation and phenotypic divergence within a single species. There is abundant evidence that autopolyploid cytotypes can exhibit different phenotypes, which could lead to subtle niche differentiation among these elements. In this way a species comprising an autopolyploid series could exhibit a large geographic distribution due to the collective ranges of its cytotypes. We aim to test this hypothesis in *Solidago gigantea* (Ait.), an abundant goldenrod species found throughout much of eastern North America. Diploid, tetraploid, and hexaploid cytotypes are known in this species, and previous studies suggest that they are non-randomly distributed across the total species' range. We plan to rigorously sample *S. gigantea*'s expansive range by extracting DNA from ca. 500 herbarium specimens from all portions of the range, and to date 410 such samples from 38 state/provinces have been obtained. Allelic variation at 12 microsatellite loci will be used to estimate cytotype based on a maximum allele number approach, and distribution models for each cytotype will be constructed and compared. Our preliminary data suggest that cytotypes are indeed non-randomly distributed, with diploids found primarily in the southern and eastern portions of the range, and hexaploids largely confined to the Great Plains.

**Mayes, D.M.<sup>1</sup> (3), Bhatta, C.<sup>1</sup>, Brown, J.C.<sup>2</sup>. 1. Department of Ecology and Evolutionary Biology, University of Kansas, 2. Department of Geography, University of Kansas.** OBSERVATIONS OF THE AFRICAN HONEY BEE *APIS MELLIFERA SCUTELLATA* IN DEFORESTED AND FORESTED LOCATIONS ACROSS RONDONIA, BRAZIL. Ever since its introduction in Brazil some 60 years ago, the African honey bee has attracted much attention from researchers interested in the impacts of invasive species on native pollinators. There has also been interest in determining how deforestation plays a role in mediating these impacts. We present the largest-ever, systematic survey of African honey bee presence/absence in the Neotropics to test whether the honey bee prefers to forage in deforested over forested environments. Honey bee presence/absence within and outside forest fragments was recorded at 187 locations distributed across the state of Rondonia, Brazil. The landscapes at each location varied in terms of overall level of deforestation and the length of time since modern human settlement. Honey bee presence was significantly higher in deforested environments than forested. These findings agree with previous studies documenting the spread of African honey bees in the Amazon in their preference for deforested areas.

**Mayes, D.M. (3) and Smith, D.R. Department of Ecology and Evolutionary Biology, University of Kansas.** DIVERSITY OF TRAP-NESTING BEES AND WASPS WITHIN REMNANT AND RESTORATION TALLGRASS PRAIRIES IN EASTERN KANSAS. Solitary bees and wasps are important contributors to ecosystem functioning, and are reliant on foraging and nesting resources in their environment. Some species of above-ground nesting bees and wasps utilize particular cavities and resources to build and provision their nests, which may include hollow stems or beetle burrows in dead wood. Tallgrass prairies provide habitat for these organisms, yet the extent to which restorations and remnants support them remains unclear. Our objective is to compare the diversity of above-ground nesting bees and wasps in remnant and restoration tallgrass

prairies across eastern Kansas. Bees and wasps were sampled from 15 prairies (9 remnant, 6 restoration) using wood block trap-nests from May to September 2013. Two hundred and seventy-seven nests were occupied by eight species of bees and four species of wasps. In this study, we found a significant difference between the diversity of trap-nesting bees and wasps (TNBW) between remnant and restoration tallgrass prairies, with higher diversity in remnant prairies, however, there was no difference in the abundance of TNBW between the two prairie types.

**McC Campbell, B.C. (2), and Maricle, B.R. Department of Biological Sciences, Fort Hays State University.**

**ORGANISMAL COMPOSITION AND PHOTOSYNTHETIC TRAITS OF BIOLOGICAL SOIL CRUSTS IN PRAIRIE ECOSYSTEMS OF THE GREAT PLAINS.** Biological soil crusts (BSCs) are soil-surface microecosystems composed of a close association of algae, cyanobacteria, fungi, lichens, and non-vascular plants with soil particles. BSCs have several ecological functions including carbon fixation, nitrogen fixation, nutrient relations, soil stabilization, water relations, and floral community development, which make them extremely important in the dryland ecosystems where they occur. While BSCs have been studied throughout the American West, little work has been done in the Great Plains region where they are less prominent among the dominant vascular plant communities. This novel study examined organismal and photosynthetic traits of BSCs in four ecosystems within the Great Plains—sandsage, short grass, mixed grass, and tall grass prairies. To document the BSCs, seasonal photosynthesis measurements were performed in the field and samples were collected for lab analysis. The BSCs primarily consisted of lichens, bryophytes, and cyanobacteria with lichens being dominant in all ecosystems and an increasing bryophyte presence in the wetter and cooler ecosystems. Heterocystic (nitrogen-fixing) and non-heterocystic cyanobacteria were present in lichens at all sites, which contribute to soil nitrogen content. Photosynthesis rates varied between sites and seasons, ranging from 0.26 to 3.31  $\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ , that were generally correlated with precipitation and temperature. Not only does this research provide more knowledge about BSCs, but its information could also be incorporated into the conservation, restoration, and management of prairie ecosystems.

**McElroy, A.P. (2), and Wehrbein, R.L. Emporia State University.** **EVIDENCE OF THE OLDEST HEALED LIMB FRACTURE IN A PROBABLE AMNIOTE.** A fossil locality in eastern Greenwood County, near Toronto, Kansas in the Snyderville (Shale) Member of the Oread (Limestone) Formation (Pennsylvanian, Virgilian) contains an abundance of disarticulated and broken vertebrate fossils weathering out of a paleosol. One of the most notable specimens is an amniote bone that was fractured while the animal was alive and then partially healed prior to death. This is shown by the presence of both the fracture offset and the presence of a preserved callous. While many identifiable features of the bone have broken off post-depositionally, it appears to be consistent with an amniote limb bone. In transverse cross-section, this bone has a teardrop shape with a rounded anterior that tapers back to a flattened posterior that slightly curves. This morphology is consistent with other limbs found at this locality. The taxonomic identification is suggested by the histology of the fossil when compared with that of known amniotes and non-amniotes. The transverse cross-section appearance of the spongy bone is most consistent with that of amniotes. The geologic age of this fossil therefore indicates that this is the earliest known healed limb fracture from an amniote.

**Miller, W.R.<sup>1</sup>, Gray, J.F.<sup>2</sup>, Gregory, M.M.<sup>3</sup>, Emanueles, A.F.<sup>1</sup> and Lowman, M.D.<sup>4</sup>,<sup>1. Baker University, 2. Unity College, 3. Piedmont College, 4. California Academy of Science.</sup>** **TARDIGRADES IN THE CANOPY: VARIATION IN THE GENUS *MILNESIUM*.** During an NSF REU internship program at Baker University looking into the diversity, density, and distribution of tardigrades in the canopy of the trees of Kansas, over a thousand specimens from the genus *Milnesium* were collected. Currently, there are 28 species in this genus, but from 1840 until 1990 they were defined as a single species *M. tardigradum*. This unique and distinct genus is characterized by an absence of placoids and a large bulb-like pharynx. Species are defined by differences in the cuticle, buccal tube length and width, stylet attachment points, and accessory points and branches on the claws. Yet our ability to identify specimens to species is still difficult. Specimens are categorized by diagnostic traits and separated by measured characteristics still we are left with many specimens that do not fit a description. So far, this program has resulted in the definition of 2 new species with others still being separated. While sorting specimens a faint pattern was noticed on the dorsal cuticle. Examination with Auto-fluorescence revealed a complex matrix of thin plates bounded by even thinner seams. Specimens prepared for SEM present the opposite impression with the plated areas sinking as the seams appear to be ridged boundaries. The pattern is now under investigation and may or may not be diagnostic for species.

**Moore, K. (2), and Gillock, E. T. Fort Hays State University.** ISOLATION OF SOIL *BACILLUS* SPP WITH INHIBITORY ACTIVITY AGAINST METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA). The overuse of antibiotics in both human medicine and agriculture has contributed greatly to the crisis we experience today. In the United States alone, at least 2 million people acquire resistant infections with approximately 23,000 of these cases resulting in death each year. MRSA infection, in otherwise healthy individuals, affects the superficial skin and soft tissues, though more serious infections can arise, affecting the deep soft tissues, blood, and bone. MRSA is able to avoid the body's immune system through production of biofilm as well as certain toxins. These virulence factors, in combination with multidrug resistance, result in high morbidity and mortality rates. One of the first studies, published in 1904, to detail the effect of soil organisms on pathogens reported the inhibition and death of pathogens as a result of saprophytes. Several soil organisms found to have inhibitory effects on a range of pathogens have since been reported. The most common antagonistic soil organisms can be divided into four major genera, including the spore-forming genus, *Bacillus*. A protocol for the isolation of soil *Bacillus* spp was followed after which the samples were screened against a methicillin-sensitive strain of *S. aureus*. Those isolates producing zones of inhibition were selected for purification. These pure cultures were then tested against a resistant strain. The most promising isolates were identified by 16S rRNA sequencing. Spent media analysis is currently in progress.

**Mukherjee, L. (2), Hendry, I.R., and Hendry, W.J. Department of Biological Sciences, Wichita State University.** DETERMINATION OF DIFFERENTIAL PROTEOMIC EXPRESSION OF CD44, CD133 AND C-KIT/CD117 IN OVARIAN CANCER CELL LINES. Ovarian serous carcinoma is the commonest form of ovarian epithelial malignancy. Among the different types, high-grade serous ovarian cancer (HGSOC) is heterogeneous in nature and poses a great challenge to modern therapies. Non-responsiveness of tumor cells to currently available platinum and taxane-based therapies is largely due to the presence in a tumor mass of cancer stem-like cells that are the source of relapses and treatment failures in most of the cases. Hence, new prognostic stem-ness markers to detect the disease in its early stages are urgently needed. In this study, we will study the expression pattern of three stem-ness marker surface glycoproteins (CD44, a type I transmembrane protein mediating cell-cell and cell-extracellular matrix (ECM) interactions via hyaluronic acid and other proteins in the ECM; CD133, a 5-transmembrane protein present in numerous cell types; CD117/c-Kit, a transmembrane receptor tyrosine kinase that binds the c-kit ligand and is expressed mainly on hematopoietic stem cells and also on epithelial ovarian tumor cells) in three newly characterized HGSOC cell lines (Kuramochi, OVSAHO and SNU-119). Using Western blot and possibly Immunohistochemistry analyses, we will compare the expression of these proteins in those cell lines and thus determine their potential as a promising stem-cell biomarker candidate for epithelium ovarian carcinoma.

**Nieves, A.C. (1), and Greer, M.J. Department of Biological Sciences, Fort Hays State University.** REMOVAL OF OLD WORLD BLUESTEM THROUGH SOIL SOLARIZATION: EFFECTS ON THE SOIL MICROBIAL COMMUNITY. Old World Bluestems (OWBs) are invasive warm-season grasses that have been planted onto millions of hectares of marginal farmland and roadside right-of-ways in the southern and central Great Plains to reduce soil erosion and to increase forage production. Unfortunately, these grasses are currently of major management concern due to their rapid invasion into native prairies. Invasions of OWBs into native prairies have negative ecological and economical consequences. Soil solarization is a method shown to be as effective as herbicides, fumigants, and other mechanisms for removing unwanted/invasive plant species. Temperatures below solarization tarps may reach 60°C in the top 15cm, potentially killing seeds, insects, nematodes, and many fungal and bacterial species. To determine if solarization is a viable option for small scale OWB eradication in Kansas, we used plastic pool tarps (4.87 x 9.75m) to solarize 6 plots in OWB monocultures. Due to the high potential temperatures of solarization we also assessed its effects on the soil microbial community. Soil samples were taken before and after solarization from all plots. Phospholipid fatty acid analysis and neutral lipid fatty acid analysis were conducted on all soil samples to determine if solarization alters the abundance of key microbial functional groups in the soil. Our results indicate that soil solarization greatly decreases the abundance of gram+ bacteria, gram- bacteria, arbuscular mycorrhizal fungi, and saprophytic fungi. These results indicate a need to restore the native soil microbial community before planting native plant species to increase restoration success of OWB invaded grasslands.

**Pittenger, M.S.<sup>1</sup> (1), Caudle, K.L.<sup>1</sup>, Baer, S.G.<sup>2</sup>, Johnson, L.C.<sup>3</sup>, and Maricle, B.R.<sup>1</sup>** 1. Department of Biological Sciences, Fort Hays State University, 2. Department of Plant Biology and Center for Ecology, Southern Illinois University, 3. Division of Biology, Kansas State University. HERBIVORY PREFERENCES AMONG ECOTYPES OF BIG BLUESTEM (*ANDROPOGON GERARDII*). Big bluestem (*Andropogon gerardii*), a dominant prairie grass, exhibits a wide distribution with numerous genetically distinct ecotypes. Despite

being within the same species, each ecotype uniquely adapts to abiotic and biotic factors within its own environment. These adaptations may prove more or less desirable to herbivores in the area. For instance, plants adapted to areas with greater rainfall tend to grow larger than those adapted to drier conditions. However, wetter conditions might result in greater numbers of herbivores, so ecotypes adapted to wetter conditions might have evolved greater herbivore defense mechanisms. We hypothesized that herbivores would display a preference for plants adapted to drier conditions. We tested this with feeding preference trials involving grasshoppers and leaves from five ecotypes of *A. gerardii* that represented plants adapted to wet and dry conditions. Scans of leaves before and after herbivory trials indicated the percentage of the leaf eaten. We also hypothesized that leaves with more mechanical tissue would be less preferable to herbivores. Physical strength of leaves was measured by mechanical measures of ripping and tearing. Following herbivory trials, 45 to 59 percent of leaf area remained, but no significant differences were detected among ecotypes regarding herbivory preference or physical strength measures. This likely resulted from duration of herbivore treatments; shorter treatments may have captured a true preference as opposed to leaf availability. However, these data also suggest that ecotypes of *A. gerardii* have evolved similar tolerances to herbivory. Perhaps different environmental factors are stronger selective pressures than herbivory.

**Qian, H. (2), Yan, Y., and Yang, Y. Department of Biological Sciences, Emporia State University.** EFFECTS OF VITAMIN C ON HUMAN MALIGNANT MELANOMA. The goal of this study is to examine the effect of vitamin C on the growth, invasiveness, cell cycle progression and apoptosis induction of melanoma cells, and its effect on the cytotoxicity of Vemurafenib against melanoma cells. The effect of vitamin C on melanoma cells and on the cytotoxicity of Vemurafenib against the melanoma cells were examined by cell viability assay, wounding healing assays, and Transwell migration/invasion assay to measure its effects on cell proliferation, migration, and invasion, respectively. Cell cycle progression and apoptosis induced by vitamin C and/or Vemurafenib were determined by flow cytometry. Mitochondrial stress was determined by mitochondrial membrane potential assay. The activation of BRAF and Akt signaling were measured by Western blot. Vitamin C significantly reduced cell viability and invasion, and it synergistically inhibited cell proliferation and invasion with Vemurafenib. Vitamin C enhanced cell migration and alleviated the inhibition of cell migration caused by Vemurafenib. Vitamin C also promoted cell cycle progression and relieved the cell cycle arrest at G0/G1 phase caused by Vemurafenib. Vitamin C potently induced apoptosis, but it did not affect the ability of Vemurafenib in inducing apoptosis. Vitamin C reduced mitochondrial stress, and it also alleviated mitochondrial stress induced by Vemurafenib. Vitamin C abrogated the activation of Braf but not Akt signaling pathway.

**Reichenborn, M.M.<sup>1</sup> (2), Houseman, G.R.<sup>1</sup>, and Hughes, D.T.<sup>2</sup> 1. Department of Biological Sciences, Wichita State University, 2. Department of Anthropology, Wichita State University.** EXAMINING THE RELATIONSHIP BETWEEN TOPOGRAPHY AND THE DISTRIBUTION OF SERICEA LESPEDEZA (*LESPEDEZA CUNEATA*) THROUGH SPATIAL ANALYSIS. *Sericea lespedeza* (*Lespedeza cuneata*) is an invasive legume that is a growing threat to Kansas prairies. Once established, *L. cuneata* is difficult to control and can reduce the abundance of native species. Conventional wisdom has suggested that *L. cuneata* becomes heavily established in low-lying areas due to seed transport by water, but studies to support this observation on a landscape scale are lacking. To address this idea, we used ArcMap to plot and analyze the occurrence of *L. cuneata* on a grazed Flint Hills grassland over a five-year period. The property was surveyed annually from July to September; upon detection, individual *L. cuneata* plants were marked with a GPS unit and sprayed with herbicide. These data were uploaded to ArcMap and subsequently associated with elevation, aspect, and soil series in order to examine the association between topographical variation and *L. cuneata* occurrence. Preliminary analysis suggests that topography does impact the probability of *L. cuneata* occurrence: individuals rarely occurred in low-lying areas of the property, but were concentrated in areas of low to modest slope. In addition, there was little evidence of a relationship between soil type and *L. cuneata* presence. Ultimately, establishing a quantitative relationship between topography, soils, and land use will require additional years of data to tease apart the effects of these potentially interacting factors. Nevertheless, our preliminary results suggest that topography has an impact on the spread of *L. cuneata*.

**Renken, R.C., Thompson, J.A., and Maccarone, A.D. Biology Department, Friends University.** FORAGING MICROHABITAT SELECTION BY LONG-LEGGED WADING BIRDS AT AN ARTIFICIAL WEIR. To better understand how wading birds select among different microhabitats at foraging sites, we divided a 100-m-long concrete weir located at the terminus of the Little Arkansas River in Wichita into 10 zones based on physical characteristics. We observed five species of wading birds during 60 1-h periods from 12 June-28 July 2015 to document microhabitat use and feeding behavior. The independent variables collected before each session were time of day, Julian date (a proxy for breeding stage), water level, water clarity, and flow velocity.

We recorded bird abundance in each zone, and for each species documented foraging efficiency, prey length (relative to bill length), and aggressive interactions. Black-crowned Night-Herons ( $n = 396$ ), Great Egrets ( $n = 54$ ), Snowy Egrets ( $n = 36$ ), and Great Blue Herons ( $n = 30$ ) were the most abundant species. Time of day and water level were the only significant predictors of the number of birds recorded at the weir. A total 348 fish were captured, of which 108 were large (3/4 bill length or greater). Wading bird species differed in strike rates, capture rates, foraging efficiency, mean prey lengths, and the primary microhabitats used for foraging. Great Blue Herons and Black-crowned Night-Herons captured mainly large fish (gizzard shad, catfish, and freshwater drum); Great Egrets captured both large and small fish, and Snowy Egrets captured mainly small fish (minnows). The number of large fish captured declined significantly over the course of the breeding season. The overall aggression rate was correlated with the number of large fish captured per hour but not with total fish, whereas the *per capita* aggression rate was correlated with the total number of birds at the weir. Electro-fishing showed a non-uniform distribution of fish among the 10 microhabitats. This pattern of fish spatial distribution was reflected in prey-capture patterns, where mean fish length differed significantly by patch and ranged from 2.8 cm to 11.9 cm. We discuss possible implications from our study.

**Sassenrath, G.F.<sup>1</sup>, Hsiao, C.-H.<sup>1</sup>, Alarcon, V.J.<sup>2</sup>, Mueller, T.G.<sup>3</sup>, 1. Southeast Research and Extension Center, Kansas State University, 2. Universidad Diego Portales, Santiago, Chile, and 3. John Deere, Inc., Des Moines, IA.** AGRICULTURAL PRODUCTION IN SOUTHEAST KANSAS: TRANSITIONING TO SUSTAINABILITY. Southeast Kansas is an area blessed with high average annual rainfall totals, mainly during the spring in infrequent but intense storms. The shallow soils have limited water-holding capacity. Extensive conventional agricultural management practices further impair the shallow topsoil as tillage increases soil erosion. Although most cropped fields have only moderate slopes (0-5%), the high intensity of rainfall creates significant erosion events, and sediment and nutrient losses impair water bodies and contribute to trans-boundary water quality issues between Kansas and Oklahoma. The goal is to improve the productive capacity of the land while reducing negative environmental impacts. Yield and soil variability were determined in production fields. Changes in biological activity of claypan soils for crop and pasture production were tested with soil depth. Changes in soil electrically conductivity identified problem areas of production fields. As fields erode, exposing more of the claypan layer, crop yields are reduced, indicating the need for improved management practices. Ratios of extracellular enzymatic activities in the soil profile indicate microbial nutrient demand and soil health. Hydrolase activity decreased in the soil profile to a depth around 10", and then increased, potentially due to changes in clay content. Grassland had greater hydrolase activity at all depths. Oxidase activity decreased steadily throughout the soil profile and showed no difference with management. While conservation practices such as buffer strips and grassed waterways may reduce the sediment and nutrient contamination of streams, management practices are needed to preserve and even improve the soil quality in the crop field.

**Schillo, C.<sup>1</sup> (1), Hagen, R.H.<sup>1</sup>, and Fox, L.J.<sup>2</sup>, 1. Environmental Studies Program, University of Kansas, 2. Kansas Department of Wildlife, Parks, and Tourism.** WHITETAIL DEER POPULATIONS AT THE UNIVERSITY OF KANSAS FIELD STATION. Whitetail deer are a key part of ecosystems in eastern Kansas and the eastern US. Since 2008, evening spotlighting surveys have been used to estimate whitetail deer populations in and around the University of Kansas Field Station (KUFS), located north of Lawrence, Kansas. Our population estimate based on the evening surveys ranges from a high of 45.8 in 2010 to a low of 10.4 in 2015 deer per square mile. In fall 2015, the Kansas Department of Wildlife, Parks, and Tourism (KDWP) partnered with KUFS and the KU Environmental Studies Program to set up twelve baited trail camera stations at KUFS to better understand the whitetail deer herd. One goal was to get an independent estimate of deer population density for comparison with spotlight survey results. A second goal was to obtain information on movement and behavior of individual deer at KUFS. We obtained over 10,000 photos during the 2 weeks of camera placement. We then used a new software program (DeerLab), to tag and sort the photos by content. Individual bucks were identified from the photos, based on unique antler patterns or other features. We recognized at least 16 unique bucks, which appeared in 3200 photos from the 12 camera stations. Analysis of the photos suggests that individual bucks tend to remain in the same area of the field station during this fall period. Results from our study demonstrate the promise of trail camera studies for whitetail deer research in Kansas.

**Schouten, O.S. (2), and Houseman, G.R., Department of Biological Sciences, Wichita State University, Wichita, KS.** THE INFLUENCE OF SOIL HETEROGENEITY ON THE SPATIAL STRUCTURE OF AN ASSEMBLING PRAIRIE PLANT COMMUNITY. Analysis of plant spatial structure can reveal effects of environmental heterogeneity, species-species interactions, and dispersal limitation, however it is difficult to clearly tease



apart effects of environmental heterogeneity from other factors using observational studies. Here we use a soil heterogeneity experiment and point-pattern spatial analysis of univariate and bivariate patterns to examine how known patterns of soil heterogeneity influence plant spatial structure in grassland community assembly. Soil heterogeneity was created by splitting the vertical soil profile into three soil-types that were excavated and then randomly reassigned to 40X40cm patches comprising 2.4X2.4m plots. Homogeneous plots were similarly excavated and handled, but all soil was homogenized before filling each patch. Thirty-four tallgrass prairie species were sown into all plots and allowed to grow for five years after which the presence and density of all plants were mapped using a 5X5cm grid. Most species were spatially aggregated at similar scales in both plot types, though several species aggregated at a second scale in only one plot type, usually in heterogeneous plots corresponding with the approximate size of soil patches (35cm). Analysis of bivariate pairs indicated a number of positive and negative associations, though only three associations were shared between both plot types. Taken together, differences in univariate and bivariate patterns between plot types suggest soil heterogeneity influences plant spatial structure and that even in the absence of dispersal limitation and soil heterogeneity, species interactions are likely a driving force in these commonly observed patterns of plant aggregation.

**Simon, S. (1), Wilgers, D.J., and Ayella, A. Department of Natural Sciences, McPherson College.** EFFECTS OF FEMALE MATING STATUS ON THE EXPRESSION AND SUCCESS OF MALE MATING TACTIC IN THE WOLF SPIDER *RABIDOSA PUNCTULATA*. Mating tactics are used in the mating process to locate a mate, make contact with a mate, copulate, and engage in post-copulatory behavior. The wolf spider *Rabidosa punctulata* will adopt one of two different mating tactics. Courtship in which the male will use visual and seismic signals to attract a mate, or direct mounts, where the male grapples and holds female until copulatory posture is assumed. In this experiment we will be testing the effects of female mating status on the success and expression of male mating tactic. While females of closely related species mate only once and become unreceptive and aggressive, a recent study showed that female *R. punctulata* mates multiply in a short period of time.. Here, we explored how female mating status affects male mating behaviors. Mated and unmated females from previous trials were exposed to males and the mating tactics expressed were observed. We found that direct mounts were most commonly adopted and the most successful mating tactic at gaining copulations with already mated females. Males paired with unmated females expressed the courtship tactic most often.

**Sleezer, L.J.<sup>1</sup> (1), Kraft, C.D.<sup>2</sup>, and Sleezer, R.O.<sup>2</sup> 1. Department of Biological Sciences, Emporia State University, 2. Department of Physical Sciences, Emporia State University.** GIS AND REMOTE SENSING ANALYSIS OF BOVINE TRAILS AT THE TALLGRASS PRAIRIE NATIONAL PRESERVE. Bovine trails are ubiquitous features observed in pastures throughout Kansas. They remain vegetation free due to hoof traffic and represent a significant disturbance of natural vegetation in native grass pastures. They can also facilitate erosive damage to pasture soils where trails are concentrated and slopes are steep. This research project used NG911 imagery flown in April of 2014 as mapping media for heads-up digitization of all visible bovine trails at the Tallgrass Prairie National Preserve (TPNP). Field checks were performed to confirm that visible trails were indeed bovine trails. Field mapping of trails was performed using a GPS unit and an ATV. Two types of GIS analyses were performed: 1) Analyses to determine the controlling factors on the locations of trails and trail networks, 2) Comparisons between trail networks in pastures used for domestic beef cattle (*Bos taurus*) versus American Bison (*Bison bison*). The major controlling factors for the position of trails were: 1) Mineral feeders, 2) Ponds, 3) Fences and Gates, 4) Stream networks. Preliminary analysis of trail networks indicated that similar factors influence the spatial patterns of trails in pastures stocked with bison versus cattle. Trail density was highest in the pasture stocked with bison (Windmill pasture), indicating that bison may have a greater erosional impact on the landscape. However, results are preliminary and may be influenced by a legacy effect of past cattle-stocking in the Windmill pasture and more bison pasture replicates are needed to determine differential resource use and erosional effects of domestic cattle versus bison.

**Smith, J.J.<sup>1</sup>, Ludvigson, G.A.<sup>1</sup>, Layzell, A.<sup>1</sup>, Stotler, R.<sup>2</sup>, and Möller, A.<sup>2</sup> 1. Kansas Geological Survey, 2. University of Kansas.** SCIENTIFIC DRILLING IN THE CENOZOIC STRATA OF THE HIGH PLAINS OF WESTERN KANSAS. The Kansas Geological Survey is engaged in a scientific coring program to retrieve intact cores of the Cenozoic strata of the High Plains Aquifer in western Kansas. To date, approximately 700 m of core have been collected from 25 locales. Sedimentologic studies include cm-scale logging, measurements of organic  $\delta^{13}\text{C}$ , and sediment particle size. Chemostratigraphic records of the  $\delta^{13}\text{C}$  of pedogenic calcite and sedimentary organic matter show the expected long-term Cenozoic temporal trend from lower values more characteristic of a C3 paleoflora, to higher values more characteristic of C4 paleoflora, although the timing of this transition

in the core is uncertain. Optically-stimulated luminescence dating of Quaternary loess deposits in the uppermost 12 m of the core produces ages ranging from  $76.8 \pm 13$  Ka to  $44.3 \pm 7.8$  Ka. Approximately 300 detrital zircon grains were extracted from intervals containing mature paleosols. Paleosols are condensed stratigraphic intervals in terrestrial successions, and offer the potential to produce radiometric dates from volcanogenic zircons via LA-ICP-MS. In the HP1A core, U/Pb dates from 16–26 m suggest paleosols at this depth have depositional ages around  $\sim 27.9$  Ma, while the youngest zircons from below 33 m average around  $\sim 35.6$  Ma. These new geochronologic results are being tested further, but if true, they indicate that the contained strata are Oligocene deposits equivalent in age to the Brule Formation of the White River Group in Nebraska and previously unknown from Cenozoic deposits.

**Stoehr, K., and Nonnenmacher, H. Pittsburg State University.** OBSERVATIONS OF INSECT FORAGERS ON TALL THISTLE, *CIRSIIUM ALTISSIMUM* (L.) SPRENG. WITH ANALYSIS OF THEIR POLLEN LOADS. Tall Thistle, *Cirsium altissimum* (L.) Spreng. (Asteraceae) is a native plant species found in bloom in late summer and early fall in southeast Kansas. In 2015, sites in Cherokee and Montgomery Counties, Kansas were selected to observe and collect foragers on *C. altissimum* in stands that varied from one or two plants to stands of several plants, with all stands receiving no shade. 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 investigation into forager guilds and annual changes in their relative oligolectic or polylectic foraging. From September 07 to September 26, 2015, a total of 57 foragers (Cherokee County:  $n=16$ ; Montgomery County:  $n=41$ ) were collected and washed. Out of 57 washes, 47 (82%) showed a mixture of asteraceous and other pollens, with pollen loads ranging from less than 1% other to more than 80% other.

**Stultz, C.J. (1), and Williams, D.R. Department of Biology, University of Saint Mary.** INFLUENCE OF MARMOTA MONAX ON URBAN ENVIRONMENTS. As an urban adaptor; the Woodchuck (*Marmota monax*) can have a profound effect on local plant communities. Woodchucks have shown to effect plant growth and diversity over time and distance in rural settings. In an urban environment they can potentially increase species abundance in human-influenced lawns and woodlands. Studies have shown that Woodchucks have had a significant effect on plant species diversity in rural plots due to their adding of natural fertilizer, movement of seeds, and thinning of competing species. Within urban environments, mowing and other effects remove competition, but biodiversity could still be influenced by the other routes found in rural environments. We recorded vegetation and percentage coverage around 20 Woodchuck burrows during the summer and fall of 2015 at two adjacent urbanized sites in Leavenworth County, Kansas. Initial results showed that diversity of forbs was greater at intermediate distances from the burrow, where grass diversity was consistent throughout. Total biodiversity was low near the entrance of the burrow, significantly higher at intermediate distances, and began to decrease farther away from the burrows. Percentage coverage of vegetation was also low at the entrance of the burrows and increased significantly at intermediate distances and then remained consistently high. There was an effect of distance on plant species diversity, similar to that seen in rural environments. The effect of distance on percentage coverage was not consistent with that seen in rural environments. We therefore suggest that urban woodchucks perform ecosystem services similar, but not identical to those found in rural habitats.

**Tamang, T.M.<sup>1</sup>, Alsdurf, J.<sup>2</sup>, Johnson, L.C.<sup>2</sup>, Baer, S.G.<sup>3</sup>, and Maricle, B.R.<sup>1</sup>** 1. Department of Biological Sciences, Fort Hays State University, 2. Division of Biology, Kansas State University, 3. Department of Plant Biology and Center for Ecology, Southern Illinois University. DETERMINATION OF EVOLUTIONARY HISTORY OF BIG BLUESTEM ECOTYPES THROUGH CHLOROPLAST DNA ANALYSIS. Big bluestem is one of the most dominant and widely distributed grasses of the prairie. Big bluestem ecotypes demonstrate strong genetic and adaptive variation across a sharp environmental gradient. When considering restoration, it is important to identify local ecotypes, as they are best adapted in the particular local environment. Furthermore, establishment of phylogeny provides valuable information in identification of plants and their evolutionary relationship. In recent days, chloroplast coding and non coding regions have been used to obtain the information required to determine the phylogenetic relationship of plants at various taxonomic levels. In this study, we investigated the evolutionary relationship of 191 samples from 24 ecotypes of big bluestem based on chloroplast DNA (cpDNA) sequences (*rpl32-trnL* and *trnQ-rps16*). The spacers are AT rich with a potential informative character value of 2.69%. The number of haplotype (h) and haplotype diversity ( $H_d$ ), identified in *rpl32-trn*, *trnQ-rps16*, and both cpDNA combined were 4, 20, and 22, and 0.605, 0.982, and 0.993, respectively. Maximum likelihood and Bayesian analyses produced similar phylogenies. Although the phylogenetic analyses (based on individual and combined cpDNA sequences) did not reflect the geographical distribution of the big bluestem ecotypes, the analyses separated a population that was isolated

geographically and the subspecies sand bluestem. Moreover, the position of the two cultivar ecotypes implies they evolved recently because of selection pressure. The study suggests the cpDNA sequences *rpl32-trnL* and *trnQ-rps16* could be effectively used in understanding the evolutionary relationship and identification of species at deeper taxonomic levels.

**Tauber, G.O.<sup>1</sup> (1), Campbell, M.L.<sup>1</sup>, and Greer, M.J.<sup>2</sup> 1. Kansas Academy of Math and Science, Fort Hays State University, 2. Department of Biological Sciences, Fort Hays State University.** A STORY OF CHEMICAL WARFARE IN NATURE, CHAPTER 2: DO CLOSELY RELATED INVASIVE GRASS SPECIES WITH SIMILAR EVOLUNTARY HISTORIES POSSESS ANALOGOUS ALLELOPATHIC PROPERTIES? Biological invasion refers to the process by which a new species enters a native biological community, reproduces, and displaces native species. *Bothriochloa ischaemum* and *B. bladhii* (collectively OWB's) are invasive warm-season perennial grasses of Eurasian, African, and Australian origin that are a threat to native prairies of the central and southern Great Plains. OWB's are functionally similar to the dominant native warm-season grass *Andropogon gerardii*. Recent research shows that one potential mechanism for *B. ischaemum*'s success is the production of allelopathic compounds that reduce native grass germination or establishment. Given that *B. ischaemum* and *B. bladhii* have partially overlapping native ranges and thus evolutionary histories, we hypothesized that they may impose similar allelopathic impacts to native grasses while having little to no effect on one another. We will conduct an experiment to provide evidence for this hypothesis by examining germination of native and exotic grasses following applications of leachate from OWB's. Our study will examine the effects of exotic and native leachates on seed germination of native *A. gerardii* and the invasive OWB's. We will conduct a petri dish bioassay experiment to assess potential effects of leachate collected from native *A. gerardii* or invasive OWB's on seed germination of all three species. We are using a fully factorial design with 7 replicates for each seed x leachate combination. Deionized water will act as our control treatment. Results from this study will supply vital information related to the understanding of allelopathic chemicals "chemical warfare" in our native prairies.

**Tibbs, L.E.<sup>1</sup> (1), Cortes, B.W.<sup>1</sup>, and Miller, W.R.<sup>2</sup> 1. Biology Department, Benedictine College, 2. Department of Biology and Chemistry, Baker University.** TARDIGRADES IN THE CANOPY: THE DILEMMA BETWEEN THE GENERA *ITAQUASCON* AND *ASTATUMEN*. Through an NSF-REU program, microscopic animals of the phylum Tardigrada were collected from the canopy of Kansas trees. Several specimens collected keyed out to *Itaquascon placophorum* Maucci, 1973, but on closer inspection appeared to belong to the genus *Astatumen* Pilato, 1997. The holotype of *I. placophorum*, in the collection of Dr. Roberto Bertolani in Modena, Italy, was also examined and also appeared to belong to *Astatumen*. The classification of this species has been previously disputed; although Pilato moved this species to *Astatumen* in 1999, Guidetti returned it to *Itaquascon* in 2005. However, both the new specimens collected in Kansas and the holotype show a lack of stylet supports and a buccal/pharyngeal tube that is flexible all along its length, which are characteristics of *Astatumen* rather than *Itaquascon*. This suggests that *I. placophorum* should be re-examined and possibly reclassified under *Asatatumen*.

**Toth, S.P. (1), and Leung, S.H. Department of Chemistry, Washburn University.** FURTHER ADVANCEMENT AND OPTIMIZATION IN THE SYNTHESIS OF DIPYRRROMETHANES WITH A  $\beta$ -AZO LINKAGE TO SUBSTITUTED BENZENES. Porphyrins have been studied a significant amount in the medical science community due to their use as photosensitizing agents in a type of treatment known as photodynamic therapy (PDT). Over the past fifty years or so, several different kinds of porphyrins have been synthesized in order to achieve maximum potency in regards to the treatment. However, many of these synthetic macrocyclic organic molecules fall short of being considered an "ideal photosensitizer." One of the main qualities of an ideal photosensitizer is that it has a strong absorption in the red/near infrared region of the electromagnetic spectrum (600-800 nm). It has been shown that porphyrins with meso-azo linkages to a nitrobenzene have an absorption at ~692 nm. This research project aims to determine if this absorption remains the same or increases when the azo linkage is moved to a  $\beta$ -position of the porphyrin. A series of experiments was performed in order to determine the optimal conditions for the reaction to produce a pyrrole with an azo linkage in the  $\beta$ -position to nitrobenzene. The subsequent reaction to synthesize the acetoxy-methylpyrrole was successful. However, this acetoxy-methylpyrrole proved to be difficult to work with because of solubility issues. Currently, work is being done on the synthesis of an acetoxy-methylpyrrole linked to a methoxycarbonylbenzene. This acetoxy-methylpyrrole with the azo linkage would then be reacted with an  $\alpha$ -free pyrrole to make a dipyrromethane which constitutes as half of the target porphyrin.

**Trump, E.L., and Alrashed, M. Department of Chemistry, Emporia State University.** THE USE OF COAL FLY ASH AS A CATALYST SUPPORT FOR THE FABRICATION OF CARBON NANOTUBES. Carbon nanotubes (CNTs) can be used for many different purposes. The ideal process of manufacturing CNTs is through fabrication in a Chemical Vapor Deposition (CVD) apparatus from the ethylene, through the use of a metal catalyst and an expensive porous silica support. Fly ash is described as the unburned particulate material that is derived from the combustion of fossil fuels. It is an ideal material because it is a waste product and, therefore, it is inexpensive. In Saudi Arabia, oil fly ash, a waste product, has been investigated as a very inexpensive catalyst support for growing CNTs. In the United States, the petroleum refining process does not generate fly ash. Therefore, fly ash from coal combustion was investigated. Class C fly ash that was collected from Jeffrey Energy Center near St. Mary, Kansas, was prepared at different weight percent's of iron and at different calcination temperatures. Raman spectroscopy showed that coal fly ash is mainly composed of silica and alumina. The Neutron Activation Analysis showed that there were other elements present in the Class C fly ash. The process we used produced small nanotube growth as indicated by scanning electron microscopy. Future research may studies to examine the pore sizes of the fly ash through the use of electron microscopy in order to determine the ideal size that can be used successfully to manufacture CNTs. Research could be done conducted in order to see whether Class F fly ash can be used in the manufacturing process.

**Tuck, R.<sup>1</sup>, Adhikari, S.<sup>2</sup>, and Russell, F.L.<sup>1</sup>** 1. Department of Biological Sciences, Wichita State University, 2. Department of Land Resources and Environmental Sciences, Montana State University. APICAL MERISTEM MINING, SEED DISPERSAL PHENOLOGY AND OFF-SPRING PERFORMANCE IN TALL THISTLE (*CIRSIIUM ALTISSIMUM*). Effects that are only manifest in the off-spring generation can be important mechanisms by which herbivores reduce maternal plant fitness. Herbivore-induced shifts in seed dispersal phenology may place off-spring into ecological circumstances that are more hostile than those encountered by off-spring of undamaged plants. We address whether 1) apical meristem mining on tall thistle (*Cirsium altissimum*) alters seed dispersal phenology? and 2) seed dispersal timing affects off-spring performance? First, we manipulated insect apical meristem herbivory on adult *C. altissimum* and quantified the date on which each flower head began dispersing seed. Second, we sowed tall thistle seeds (100 seeds / 0.5 m X 0.5 m plot) on three dates in fall 2014 (Sept 14, Sept 28, Oct 5) during tall thistle's natural seed dispersal interval. We isolated effects of dispersal date from effects of seed quality by drawing the seeds that we sowed on each date from a common pool. We are quantifying off-spring performance. Apical mining statistically significantly delayed tall thistles' first dates of seed dispersal. However, change in mean date of first dispersal was less than a week. Plots with seeds sown on Sept 14 had greater seedling germination through spring 2015 than plots sown on Oct 5, but did not differ from plots sown on Sept 28. Seedling survival was unaffected by sowing date. One year after sowing, only plots sown on Sept 14 contained off-spring that reproduced themselves. Although apical herbivory shifts seed dispersal phenology, these changes may be too small to strongly affect off-spring performance.

**Urban, A.D. (1), Kobayashi, Y., and Maricle, B.R. Department of Biological Sciences, Fort Hays State University.** EFFECT OF LACTIC ACID ON ENZYMES OF RESPIRATION IN CATFISH TISSUE. Lactic acid can accumulate in tissues of animals during periods of fermentation, potentially resulting in impaired muscle function following strenuous exercise. However, specific toxicity of lactic acid on tissue metabolism is not well defined. The objective of this study was to investigate lactic acid toxicity on activities of the enzymes lactate dehydrogenase (LDH), citrate synthase (CS), and cytochrome *c* oxidase (CytOx), each essential to one of the three phases of respiration. Channel catfish were collected from the Arkansas River and LDH, CS, and CytOx activity were measured in tissue homogenates from liver and muscle. Enzyme activity was measured in the presence of 0, 1, 10, 50, and 100 mM lactic acid. Enzyme activities were higher in liver when compared to muscle. Increasing lactic acid concentration significantly decreased activity in all enzymes. LDH activity appeared to be more sensitive to lactic acid toxicity when compared to CS and CytOx. Activity of LDH was as high as 78.7  $\mu\text{mol min}^{-1} \text{g}^{-1}$ , but increasing lactic acid concentration decreased LDH activity in a dose-dependent manner. Activity of CS was as high as 3.4  $\mu\text{mol min}^{-1} \text{g}^{-1}$  and activity of CytOx was as high as 6.5  $\mu\text{mol min}^{-1} \text{g}^{-1}$  in the absence of lactic acid. CS and CytOx displayed a threshold response, where activities were not reduced until 50 mM lactic acid. Our results indicate that lactic acid influences the activity of enzymes involved in all stages of cellular respiration, suggesting that accumulation of lactic acid leads to impaired cellular metabolism in animal tissues.

**Varvel, N.A.<sup>1</sup> (1), Hilt, C.J.<sup>1</sup>, Baer, S.G.<sup>2</sup>, Johnson, L.C.<sup>3</sup>, and Maricle, B.R.<sup>1</sup>** 1. Department of Biological Sciences, Fort Hays State University, 2. Department of Plant Biology and Center for Ecology, Southern Illinois University, and 3. Division of Biology, Kansas State University. GENETIC AND ENVIRONMENTAL

INFLUENCES ON STOMATES OF BIG BLUESTEM (*ANDROPOGON GERARDII*) ECOTYPES. Big bluestem (*Andropogon gerardii*) is a dominant prairie grass that has wide distribution and numerous genetically distinct ecotypes within the species. Many of the ecotypic adaptations of big bluestem are related to water availability in the native environment. Epidermal pores on leaves, called stomates, regulate water loss from the plant. As such, stomatal size and density represent possible adaptations to conserve water. We hypothesized drought-tolerant ecotypes of big bluestem would have fewer or smaller stomates compared to more mesic ecotypes. Five ecotypes of big bluestem were planted in four common gardens from western Kansas to southern Illinois to determine genetic and environmental influences on stomates. We made epidermal imprints to measure stomatal size and density on tops and bottoms of leaves. Leaves were largely hypostomatous, with genetics being a much more prominent influence than environment. The drought-tolerant Sand Bluestem had larger stomates on the bottoms of leaves, but a lower density compared to most other ecotypes. The most mesic ecotype from Illinois and the Kaw cultivar had the greatest density of stomates on the bottoms of leaves. Sand Bluestem had a greater density of stomates on the tops of leaves compared to all other ecotypes. There was no difference in size or density of stomates among sites, despite mean annual precipitation ranging from 505 to 1167 mm, illustrating the genetic underpinnings of stomates in big bluestem. There is a genetic predisposition for drought-tolerant ecotypes to have fewer stomates, illustrating an evolutionary adaptation to drought tolerance in an important prairie species.

**Westerfield, J.H. (1), and Conard, J.M. Natural Science Department, Sterling College.** FOOD HABITS OF MOURNING AND EURASIAN COLLARED-DOVES IN CENTRAL KANSAS. The mourning dove (*Zenaida macroura*) is a granivorous migratory bird that is widely distributed throughout North America. It is important to understand the diet of the mourning dove during fall migration, which may be a critical time in the life cycle of the species. This is also a subject that has not been studied extensively or recently in Kansas. To gather data, mourning doves were harvested during the hunting season in September 2014 and 2015. We removed the crops from harvested doves and placed the contents into paper bags until seeds were dry. We identified seeds by observing under a dissecting microscope and comparing samples against a seed identification book. We sampled a total of 52 mourning doves and 3 Eurasian collared-doves (*Streptopelia decaocto*) from Ellsworth, Rice, and Sedgwick counties in central Kansas. The top agricultural grains that were consumed by seed mass and number were wheat (*Triticum aestivum*) and corn (*Zea mays*). The most frequent type of native seed that was consumed was hemp (*Cannabis sativa*) in 2014 & 2015. Foxtail (*Setaria* sp.) was also frequently present in samples from 2015. This information will be useful in helping effectively manage North America's most popular gamebird, and understanding possible responses of this species to changing patterns of land-use.

**Whitenack, W.B. McPherson Museum and Arts Foundation.** J.Z. GILBERT - PREACHER, TEACHER, PIONEER PALEONTOLOGIST. Housed in the McPherson Museum and Arts Foundation are skeletons of a Harlan's ground sloth (*Paramylodon harlani*), saber-tooth cat (*Smilodon fatalis*), and dire wolf (*Canis dirus*) along with other assorted bones collected from the Rancho La Brea deposits, commonly known as the "La Brea Tar Pits." How and why these specimens came to reside in McPherson, Kansas is the result of one man - James Zacchaeus Gilbert. A Church of the Brethren pastor and the first collegiate graduate of McPherson College, Gilbert went to Los Angeles, California to teach high school biology and zoology. Beginning in 1907, Gilbert, with the help of his students, was among the first to attempt large-scale excavations in the tar pits. Gilbert and his crews worked under the auspices of the Southern California Academy of Science and the Los Angeles County Board of Supervisors. The fossils they acquired were housed in a teaching museum in Los Angeles High School and also made up the nucleus of the fossil vertebrate collections of the Los Angeles Museum of History, Science and Art (now the Natural History Museum of Los Angeles County). Gilbert's agreements with the museum allowed him to keep duplicates of the fossils he collected. In 1918 he made donations to McPherson College where the collection was later moved to the McPherson Museum (now the McPherson Museum and Arts Foundation). Today, visitors to the museum admire the work accomplished by a true pioneer in the rich history of the Rancho La Brea story.

**Williams, D.R. Department of Biology, University of Saint Mary.** SCAVENGERS OR HUNTERS? EVIDENCE IN THE AGE DISTRIBUTION OF COMMON RAVENS (*CORVUS CORAX*) FROM NATURAL TRAP CAVE. Common Ravens (*Corvus corax*) can act as accumulators of bone, but emphasize different prey items depending on age. Immature ravens aggregate into large communal roosts and tend to scavenge large mammal carcasses. Older adults form mating pairs, cordon off a territory, and emphasize hunting small mammal prey. This change in prey focus poses a taphonomic issue for the small mammal faunal assemblage collected from Natural Trap Cave, Wyoming; a communal roost would collect a narrower sample of the microfauna and emphasize larger

carcasses. The presence of a roost seems likely given that Natural Trap Cave would have large mammal carcasses at the base of the 30 m vertical drop. There are three testable predictions: 1) the signature in the cave is overwhelmingly from a nearby nest, resulting in mostly nestlings with few immatures and adults; 2) the cave was the site of a communal roost, in which case the ravens will consist almost entirely of immatures with some adults; 3) the environment near the cave served as a nesting territory and a communal roost at various times, leading to the presence of all three age classes in the sample. I used a combination of bone size and texture for femur, tibiotarsus, and humerus to assign individual elements to an age class. Immatures and adults were evenly represented in the sample. I interpret this to mean that a communal roost was the most common representation of ravens, although other evidence suggests a nest may have also been present.

**Wilson, P.J. (2), and Zhang, C. Department of Geosciences, Fort Hays State University.** STABLE ISOTOPE DIET ANALYSIS OF *TELEOCERAS FOSSIGER* FROM THE HIGH PLAINS OF KANSAS AND COMPARISON BETWEEN TWO SPECIES. Stable isotope geochemistry provides a way of examining both modern and ancient ecosystems. One important usage for stable carbon and oxygen isotope data is to determine the diet of animals and the climate in which those animals lived. When the stable oxygen isotopes show an inverse relationship with stable carbon isotopes, the climate is interpreted to have monsoonal seasons. We analyzed stable carbon and oxygen isotope values of 85 serial samples obtained from the tooth enamel of six isolated molars of *Teleoceras fossiger*, an extinct North American rhinoceros from the Late Miocene, to determine the diet of this animal and the climate in which this animal lived. The  $\delta^{13}\text{C}$  values from the samples showed a range between  $-11.16\text{‰}$  and  $-7.24\text{‰}$  with respect to the Vienna Pee Dee Belemnite (VPDB) standard. With an established conservative cut-off value for a pure C3 diet set at  $-7.7\text{‰}$  VPDB, the diet of *Teleoceras fossiger* was determined to be a pure or nearly pure C3 diet. The  $\delta^{13}\text{C}$  and the  $\delta^{18}\text{O}$  in this study do not show the inverse relationship associated with monsoonal rains. Therefore, there was not a strong monsoonal influence in the High Plains of Kansas during the lifetime of *T. fossiger* in the Late Miocene. The  $\delta^{13}\text{C}$  data were also statistically compared to the  $\delta^{13}\text{C}$  values from a different *Teleoceras* species which is endemic to Florida and contemporaneous with *T. fossiger*. It was found that the two diets were statistically different.

**Yan, Y. (2), Qian, H., and Yang, Y. Department of Biological Sciences, Emporia State University.** EFFECT OF miR-26a ON HUMAN MALIGNANT MELANOMA. Melanoma is the deadliest skin cancer that is refractory to therapy. This work aimed to investigate the potential of miR-26a as a novel therapeutic strategy against human malignant melanoma. It examined the effect of miR-26a on proliferation and invasiveness of malignant melanoma cells and examined the effect of miR-26a on the cell cycle progression of human malignant melanoma cells. It also identified and validated the potential target of miR-26a in melanoma. The expression level of miR-26a was determined by RT-PCR. The effect of miR-26a on cell proliferation, migration and invasion has been investigated by using an MTT assay, wound healing assay and Transwell assay. The effect of miR-26a on the cell cycle progression of human malignant melanoma cells was determined by flow cytometry. Cell viability assay indicated that miR-26a (50 nM and 100 nM) suppress cell proliferation in melanoma. Wound healing and Transwell invasion assay illustrated that miR-26a significantly inhibited the ability of migration and invasion. In addition, miR-26a induced cell cycle arrest at G1/G0 phase as shown by flow cytometry. Western Blot showed that miR-26a reduced the expression of MITF, and the luciferase reporter assay confirmed that MITF is the *bona-fide* target for miR-26a. Therefore, miR-26a may be a novel therapeutics against malignant melanoma.

**Yang, T. and Simons, K.T. Department of Physical Sciences, Emporia State University, Emporia, KS.** CHARACTERIZATION OF FLUORESCENT DNA POLYMERASE. PCR (polymerase chain reaction) is used to amplify a minute amount of DNA sequences into large amount that can be visualized and manipulated. The enzyme responsible for copying DNA in PCR is Taq polymerase. Taq polymerase is thermostable maintaining its activity under high temperatures in PCR. Some fluorescent proteins, such as td-Tomato, ZsGreen, and mTFP1 are found have the ability to refold after boiling and cooling cycles. This characteristic enables us to connect these fluorescent proteins with Taq polymerase to construct a fusion protein, which can be used in PCR. The fluorescence of the fusion protein enables us to study the process of PCR using a fluorescence resonance energy transfer (FRET) experiment. This experiment requires a fluorescent oligonucleotide as either the energy donor or acceptor. When the oligo anneals to template DNA and is close enough to the fluorescent Taq polymerase, energy can be transferred from donor to acceptor. By measuring the fluorescence signals, we are able to study the PCR process.

**Yu, C. (2), and Yang, Y. Department of Biological Sciences, Emporia State University.** THE EFFECT OF ULTRA-VIOLET LIGHT ON THE EXPRESSION OF P53 DOWNSTREAM GENES. This work aims to to examine

the activation of p53 downstream genes in response to ultra-violet light (UV) irradiation in p53 mutant human malignant melanoma cell SK-MEL-28. We aim to understand the activation of p53 and its downstream genes in response to UV irradiation in the context of mutant p53 and deregulated p53 regulation network. Human melanoma SK-MEL-28 (p53 mutant) cells were irradiated by UV light, and then the total RNAs were extracted from cells that were exposed to the UV irradiation (50 mJ/cm<sup>2</sup>) and collected at four time points (0, 30, 60 and 120 minutes) after the UV irradiation. Real-time qPCR was employed to measure the expression of p53 and its downstream genes *bax* and *mdm2* at mRNA level. After UV light irradiation, p53 and *mdm2* gene expression levels were down-regulated, but *bax* gene expression level was up-regulated. Despite of the mutant p53 in SK-MEL-28 melanoma cells, the expression of p53 and its downstream genes were still altered in response to UV irradiation, suggesting that other regulation mechanism of p53 and its downstream genes exists in coping with UV challenge. The up-regulated BAX gene and the down-regulated MDM2 gene indicated that cells respond to UV by attempting to initiate apoptosis and promote DNA repair.

**Zimmerman, D.M. (1), and Carvalho, C.M. Department of Biological Sciences, Fort Hays State University.** PREVALENCE OF LIVESTOCK-ASSOCIATED MRSA AMONG THE UNIVERSITY POPULATION IN MIDWESTERN KANSAS. *Staphylococcus aureus* is a gram-positive coccus that colonizes nasal passages of approximately 30% of healthy individuals as a normal flora. In contrast, 2% of the population are considered carriers of *methicillin-resistant Staphylococcus aureus* (MRSA). MRSA is a virulent pathogen that requires treatment with potent antibiotics when infected. This pathogen subsists in three known types; community-, hospital-, and livestock-associated MRSA. Until recently, the majority of research has neglected livestock; and, Europe has led the forefront of this investigation. Livestock-associated MRSA is mainly associated with clonal complex (CC) 398 and is described as a major animal pathogen capable of causing an infection in human beings. The main reservoir for CC398 is within livestock such as swine, poultry, and cattle. Human-to-human dissemination occurs within households and even among individuals who are not occupationally exposed. Outside of Europe, little exploration has been conducted into this pathogen. The primary goal of this research is to identify the colonization levels of MRSA among the university population and illustrate the potential threat to the community. Participants will fill out surveys and get their nasal passages swabbed. The swab will be smeared onto Mannitol Salt Agar, to select for gram-positive halophiles and mannitol fermentation. Positive isolates will then be gram stained, and tested for catalase and coagulase enzyme activity. Identification of oxacillin resistance will be performed with a Kirby-Bauer disk assay. Positive results of the preceding tests are a preliminary indication of a MRSA isolate that will be analyzed in connection with student surveys to isolate its origin.

**Zimmerman, W.<sup>1</sup> (1), Koralegedara, M.<sup>1</sup>, and Wimalasena, K.<sup>2</sup> 1. Department of Natural Science, McPherson College, 2. Department of Biochemistry, Wichita State University.** CELL TOXICITY STUDIES TO UNDERSTAND NEURODEGENERATIVE PARKINSON'S DISEASE. Parkinson's disease is one of the most common neurodegenerative disorders. Parkinson's can affect all ages but is predominantly diagnosed in older people. The cause for Parkinson's disease is from the loss of dopamine as dopaminergic neurons are killed in the brain, causing symptoms that include shaky limbs, depression, and speech impediment. However, the mechanism for how the dopaminergic cells are progressively dying is unknown. In the study, SH-SY5Y, a dopaminergic cell line, was tested with 1-methyl-4-phenylpyridinium (MPP<sup>+</sup>), a compound thought to be most capable of causing Parkinson's. An amyloid precursor protein (APP), is a known toxin to SH-SY5Y, so this research tested the toxicity of MPP<sup>+</sup>APP within SH-SY5Y cells. The cells were exposed to different concentrations of MPP<sup>+</sup>APP and incubated for specific times and the cell viability was measured by spectrophotometry. According to the data, MPP<sup>+</sup>APP is toxic to SH-SY5Y cells at 400 micro molar concentration and higher. Flufenamic Acid (FFA) was used as an inhibitor and was able to significantly inhibit toxic effects of MPP<sup>+</sup>APP beginning at 350 micro molar concentrations. A test was also performed on Mn9D cells to evaluate the toxicity and inhibition of MPP<sup>+</sup>APP and FFA and the result showed significant inhibition of toxicity at 15 micro molar concentration.

