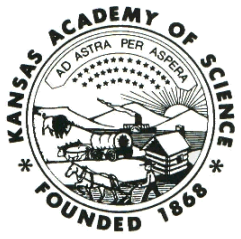
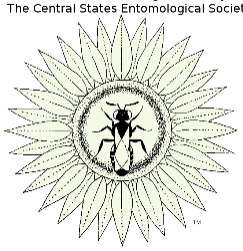


The Kansas Entomological Society
The Central States Entomological Society



150th Annual Meeting of the Kansas Academy of Science

94th Annual Meeting of the Kansas Entomological Society

April 6-7, 2018
Washburn University

WASHBURN UNIVERSITY

WASHBURN UNIVERSITY CAMPUS MAP

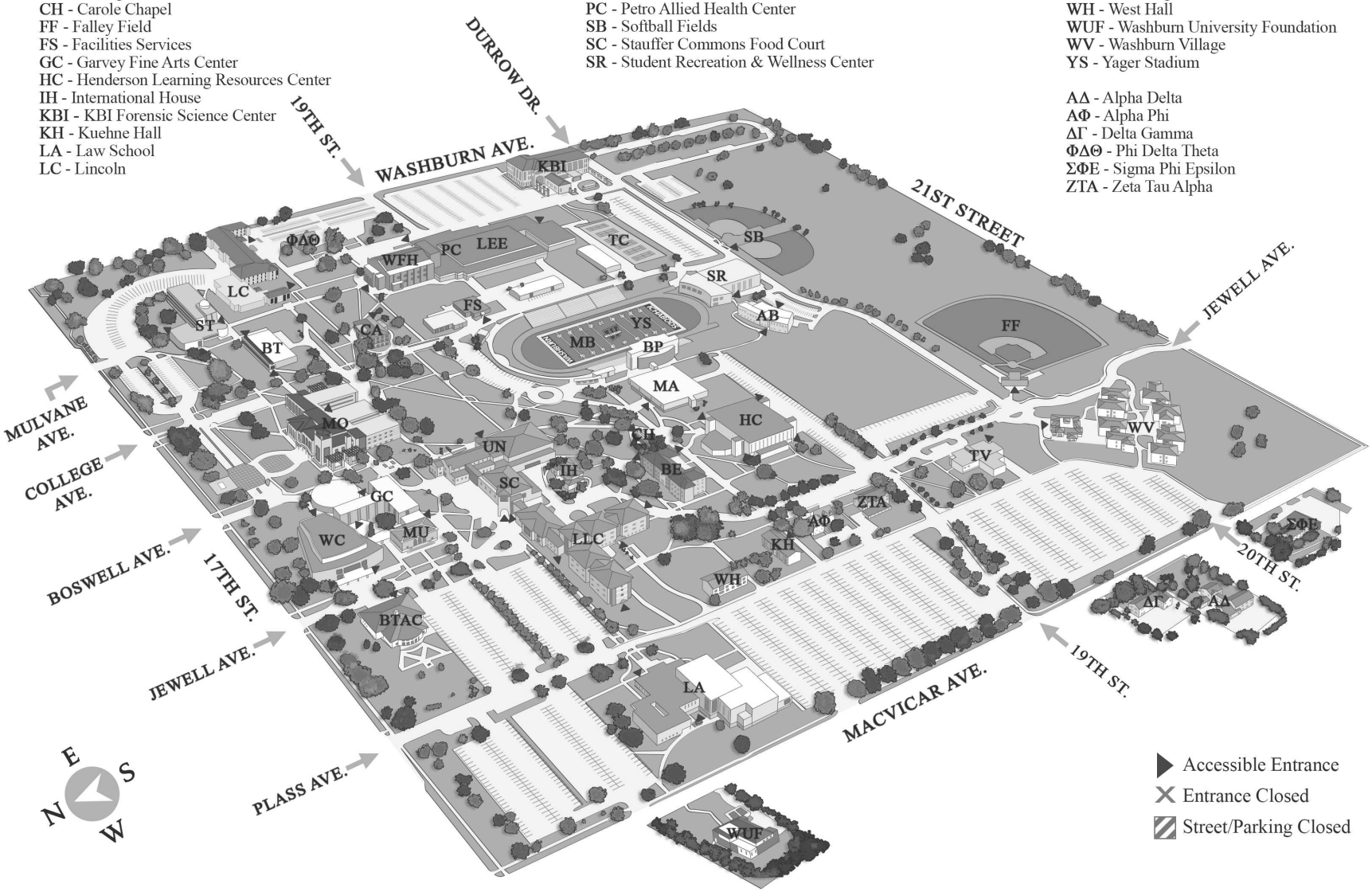
1700 SW College Ave., Topeka, Kansas 66621 • 785.670.1010

AB - Art Building
BE - Benton Hall
BP - Bianchino Pavilion
BT - Bennett Computer Center
BTAC - Bradbury Thompson Alumni Center
CA - Carnegie Hall
CH - Carole Chapel
FF - Falley Field
FS - Facilities Services
GC - Garvey Fine Arts Center
HC - Henderson Learning Resources Center
IH - International House
KBI - KBI Forensic Science Center
KH - Kuehne Hall
LA - Law School
LC - Lincoln

LEE - Lee Arena
LLC - Living Learning Center
MA - Mabee Library
MB - Moore Bowl
MO - Morgan Hall
MU - Mulvane Art Museum
PC - Petro Allied Health Center
SB - Softball Fields
SC - Stauffer Commons Food Court
SR - Student Recreation & Wellness Center

ST - Stoffer Science Hall
TC - Tennis Courts
TV - KTWU Television Studio
UN - Memorial Union
WC - White Concert Hall
WFH - Whiting Field House
WH - West Hall
WUF - Washburn University Foundation
WV - Washburn Village
YS - Yager Stadium

ΑΔ - Alpha Delta
ΑΦ - Alpha Phi
ΔΓ - Delta Gamma
ΦΔΘ - Phi Delta Theta
ΣΦΕ - Sigma Phi Epsilon
ΖΤΑ - Zeta Tau Alpha



Schedule of Events

Friday, April 6, 2018

1:45 pm – 2:30 pm	Field Trip: KBI Building (registration closed)	*Meet outside the main entrance of the KBI Building*
4:30 pm – 5:30 pm	Onsite Registration	*Memorial Union - Washburn B*
5:00 pm – 5:15 pm	Welcome and Introductions	*Memorial Union - Washburn B*
5:15 pm – 5:50 pm	"One Hundred and Fifty Years of Science in Kansas; The Beginning" By Mike Everhart	*Memorial Union - Washburn B*
6:00 pm – 7:00 pm	Banquet	*Memorial Union - Washburn B*
7:00 pm – 8:00 pm	Keynote Lecture by Dr. R. Scott Hawley	*Memorial Union - Washburn B*
8:30 pm – 9:30 pm	Crane Observatory Visit (weather permitting)	*Stoffer Science Hall - Fourth Floor*

Saturday, April 7, 2018

7:00 am – 11:00 am	Registration	*Morgan Hall - outside of Room 202*
7:30 am – 7:50 am	Poster Set Up	*Morgan Hall Lobby*
8:00 am – 9:20 am	Oral Paper Session I	*Morgan Hall - Rooms 150, 153, 154, 155*
8:00 am – 9:20 am	19th Annual Paleontology Symposium – Session I	*Morgan Hall - Room 137*
9:30 am – 10:15 am	Poster Session I (odd-numbered posters)	*Morgan Hall Lobby*
10:15 am – 11:35 am	Oral Paper Session II	*Morgan Hall - Rooms 150, 151, 153, 154, 155*
10:15 am – 11:35 am	19th Annual Paleontology Symposium – Session II	*Morgan Hall - Room 137*
11:45 am – 12:30 pm	Luncheon	*Bradbury Thompson Alumni Center - Ruth Garvey Fink Convocation Hall*
12:45 pm – 1:45 pm	Keynote Lecture by Dr. Rebecca Schmidt-Jeffris	*Bradbury Thompson Alumni Center - Ruth Garvey Fink Convocation Hall*
2:00 pm – 2:45 pm	Poster Session II (even-numbered posters)	*Morgan Hall Lobby*
2:45 pm – 3:30 pm	Afternoon Break	
3:30 pm	Award Presentations	*Morgan Hall Lobby*

Keynote Lectures

How a Really Really Big Structure Facilitates Meiosis

R. Scott Hawley, Ph.D.

Investigator and American Chemical Society Research Professor, Stowers Institute for Medical Research; Dean, Graduate School of the Stowers Institute for Medical Research

Dr. R. Scott Hawley is widely recognized as an expert in *Drosophila* genetics, chromosome biology, and meiosis. He has authored over 150 articles and seven books. Scott was elected to the National Academy of Sciences in 2011, inducted into the American Academy of Arts and Sciences in 2006, and appointed as an American Cancer Society Research Professor in 2005. He has won numerous awards for his teaching, including the Genetics Society of America's award for Excellence in Education in 2008. Scott received a B.S. in Biology from the University of California at Riverside in 1975 and his Ph.D. in Genetics from the University of Washington in 1979 under the supervision of Laurence Sandler. This was followed by a Helen Hay Whitney Postdoctoral Fellowship at the Institute for Cancer Research in Philadelphia. In 1982 he joined the faculty of the Albert Einstein College of Medicine in New York City and then, in 1991, he moved to the University of California at Davis as a Professor of Genetics. In 2001 he was recruited to the faculty of the Stowers Institute for Medical Research in Kansas City. Scott believes that there are three functions of a scholar: to learn, to write, and to teach. He is committed to excellence in all three pursuits.

Exploring and Leveraging the Unintended Consequences of Agriculture on Arthropods

Rebecca Schmidt-Jeffris, Ph.D.

Assistant Professor of Entomology, Clemson University

Dr. Rebecca Schmidt-Jeffris is an assistant professor of entomology at Clemson University, where she serves as the vegetable and strawberry entomology extension specialist for South Carolina. She received her B.S. in Biology from Washburn University in 2010 and her Ph.D. in Entomology from Washington State University in 2015. Her dissertation examined the ecology of phytoseiids, important natural enemies of pest spider mites, in apple orchards. Rebecca did her postdoctoral research on the landscape ecology and management of European corn borers at Cornell University. Her current research program focuses on the applied ecology of arthropods in agriculture, including spider mite management, biological control, landscape ecology, and soil health management impacts on arthropods. Rebecca is a member of the Entomological Society of America and the South Carolina Entomological Society. She is currently a member of the ESA Plant-Insect Ecosystems Section Governing Council, the Southeastern Branch Program Committee, and the executive board of the SCES. Rebecca has received several ESA awards, including the Comstock Award and the Student Activity Award.

Oral Paper Session I

8:00 am – 9:20 am, April 7, 2018

Animal Behavior *Morgan Hall, Room 150*

8:00 am – 8:20 am
CHARACTERIZING GREAT EGRET (*ARDEA ALBA*) BEHAVIOR AND ESTIMATING ENERGY EXPENDITURE USING ACCELEROMETRY DATA
Maccaone, A.D. and Brzorad, J.N.
Biology Department, Friends University

8:20 am – 8:40 am
COMPARISONS OF FORAGING BEHAVIOR AND ENERGETICS BY GREAT EGRETS (*ARDEA ALBA*) AND SNOWY EGRETS (*EGRETTA THULA*) ACROSS THREE MICROHABITATS
Harper, A.C. and Maccarone, A.D.
Biology Department, Friends University

8:40 am – 9:00 am
LEMUR USE OF HANDS VS. MOUTH
Schoeck, C.S. and Edds D.R.
Department of Biological Sciences, Emporia State University

Ecology and Organismal Biology *Morgan Hall, Room 151*

8:00 am – 8:20 am
COMPARISON OF HOME RANGE ESTIMATORS WITH DATA FROM A SMALL RATTLESNAKE
Mead, J.J. and Stark, W.J.
Department of Biological Sciences, Fort Hays State University

8:20 am – 8:40 am
HABITAT ASSESSMENT OF A SOUTHEASTERN KANSAS SQUAMATE ASSEMBLAGE WITH EMPHASIS ON A THREATENED LIZARD
Hullinger, A.[1], Cordes, Z.[2], Riedle, D.[2] and Stark, W.[1]
[1]Department of Biological Sciences, Fort Hays State University; [2]Ecological Services Section, Kansas Department of Wildlife, Parks, and Tourism

8:40 am – 9:00 am
RELATING ESTIMATED BIRTH YEAR OF COMMON CARP (*CYPRINUS CARPIO*) TO HEAVY RAINFALL EVENTS AT SHERIDAN STATE FISHING LAKE IN NORTHWESTERN KANSAS
Engelbert, J.G.[1], Stark, W.J.[1] and Spalsbury, D.[2]
[1]Department of Biological Sciences, Fort Hays State University; [2]Department of Wildlife, Parks, and Tourism

9:00 am – 9:20 am
SHIFTING UNIONID MUSSEL ASSEMBLAGES OF THE WALNUT RIVER BASIN
Nickel, T.[1], Welch, W.[1], Cope, C.[2], Schneegurt, M.[3]
[1]Derby High School, Derby, KS; [2]Kansas Department of Wildlife and Parks, Great Plains Nature Center, Wichita, KS; [3]Department of Biological Sciences, Wichita State University

Entomology *Morgan Hall, Room 154*

8:00 am – 8:20 am

DOES CONSERVATON RESERVE PROGRAM LAND SUPPORT DIVERSE AND ABUNDANT NATIVE BEE COMMUNITIES?

Morphew, A.R.[1], Jameson, M.E.[1], Houseman, G.[1], Jensen, W.[2] and Reichenborn, M.[1]

[1]Department of Biological Sciences, Wichita State University, [2]Deparment of Biological Sciences, Emporia State University

8:20 am – 8:40 am

BODY SIZE RESPONSES OF *HERIADES SPP*. (HYMENOPTERA: MEGACHILIDAE) TO LOCAL AND LANDSCAPE LEVEL RESOURCES IN TALLGRASS PRAIRIE SYSTEMS

Mayes, D.M., Anderson, S., Denning, K.R. and Smith, D.R.

Department of Ecology & Evolutionary Biology, University of Kansas

8:40 am – 9:00 am

HERBIVORY PREFERENCES AMONG ECOTYPES OF BIG BLUESTEM (*ANDROPOGON GERARDII*)

Pittenger, M.S.[1], Maricle, K.L.[1], Baer, S.G.[2], Johnson, L.C.[3] and Maricle, B.R.[1]

[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

Geology and Hydrology *Morgan Hall, Room 153*

8:00 am – 8:20 am

COMPARISON OF GROUNDWATER RESOURCE CHANGES IN THE OGALLALA AND QUATERNARY REGIONS OF THE HIGH PLAINS AQUIFER IN KANSAS

Whittemore, D.O., Butler, J.J., Jr. and Wilson, B.B.

Kansas Geological Survey, University of Kansas

8:20 am – 8:40 am

PARTICLE SIZE ANALYSES OF A LONG CONTINUOUS CORE RETRIEVED FROM CENOZOIC HIGH PLAINS AQUIFER IN THOMAS COUNTY, KANSAS

Christensen, A.D.[1], Smith J.J.[1], Sanderson, B.[1], Stotler, R.[2], Mandel, R.[1]

[1]Kansas Geological Survey; [2]Department of Geology, University of Kansas

8:40 am – 9:00 am

WATER QUALITY OF THE ARKANSAS RIVER AFTER RUNNING THROUGH URBANIZED AREAS

Hubbell, E.M.

Department of Biology, Sterling College

Molecular Biology and Genetics *Morgan Hall, Room 155*

8:00 am – 8:20 am

AN INVESTIGATION TO RECOVER AND INDIVIDUALIZE VERTEBRATE DNA FROM THE GI-TRACT OF FLESH EATING BEETLES (*Dermestes maculatus*): A PILOT STUDY.

Masarirambi, P.T. and Crupper, S.S.,

Department of Biological Sciences, Emporia State University

8:20 am – 8:40 am

HOST-DELIVERED RNA INTERFERENCE MAY CONFER PLANT RESISTANCE AGAINST CHARCOAL ROT DISEASE

Forster, H. and Shuai, B.

Department of Biology, Wichita State University

8:40 am – 9:00 am ANALYZING PROTEIN INTERACTIONS OF THE HERPES SIMPLEX TYPE 1 UL34 PROTEIN
Higdon, N.B.A. and Bjerke, S.L.
Department of Biology, Washburn University

9:00 am – 9:20 am REPLICATION CHARACTERISTICS OF A LYTIC BACTERIOPHAGE INFECTING *BACILLUS SUBTILIS*
Herken, A.M. and Herbig A.F.
Department of Biology, Washburn University

Oral Paper Session II

10:15 am – 11:35 am, April 7, 2018

Ecology and Organismal Biology

Morgan Hall, Room 151

10:15 am – 10:35 am COMPARISON OF VEGETATION MEASUREMENT TECHNIQUES FOR ESTABLISHMENT OF LONG TERM MONITORING PROTOCOL FOR GRASSLAND BIRD COMMUNITIES AT QUIVIRA NATIONAL WILDLIFE REFUGE
Schumacher, K.W., Tanner, L.E., Channell, R., Greer, M.J. and Stark, W.J.
Department of Biological Sciences, Fort Hays State University

10:35 am – 10:55 am EFFECTS OF PRECIPITATION, GRAZING, AND INITIAL PLANTING PRACTICE ON CRP PLANT DIVERSITY ACROSS KANSAS
Watson, D.F., Houseman, G.R., Jameson, M.L., and Reichenborn, M.M.
Department of Biological Sciences, Wichita State University

10:55 am – 11:15 am CHARACTERIZATION OF TREE SPECIES COMPOSITION IN RELATION TO SLOPE ASPECT IN CROSS TIMBERS WOODLANDS
Tullis, V.R., De Los Santos, B., Russell, F.L.
Department of Biological Sciences, Wichita State University

11:15 am – 11:35 am NEW RECORDS OF TARDIGRADES FROM PENANG, MALAYSIA, A PRELIMINARY REPORT
Miller, W.R.[1], Nor, S.A.M.[2] and Lowman, M.D.[3]
[1]Department of Biology, Baker University; [2]Department of Biology, Universiti Sains Malaysia; [3]Institute for Biodiversity Science and Sustainability, California Academy of Sciences

Entomology

Morgan Hall, Room 154

10:15 am – 10:35 am REDUCTION IN MOVEMENT AND DISPERSAL CAPACITY OF IMMATURE STAGES OF *TROGODERMA VARIABILE* (COLEOPTERA: DERMESTIDAE) AND *TRIBOLIUM CASTANEUM* (COLEOPTERA: TENEBRIONIDAE) AFTER EXPOSURE TO LONG-LASTING INSECTICIDE NETTING
Wilkins, R.V. and Morrison, W.R., III
Kansas State University and USDA-ARS Center for Grain and Animal Health Research

10:35 am – 10:55 am HEADS OR TAILS: AN ANALYSIS OF DUNG BEETLE (COLEOPTERA: SCARABAEIDAE: SCARABAEINAE & APHODIINAE) ATTRACTION TO SMALL MAMMAL CARRION
Stone, R.L., Engasser, E.L., and Jameson, M.L.
Department of Biological Sciences, Wichita State University

10:55 am – 11:15 am MOSQUITOES IN WESTERN KANSAS
Growe, A.L. and Packauskas, R.J.
Department of Biological Sciences, Fort Hays State University

11:15 am – 11:35 am ANTS FROM WESTERN KANSAS
Durr, A.N. and Packauskas, R.J.
Department of Biological Sciences, Fort Hays State University

Geology and Remote Sensing *Morgan Hall, Room 153*

10:15 am – 10:35 am OVERVIEW AND DIRECTION OF THE GEOLOGIC MAPPING PROJECTS AT THE KANSAS GEOLOGICAL SURVEY
Smith, J.J., Ludvigson, G.A., Layzell, A. and Dunham, J.W.
Kansas Geological Survey, Lawrence, Kansas

10:35 am – 10:55 am STRUCTURAL MAPPING IN THE HUMBOLDT FAULT ZONE USING REMOTE SENSING, CHASE COUNTY, KANSAS
Peterson, A., Smith, J.J., Layzell, A. and Bidgoli, T.
Kansas Geological Survey, Lawrence, Kansas

10:55 am – 11:15 am AERIAL INVESTIGATION OF THE 19TH C. FRUITLAND SCHOOLHOUSE RUINS USING UNMANNED AERIAL SYSTEMS (UAS), ROSS NATURAL HISTORY RESERVATION, LYON COUNTY, KANSAS
Allison, A.J. and Pettit, C.M.
Department of Physical Sciences, Emporia State University

Physics and Chemistry *Morgan Hall, Room 155*

10:15 am – 10:35 am ISOLATION OF THE AZAMACROCYCLES FORMED FROM THE DETOSYLATION OF CYCLIC TOSYLAMIDES
Heffren, P.M. and Schmidt, S.E.
Department of Chemistry, Washburn University

10:35 am – 10:55 am PARTICLES TIMING DETECTORS
Isidori, T.I., Royon, C.R. and Minafra, N.M.
Department of Physics and Astronomy, University of Kansas

10:55 am – 11:15 am PROTON STRUCTURE AND GLUON BEHAVIOR AT HIGH ENERGIES
Lindsey, C.
Department of Physics and Astronomy, University of Kansas

11:15 am – 11:35 am HIGH ENERGY PHOTON-PHOTON COLLISIONS AT THE LARGE HADRON COLLIDER
Baldenegro, C. and Royon, C.R.
Department of Physics and Astronomy, University of Kansas

Science Education *Morgan Hall, Room 150*

10:15 am – 10:35 am TARDIGRADES OF THE CANOPY: FROM OUTREACH TO CLASSROOM TO SCIENCE
Miller, W.R.[1], Cotten, H.[2], Kimball, S.A.[1], and Lowman, M.D.[3]
[1]Department of Biology and Chemistry, Baker University; [2]Fifth Grade, Hill Elementary School; [3]Californian Academy of Science

10:35 am – 10:55 am DESIGNING A MEASURE OF EVOLUTIONARY EDUCATION EFFECTIVENESS IN MUSEUM EXHIBITS AT THE STERNBERG MUSEUM OF NATURAL HISTORY

Williams, T.M.
Department of Geosciences, Fort Hays State University

10:55 am – 11:15 am UNETHICAL PUBLISHER PRACTICES

Schrock, J.R.
Department of Biological Sciences, Emporia State University

19th Annual Paleontology Symposium

Session I

8:00 am – 9:20 am, April 7, 2018 - Morgan Hall, Room 137

8:00 am – 8:20 am

FIRST DESCRIPTION OF AXIAL HISTOLOGY FOR THE GENUS DOLICHORHYNCHOPS (SAUROPTERYGIA; PLESIOSAURIA)
Holman, P.L.[1] and Wilson, L.E.[2]
[1]Department of Geosciences, Fort Hays State University; [2]Sternberg Museum of Natural History

8:20 am – 8:40 am

NEW SPECIMENS OF THE HESPERORNITHIFORM BIRD FUMICOLLIS FROM THE UPPER CRETACEOUS OF WESTERN KANSAS
Garofalo, I.[1] and Bell, A.K.[2]
[1]Department of Geosciences, Fort Hays State University; [2]The Dinosaur Institute, Natural History Museum of Los Angeles County

8:40 am – 9:00 am

OSTEOHISTOLOGY AND SKELETOCHRONOLOGY IN AN ONTOGENETIC SERIES OF CLIDASTES (SQUAMATA: MOSASAURIDAE)
Green, C.C. and Wilson, L.E.
Department of Geosciences, Fort Hays State University

9:00 am – 9:20 am

STATISTICAL ANALYSIS, FUNCTIONAL MORPHOLOGY, AND PRESERVED GUT CONTENTS PROVIDE INSIGHT INTO THE TROPHIC ECOLOGY OF ACTINOPTERYGIAN CLADES FROM THE WESTERN INTERIOR SEAWAY
Michels, A.N,
Department of Geosciences, Fort Hays State University

Session II

10:15 am – 11:35 am, April 7, 2018 - Morgan Hall, Room 137

10:15 am – 10:35 am

DETERMINING SUTURE COMPLEXITY IN AMMONITES: DOES EQUIPMENT MATTER?
Steffen, D.D.
Sternberg Museum of Natural History

10:35 am – 10:55 am

PRELIMINARY EXAMINATION OF ENAMELOID BUNDLING PATTERNS IN THE EXTINCT REQUIEM SHARK *PHYSOGALEUS CONTORTUS* FROM THE PUNGO RIVER FORMATION OF NORTH CAROLINA (PALEOCENE: MIOCENE)
Hoffman, B.L. and Hageman, S.A.
Department of Natural and Physical Sciences, Park University

10:55 am – 11:15 am

WILL THE REAL PTYCHODUS ANONYMUS PLEASE "SWIM" UP?
Hamm, S.

11:15 am – 11:35 am

DISCOVERY OF MIOCENE BEAR JAW IN SEDGWICK COUNTY RAISES QUESTION OF THE GEOLOGIC AGE OF THE SEDIMENTS
Everhart, M.J.[1] and Hawkins, R.A.[2]
[1]Sternberg Museum of Natural History, Fort Hays State University; [2]Algonquin Consultants, Inc., Miami, Oklahoma

Poster Session I	Poster Session II
(Odd-Numbered Posters)	**(Even-Numbered Posters)**
9:30 am – 10:15 am, April 7, 2018	***2:00 pm – 2:45 pm, April 7, 2018***
Morgan Hall Lobby	***Morgan Hall Lobby***

Poster No.

PILOT STUDY: BUILDING A NON-RECIRCULATING MICROCOSM SYSTEM AND TESTING HOW TEMPERATURE INFLUENCES GROWTH OF SOUTHERN REDBELLY DACE (*CHROSOMUS ERYTHROGASTER*) — 1
Alamri, A.[1], Alqahtani, S.[1] and Martin, E.C.[1,2]
[1]Department of Biological Sciences, Emporia State University; [2]Department of Physical Science, Emporia State University

GRIP IT AND FLIP IT: USING ARTIFICIAL COVER TO MONITOR CHANGES IN HERPETOFAUNAL COMMUNITY COMPOSITION IN RESPONSE TO SMALL-SCALE PRAIRIE RESTORATION — 2
Alexander, J.N., Schmidt, C.J., Noland, M.A. and Greer, M.J.
Department of Biological Sciences, Fort Hays State University

DISTRIBUTION AND HABITAT OF MUDPUPPIES IN KANSAS — 3
Autz, J.[1], Mahr, M.[1], Buchanan, J.[1], Porth, C.[1], Gersten, D.[1], Powell, A.[1], Sievert, L.[1], Edds, D.[1], and Riedle, D.[2]
[1]Department of Biological Sciences, Emporia State University; [2]Kansas Department of Wildlife, Parks and Tourism

SMALL SCALE RESTORATION OF THE STERNBERG NATURAL AREA: A POTENTIAL INCREASE OF FORBS AND ASSOCIATED ECOSYSTEM SERVICES IN THE PLANT COMMUNITY — 4
Black, L.F., Schumacher, K.W., Roemer, J.P, Noland, M.A., Schmidt, C.J. and Greer, M.J.
Department of Biological Sciences, Fort Hays State University

DIET ANALYSIS OF THE MUDPUPPY (*NECTURUS MACULOSUS*) — 5
Buchanan, J., Powell, A. and Sievert, L.
Department of Biological Sciences, Emporia State University

CONSERVATION GENETICS OF *WAREA AMPLEXIFOLIA*, AN ENDANGERED PLANT — 6
Emoto, J.L.[1], Peterson, C.[2] and Pruett, C.L.[1]
[1]Science Department, Tabor College; [2]Bok Tower Gardens

PARASITE EXPLOITATION OF *C. INAEQUALIS* MATING PHEROMONES — 7
Flickinger, H.D.
Department of Ecology, Evolution, and Organismal Biology, University of Kansas

GENETIC DIFFERENTIATION OF VARIOUS AGGREGATIONS OF *COLLETES INAEQUALIS* ON THE CAMPUS OF THE UNIVERSITY OF KANSAS — 8
Harford, M., Pham, T. and Anderson, S.
Department of Ecology, Evolution, and Organismal Biology, University of Kansas

PLANT-SOIL MICROBIOME FEEDBACK IMPACTS ON NATIVE AND NON-NATIVE GRASSES THROUGHOUT KANSAS — 9
Harrison, S.M. and Greer, M.J.
Department of Biological Sciences, Fort Hays State University

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Kramer, D.L. and Stark, W.J.
Department of Biological Sciences, Fort Hays State University

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Lambert, S.[1], Hodges, C.[2], and Bailey, M.M.[1]
[1]Emporia State University, MSFS Program; [2]Kansas Bureau of Investigation, Topeka, KS

TARDIGRADES OF THE CANOPY: A NEW GENUS FOR ACANTHECHINISCUS GOEDENI (HETEROTARDIGRADA: ECHINISCOIDEA: ECHINISCIDAE) FROM OREGON, U.S.A. — 12
Moore, A.[1], West, M.[2], Tibbs, L.[3], Cortes, B.V.[4], Miller, W.R.[1], Johansson, C.[5] and Lowman, M.D.[6]
[1]Department of Biology and Chemistry, Baker University; [2]Department of Biology, Missouri Western State University; [3]Interdepartmental Genetics and Genomics Program, Iowa State University; [4]Interdepartmental Microbiology Program, Iowa State University; [5]Department of Biology, Fresno City College; [6]Californian Academy of Science

A PRELIMINARY STUDY OF THE FLORAL ECOLOGY OF TALL THISTLE, *CIRSIUM ALTISSIMUM* (L.) SPRUNG., IN SOUTHEAST KANSAS — 13
Nonnenmacher, H.
Biology Department, Pittsburg State University

THE PURPLE PLAGUE: EFFECTS OF GRAZING POST FIRE ON PURPLE THREEAWN COVER AND REPRODUCTIVE EFFORT — 14
Roemer, J.[1], Bain, M.R.[2] and Greer, M.J.[1]
[1]Department of Biological Sciences, Fort Hays State University; [2]The Nature Conservancy

SMALL SCALE RESTORATION OF THE STERNBERG NATURAL AREA CONTINUED: INFLUENCES ON COMMUNITY STRUCTURE OF SMALL MAMMALS — 15
Salazar, V., Noland, M.A., Schmidt, C.J. and Greer, M.J.
Department of Biological Sciences, Fort Hays State University

UNDERGRADUATE RESEARCH AT THE STERNBERG MUSEUM NATURAL AREA — 16
Stramel, D.A., Alexander, J., Black, L. F., Salazar, V., Stroyan, E., Greer, M.J.
Fort Hays State University

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Stroyan, E.C. and Greer, M.J.
Department of Biological Sciences, Fort Hays State University

EVIDENCE OF PRECIPITATION AND TEMPERATURE PATTERNS IN TREE RINGS OF URBAN AND RURAL TREES IN NORTHEAST KANSAS — 18
Young, H.R. and Kimball, S.A.
Department of Biology and Chemistry, Baker University

COMPARING EFFECTIVENESS OF LECTURE STYLE TO ACTIVE LEARNING STYLES IN COLLEGE SETTINGS — 19
Keehn, A.K. and Emry D.J.
Department of Biology, Washburn University

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FACILITATING THE DEVELOPMENT OF AN ADULT EDUCATION PROGRAM FOR USE IN THE STERNBERG MUSEUM OF NATURAL HISTORY — 20
Rivers, K.
Department of Geosciences, Fort Hays State University

USING A NATIVE BEE, *COLLETES INAEQUALIS* (COLLETIDAE) IN RESEARCH-INTENSIVE CLASSES — 21
Smith, D.R.
Department of Ecology and Evolutionary Biology, University of Kansas

THE POTENTIAL FOR AN OUTBREAK OF A NATIVE HERBIVORE SPECIALIST INSECT FOLLOWING HONEYSUCKLE REMOVAL TO LEAD TO INDIRECT EFFECTS ON THE INSECT HERBIVORE COMMUNITY — 22
Appenfeller, L.R. and Mercader, R.J.
Department of Biology, Washburn University

INFLUENCE OF HOST SPECIFICITY ON THE DISPERSAL PROPENSITY OF *CALLOSOBRUCHUS MACULATUS* — 23
Bergeron, P.E. and Mercader, R.J.
Department of Biology, Washburn University

DIFFERENCES IN FORAGING BEHAVIOR OF EUROPEAN AND ASIAN HONEY BEES IN RELATION WITH TEMPERATURES AND LIGHT INTENSITY — 24
Bhatta, C.P., Mayes, D.M. and Smith, D.R.
Department of Ecology and Evolutionary Biology, University of Kansas

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Abel, J.R. and Sleezer, R.O., Department of Physical Sciences, Emporia State University. ESTIMATING TEMPORAL CHANGES IN WATER VOLUME STORED IN REPRESENTATIVE FARM PONDS IN JEFFERSON COUNTY, KANSAS. Farm ponds are anthropogenic water bodies that have significantly changed the hydrologic landscape. Their primary purposes are for stock-water supplies, recreational opportunities, irrigation water sources, and aquatic habitat for wildlife. There have been attempts to quantify the number of ponds in parts or all of Kansas, but there have been few efforts to quantify the volume of water stored within them at given points in time and how that water volume fluctuates through time. My research utilized sonar and GIS to map the initial bathymetry of 10 ponds in Jefferson County, Kansas. Gauges were installed to monitor fluctuations in pond water levels from March 2017 through March 2018. Drone photography was used to monitor fluctuations in water area. Pond gauge and drone photography were used in concert with initial bathymetric data to estimate the volume of water in the study ponds at multiple water level conditions at different times. Pond volume calculations were also used to test the efficacy of using LiDAR (Light Detection and Ranging) data to estimate the volume of water within farm ponds for which no bathymetric data was available. Year-long monitoring of pond volume demonstrates that there is significant variability in stored water volume in farm ponds during the course of a typical year. Comparisons between bathymetry based volume estimates and LiDAR derived estimates of pond volume indicate that a remote method could accurately estimate the volume of water stored in ponds for a given drainage basin at the time that LiDAR data was captured.

Aber, J.S.[1], Aber, S.W.[1] and Nagasako, T.[2], [1]Earth Science, Emporia State University, Kansas; [2]Faculty of Education, Kagoshima University, Japan. COLOR-INFRARED KITE AERIAL PHOTOGRAPHY: TAKE THREE. Color-infrared (CIR) photography was developed during World War II for camouflage detection. Since then, CIR aerial and space photography has been utilized often for many scientific and environmental applications. Such images include green, red, and near-infrared (G/R/NIR) bands portrayed in false color as blue, green and red respectively; active vegetation appears as red, pink and maroon. We began developing methods for low-height CIR photography from kite platforms in 1999 based on analog (film) single-lens-reflex (SLR) cameras. By the beginning of this century, we had determined filters and camera settings for routine CIR kite aerial photography (KAP). However, CIR film became increasingly expensive, and many photo labs stopped developing this type of film. Our last use of CIR film took place in 2004. Starting in 2008, we experimented with the *Tetracam ADC* digital CIR camera. However, this camera proved impractical for several reasons and was utilized only a few times with generally disappointing results. Our third attempt for CIR kite aerial photography began last year based on a compact, digital, mirrorless SLR camera (*Sony* □6000) that was customized for B/G/NIR imagery. After several field trials for adjusting the camera settings and radio-controlled KAP rig, this camera produced excellent CIR imagery with sharp, clear pictures and high spatial resolution (~2 cm). In this false-color format, active vegetation appears in shades of orange. The hot spot, sun glint, and other special lighting effects are emphasized. A normalized-difference vegetation index (NDVI) may be extracted just as with conventional G/R/NIR color-infrared imagery.

Alamri, A.[1], Alqahtani, S.[1] and Martin, E.C.[1,2], [1]Department of Biological Sciences, Emporia State University; [2]Department of Physical Science, Emporia State University. PILOT STUDY: BUILDING A NON-RECIRCULATING MICROCOSM SYSTEM AND TESTING HOW TEMPERATURE INFLUENCES GROWTH OF SOUTHERN REDBELLY DACE (*CHROSOMUS ERYTHROGASTER*). Materials were ordered in Spring 2017. Building of the microcosm set up began in June 2017 and concluded in August 2017. We used 12 custom drilled 10 gallon glass aquaria and two 40 gallon aquaria. Aquaria were placed on steel shelving units. A Pondmaster 3000gph pump was placed into one 40 gallon aquarium and circulated water to all 12 aquaria. Drains were installed in each aquarium and drainage from aquaria was discarded. The microcosms are physically and chemically independent units. We connected a Coralife 1/4hp aquarium chiller to set the lowest temperature for the system, and added heaters to all aquaria for 6 different temperature treatments. Temperature was monitored for several days before fish were added. We collected 60 Southern Redbelly Dace (*Chrosomus erythrogaster*) from Tuttle Creek near Manhattan, KS. We assigned five fish to each aquarium. Fish were acclimated over several hours to the treatment temperature of the aquarium. Total length, weight, and water chemistry were measured the first day of the experiment, and at one and two weeks.

Alexander, J.N., Schmidt, C.J., Noland, M.A. and Greer, M.J., Department of Biological Sciences, Fort Hays State University. GRIP IT AND FLIP IT: USING ARTIFICIAL COVER TO MONITOR CHANGES IN HERPETOFAUNAL COMMUNITY COMPOSITION IN RESPONSE TO SMALL-SCALE PRAIRIE RESTORATION. In 2010 a 22-acre plot of mixed grass prairie was established as the Dr. Howard Reynolds Natural Area at the Sternberg Museum of Natural History by a grant from the Environmental Protection Agency. In the spring of 2017 a portion of this property was burned in efforts to restore the native prairie vegetation. Other on-going small-scale prairie restoration efforts include the removal of eastern red cedar and prickly pear cactus, establishment of pollinator plots, and various baseline biological diversity surveys. On June 10th, twenty-one 2.4x1.2-meter plywood boards were placed throughout the property to begin monitoring of the area's herptofaunal richness and diversity. These boards were checked twice a week until 30 October. Over the course of the sampling season we recorded a total of 199 individuals across six species. In future seasons, we will use additional sampling methods to detect additional species; Passive Integrated Transponder (PIT) tags will be used for individual recognition; and temperature data will be collected to determine the relationships between ambient temperature, board temperature, and cover use. The ultimate goal is to monitor changes in species richness and diversity in relation to changes in landscape composition.

Allison, A.J. and Pettit, C.M., Department of Physical Sciences, Emporia State University. AERIAL INVESTIGATION OF THE 19TH C. FRUITLAND SCHOOLHOUSE RUINS USING UNMANNED AERIAL SYSTEMS (UAS), ROSS NATURAL HISTORY RESERVATION, LYON COUNTY, KANSAS. An aerial investigation of the 19th C. Fruitland Schoolhouse ruins was conducted using UAS technology (Phantom 3 Professional quadcopter) to determine the extent of the ruins and to acquire high-resolution imagery of the site in its entirety, a perspective not obtainable from ground-level. The Fruitland Schoolhouse is a limestone structure that was built in the mid-1860s by Quakers Thomas and Mary Stanley on what is today known as the Ross Natural History Reservation (RNHR) near Americus, Kansas. This schoolhouse served as both an educational and religious center throughout the mid-to-late-19th century, but was eventually abandoned and overgrown with dense vegetation. These archaeological ruins were recently rediscovered in 2012 after a wildfire exposed the schoolhouse's foundation stones, the only portion of the schoolhouse that is still visible today. The natural vegetative state at RNHR typically causes the schoolhouse's foundation to be hidden by overgrowth, however a controlled burn at the Ross Reservation in the spring of 2017 allowed for an aerial investigation of the site and surrounding property via UAS. Aerial imagery revealed for the first time that, in addition to the 9 m x 9 m schoolhouse, the foundation of a limestone wall approximately 100 m x 50 m surrounds the Fruitland Schoolhouse property, and a hand-dug well also remains in the southeastern corner of the site. As work at this archaeological site continues, future investigations will include a UAS-mounted LiDAR survey and a ground-based geoarchaeological excavation, as it is very likely that period artifacts are scattered amongst the ruins.

Appenfeller, L.R. and Mercader, R.J., Department of Biology, Washburn University. THE POTENTIAL FOR AN OUTBREAK OF A NATIVE HERBIVORE SPECIALIST INSECT FOLLOWING HONEYSUCKLE REMOVAL TO LEAD TO INDIRECT EFFECTS ON THE INSECT HERBIVORE COMMUNITY. Invasive plant species abatement is often restricted simply to the removal of the invasive which can lead to rapid and uneven regrowth of native plant species. This condition may result in a significant expansion of one plant species creating a large resource concentration that may instigate conditions that promote the occurrence of local herbivore outbreaks. At a site in Shawnee Co., KS during the summer of 2012, an outbreak of the locally monophagous herbivore of the common paw-paw, *Asimina triloba*, the asimina webworm moth, *Omphalocera munroei*, was observed. This outbreak initiated in locations of increased understory growth of *A. triloba* following the removal of Amur Honeysuckle, *Lonicera maackii*. *A. triloba* defoliation levels peaked in 2013 wherein virtually all stems experienced nearly complete defoliation. The outbreak also led to an apparent increase in predator numbers and parasitism rates as suggested by a departure from expected defoliation patterns, and higher parasitism rates observed in larvae collected in 2016 and 2017 than those from 2014. This suggests a strong potential for increased predation and parasitism of other native species in the insect herbivore community. *O. munroei* has a single generation emerging late in the summer likely leading predators emerging earlier throughout the following year to feed on other species, and the primary parasitoid observed, *Itoplectis conquisitor,* is a generalist with multiple generations.

Assenmacher, D.M. and Crupper, S.S., Department of Biological Sciences, Master of Science in Forensic Science Program, Emporia State University. COMPARISON OF COMMERCIAL KITS FOR RECOVERY AND ANALYSIS OF THE BACTERIAL DNA FROM FINGERPRINTS. In forensic science, fingerprints are a common source of information. However, latent examination is not always successful and trace human DNA cannot always be obtained. Promising research indicates that the microbiome from an individual may provide an alternative tool for forensics. The population of microorganisms associated with humans, commonly referred to as the human microbiome, constitutes over 10,000 species and 30,000 nonhuman cells on and within the average person. These organisms can be highly variable and unique between individuals, at both the population and genetic level. Thus, examining the fingerprint microbiome may offer a suitable alternative to more traditional methods of identification. This research sought to determine if trace bacterial DNA from one fingerprint could be quantified providing sufficient quantities for microbiome analysis. Four commercial bacterial DNA isolation kits were compared from Zymo Research, Promega, MP Biomedicals and Qiagen. Prints were deposited onto slides, allowed to sit for variable periods up to 1 month, and total DNA isolated using each kit. The bacterial DNA from each sample was then quantified using qPCR. Kits from Zymo Research and Qiagen produced the highest average bacterial DNA yield. A microbiome analysis was successfully obtained with the quantities recovered. Thus, trace amounts of bacterial DNA from a fingerprint was found to be quantifiable and sufficient for microbiome analysis.

Autz, J.[1], Mahr, M.[1], Buchanan, J.[1], Porth, C.[1], Gersten, D.[1], Powell, A.[1], Sievert, L.[1], Edds, D.[1], and Riedle, D.[2], [1]Department of Biological Sciences, Emporia State University; [2]Kansas Department of Wildlife, Parks and Tourism. DISTRIBUTION AND HABITAT OF MUDPUPPIES IN KANSAS. We are conducting a three-year study of the distribution, abundance, habitat use, and conservation status of the Common Mudpuppy (*Necturus m. maculosus*) and Red River Mudpuppy (*N. m. louisianensis*) in Kansas. To capture mudpuppies, we have set minnow traps with widened mouths in the Neosho, Marais des Cygnes, Cottonwood, and Verdigris rivers and their tributaries, as well as in Pomona and Melvern lakes. Target sites include all locations of known historical occurrence, low-water dams, and places where the Kansas Department of Wildlife, Parks and Tourism recently conducted environmental DNA (eDNA) surveys for these obligately aquatic salamanders. We measure habitat and water quality parameters at each site. Since July 2017, we have captured 45 individuals in 160 trap sets at 86 sites. We are conducting mark-recapture surveys at each site to estimate population sizes.

Baldenegro, C. and Royon, C.R, Department of Physics and Astronomy, University of Kansas. HIGH ENERGY PHOTON-PHOTON COLLISIONS AT THE LARGE HADRON COLLIDER. We will discuss the photon physics accessible in hadron-hadron collisions at the Large Hadron Collider (LHC). A general overview of the general hadronic collisions at the LHC and how they can be used to study fundamental interactions will be discussed. Then we will discuss a special class of collisions where each of the colliding hadrons radiate energetic photons which result in photon-photon collisions. The latter class of events gives us access to potentially new fundamental interactions to be discovered at the LHC.

Beikman, M.[1], Flax, S.[1], Starkey, B.[2], Keener, R.[1], Kobayashi, Y.[2] and Stoppel, M.[1], [1]Department of Agriculture, Fort Hays State University; [2]Department of Biological Sciences, Fort Hays State University. PREBIOTIC AND PROBIOTIC INFLUENCE ON BEEF CALVES IMMUNITY. Physiological transition during the weaning period plus tremendous stress in the animals results in compromised immunity and reduced growth. The objective of this study was to evaluate whether prebiotic and probiotic feed additive influences the immune response during the weaning period in beef calves. Forty calves of similar genetics and weights (251.3 ± 5.2 kg) were randomly assigned into four feeding groups, (ten calves per pen). Within each treatment, five calves received creep feed prior to weaning whereas the others did not receive creep feed. Animals were fed an isocaloric ration daily containing a commercially available probiotic, (AMF, 14.2 g/hd/day) alone, a commercially available prebiotic, (LP, 10 g/hd/day) alone, a combination of both AMF plus LP (AL), or control ration devoid of additives (C). Calves were fed for a total of 28 days, blood samples were collected 7 days prior to weaning (d -7), at weaning (d 0), and every 7 days post-weaning for 21 days. Serum IgG concentrations were measured using a commercially available Enzyme-linked immunoassay. Serum IgG concentrations were similar ($P > 0.10$) among all four treatments prior to weaning. Serum IgG concentration post-weaning was lower in calves that received creep feed compared to non-creep fed ($P < 0.01$). Feed additives did not influence serum IgG concentrations regardless of whether calves received creep feed or not ($P > 0.10$). It is likely that addition of prebiotics or probiotics in the diet at weaning may

not provide a health benefit. Whether inclusion of these additives influenced stress responses needs to be investigated.

Bergeron, P.E. and Mercader, R.J., Department of Biology, Washburn University. INFLUENCE OF HOST SPECIFICITY ON THE DISPERSAL PROPENSITY OF *CALLOSOBRUCHUS MACULATUS*. Models predicting the spread of invasive species generally consider the spread of the invasive in terms of local demography and dispersal, and how those two interact. However, the influence of differing foraging behaviors is not well understood even though they can significantly impact dispersal. Predicting the spread of newly founded populations requires the ability to assess the organismal traits influencing dispersal. Because the larvae of many plant feeding insect species are sessile, adult host-plant preference defines the larval habitat and strongly affect dispersal. For this reason, host plant preference is expected to be under high selective pressure and likely to shift as populations encounter new environments. Here we use populations of the cowpea weevil, *Callosobruchus maculatus*, raised for over 40 generations on the preferred host of the ancestral population (mung beans) or a marginal host of the ancestral population (chick peas) to test for differences in host-preference and dispersal. Specifically, we tested the ovipositional behavior and dispersal of each population. Ovipositional behavior was tested using four choice and no choice assays including two marginal hosts (lentils and chick peas) and two high quality hosts (mung beans and black eyed peas) of the original population. Dispersal was tested in interconnected arenas containing one of three different hosts: mung beans (preferred host), black eyed peas (secondary host), and chick peas (marginal host). Results indicate that the chickpea population lay more eggs and are also less selective when choosing which host to lay their eggs on. Results also indicate that the mung bean population is more selective when laying their eggs.

Bergman, W., Yonke, J., and Jones, C.P., Department of Chemistry, Washburn University. CLONING OF THE *GIARDIA LAMBLIA* ACETYL-COA SYNTHETASE GENE IN PREPARATION FOR STRUCTURE-FUNCTION STUDIES. ADP-forming acetyl-CoA synthetase (ACD) is an enzyme that participates in fermentation of acetyl-CoA to acetate. Catalysis conserves energy from the hydrolysis of the thioester bond of acetyl-CoA to generate ATP from ADP via substrate level phosphorylation. ACD activity is most common in archaea and acetate-producing bacteria, however it is also present in a select group of protozoan parasites, such as *Entamoeba histolytica* (dysentery) and *Giardia lamblia* (giardiasis). As amitochondriates, both of these parasites lack oxidative phosphorylation; consequently, they must rely on glycolysis and amino acid degradation as key pathways for ATP generation. Biochemical characterization of ACD suggests it may play a role in extending the glycolytic pathway to provide additional ATP for the cell and regenerate CoA. Alternatively, ACD from *E. histolytica* may also function in acetate utilization during colonization in the intestine, as the enzyme is reversible. Interestingly, ACD from *G. lamblia* is only capable of functioning in the acetate-forming direction. The aim of our research is to understand the structure-function relationship of the ACD enzyme, primarily investigating how the *G. lamblia* enzyme is unidirectional while the *E. histolytica* version is bidirectional. To accomplish this, our first priority is to use traditional cloning to recombinantly produce *Gl*ACD. We have successfully amplified the *Acd* gene from *G. lamblia* genomic DNA. Following restriction enzyme digests, we are currently ligating this product into multiple cloning and expression vectors. Once cloning is complete, we will use site-directed mutagenesis to target specific residues that differ between the two enzymes, recombinantly produce the variants, and use biochemical and kinetic assays in order to elucidate their contribution to substrate binding and catalysis.

Bergstrom, M.[1], Stewart, R.[1], Weber, H.[1], Keener, R.[1], Kobayashi, Y.[2], Satran, C.[1], [1]Department of Agriculture, Fort Hays State University; [2]Department of Biological Sciences, Fort Hays State University. INFLUENCE OF PROBIOTICS ON SWINE PERFORMANCE: AN INITIAL STUDY. Seventy-two weanling pigs were used to compare the rate of gain (ADG) and feed efficiency (FE), for three probiotic feed additive in a commercial swine ration. At four weeks of age, pigs of similar genetics and weights were randomly assigned into individual feeding groups of twenty-four pigs. The pigs were fed in pens of twelve allowing the experiment to be replicated twice. Each pen was fed the same base commercial ration. Animals were fed ad libitum isocaloric rations with either essential oils (EO) at 125mg/kg body weight, mannan-oligosaccharides plus β-glucans (MOS) 551.16mg/kg body weight, or EO 125mg/kg plus MOS 551.16mg/kg body weight (EM). Pigs were fed for 43 days. Mean ADG for barrows were 0.40, 0.47, and 0.45 kg/day for EO, MOS, and EM, respectfully (SEM=0.04 kg/day, $P>0.10$). In contrast, mean ADG for gilts on EM (0.38 kg/day tended to be less than that of MOS) (0.43 kg/day) or EO (0.44 kg/day, SEM=0.02 kg/day, $P<0.10$). Average FE were 0.92, 0.99 and 0.98 kg feed/kg gain (as-fed) for EO, MOS and EM, respectfully ($P>0.10$). Our results suggest that inclusion of probiotics is not beneficial during early post

weaning growth. It was concluded this research should be performed from weaning through market weight to determine if increased effectiveness of the ration additives on rate of gain and efficiency of gain is achieved.

Bhatta, C.P., Mayes, D.M. and Smith, D.R., Department of Ecology and Evolutionary Biology, University of Kansas. DIFFERENCES IN FORAGING BEHAVIOR OF EUROPEAN AND ASIAN HONEY BEES IN RELATION WITH TEMPERATURES AND LIGHT INTENSITY. We observed the foraging differences in *Apis cerana* Fabricius and *Apis mellifera* Linnaeus in relation with environmental variables. The observation experiment was conducted at four apiaries where we kept both species together and in isolation at different places of the Kathmandu valley, Nepal. Ambient temperature, thoracic temperature, brood nest temperature, and light intensity were recorded at the times when foraging commenced. We found *A. cerana* colonies have a longer foraging hours than *A. mellifera* colonies. They start foraging earlier in the morning and kept working later in the evening at lower temperatures and less light visibility than do *A. mellifera*. *A. mellifera* foraging (departures per minute) peaked only once in noon at higher temperature and light visibility while *A. cerana* foraging peaked twice, earlier in the morning and later in the afternoon both at lower temperatures and moderate light visibilities at all apiaries. It is also noted that *A. cerana* colonies maintained their brood nest temperatures significantly lower than did *A. mellifera* in all apiaries. This study suggests that *A.mellifera* foragers stay inside the hive at lower ambient temperatures to maintain the optimum brood nest temperature at which *A. cerana* foragers are still able to forage because of their overall lower brood nest temperature.

Black, L.F., Schumacher, K.W., Roemer, J.P, Noland, M.A., Schmidt, C.J. and Greer, M.J., Department of Biological Sciences, Fort Hays State University. SMALL SCALE RESTORATION OF THE STERNBERG NATURAL AREA: A POTENTIAL INCREASE OF FORBS AND ASSOCIATED ECOSYSTEM SERVICES IN THE PLANT COMMUNITY. With a global decline in natural resources, restoration of degraded lands is needed to reverse this trend. Currently, there are numerous restoration activities being conducted at the Sternberg Natural Area. One activity is the planting of forb plots throughout the property. These plots were planted in areas where they will catch prevailing winds, which aids in seed spread. The goal of these plantings is to increase native forbs and ecological services they supply throughout the area. We used the line-point intercept technique and sampled during early June and end of August to catch peak production of C3 and C4 species. We determined the percentage of grasses and forbs in the initial planting season before seed production by the forb plots. Results indicate that during June sampling the plant composition was 46% grasses, 48% forbs and 6% walking trails. During August sampling the composition was 46% grasses, 49% forbs and 5% walking trails. The large percentage of forbs overall and increase in August were due to annual forb species, not from our plantings, which germinated as a result of a prescribed burn conducted last spring. Forbs are vital to grassland health and it is important to monitor them in any restoration project.

Buchanan, J., Powell, A. and Sievert, L., Department of Biological Sciences, Emporia State University. DIET ANALYSIS OF THE MUDPUPPY (*Necturus maculosus*). The Mudpuppy (*Necturus maculosus*) is a rarely seen and poorly understood obligately aquatic salamander in the eastern United States. Mudpuppies, and amphibians in general, are on the decline, and baseline data is needed for conservation efforts. Little has been published on their natural history in Kansas. To catch mudpuppies, we are setting minnow traps with widened mouths in rivers of eastern Kansas, including the Neosho, Cottonwood, and Marais des Cygnes. We obtain the stomach contents of mudpuppies with a stomach flushing protocol. This process is as effective as stomach dissections without having to sacrifice the animal. Stomach contents are preserved in isopropyl alcohol for identification to the lowest identifiable taxonomic group. We have collected fish (Teleostei), frogs (*Rana* sp., *Acris blanchardi*), crayfish (*Orconectes* spp.), damselfly and dragonfly nymphs (Odonata), Dobsonfly larvae (*Corydalus cornutus)*, and a Zebra Mussel *(Dreissena polymorpha*). Data analysis consists of obtaining total count, frequency of occurrence, and percent dry mass for each taxon. Diet information is important for understanding the mudpuppy's role in the food web and energy flow in these aquatic ecosystems.

Bush, K.J., Athey, S.C., Walls, M.M., Beltz, S.L. and Klales, A.R., Department of Sociology & Anthropology, Washburn University. A COMPARATIVE ANALYSIS OF STATURE ESTIMATION METHODS FOR APPLICATION IN FORENSIC ANTHROPOLOGY. Forensic anthropologists use both anatomical and mathematical methods for stature estimation in unidentified individuals. Anatomical methods utilize all bones contributing to stature, while mathematical methods utilize correlations of long bones to overall stature. Anatomical methods have long been cited as being more accurate; however, this has yet to be thoroughly tested. Therefore, the

aim of this research was to determine if anatomical methods are more accurate and secondly, if newer revised methods (since 1995) are more accurate than the original methods. Skeletal measurements were collected from 72 white males and females with known stature from the Bass Donated Collection. Measurements were added together to estimate stature using the anatomical methods (n=2) or were entered into each method's regression equation (n=4) to estimate stature using mathematical methods. Estimated stature was compared to known stature to calculate accuracy of the methods. Overall, most methods tended to underestimate stature, but were accurate. The anatomical methods were more accurate than the mathematical methods and the revised methods provided more accurate estimates than the older methods, likely due to secular change. For example, Raxter et al.'s (2006) revision of Fully's (1956) anatomical method provided a stature estimate closer to known height in 75% of males and females. Newer mathematical methods (Ousley 1995, Wilson et al. 2010) also produced higher accuracy rates (94-97%) than the originals (Trotter & Gleser 1952, 1958) of 47-72% accuracy. If remains are complete, anatomical methods should be used; however, mathematical methods can be used to accurately estimate stature with incomplete remains.

Cai, X. and Packauskas, R.J., Department of Biological Sciences, Fort Hays State University. AQUATIC HEMIPTERA FROM WESTERN KANSAS. Results of an undergraduate project undertaken to identify aquatic Hemiptera in the Stermberg Museum entomology collection are presented. Some of the more interesting species are pictured and discussed along with useful characters for identification.

Christensen, A.D.[1], Smith J.J.[1], Sanderson, B.[1], Stotler, R.[2], Mandel, R.[1], [1]Kansas Geological Survey; [2]Department of Geology, University of Kansas. PARTICLE SIZE ANALYSES OF A LONG CONTINUOUS CORE RETRIEVED FROM CENOZOIC HIGH PLAINS AQUIFER IN THOMAS COUNTY, KANSAS. In large portions of the High Plains aquifer (HPA), groundwater withdrawals exceed rates of recharge–leading to dramatic water level declines and growing concerns for long-term sustainability. Significant geographic variance in water availability is likely derived from the formative processes and depositional histories of geologic units comprising the HPA. In Thomas County, western Kanas, scientific drilling has produced an intact core to investigate the subsurface litho- and hydrostratigraphy of the HPA in this region. The core was drilled to a depth of ~65 meters, all within the vadose zone, using an Acker hollow-stem auger with a wireline, split-spoon core barrel sampler. Quantitative particle size analysis of the core at 0.5 m intervals was conducted at the KGS Geoarchaeology and Paleoenvironmental Research Laboratory using the standard pipette method based on Stoke's Law of gravitational settling to determine particle sizes less than 2000 μm; 2000–50 μm (total sand), 50–2 μm (total silt), and <2 μm (total clay). Nearly pure sand samples were analyzed with a Ro-Tap sieve shaker as follows: 63–90 μm (very fine sand), 90–250 μm (fine sand), 250–355 μm (medium sand), 355–710 μm (medium-coarse sand), 710-1440 μm (coarse sand), and 1410–2000 μm (very coarse sand). The upper ~14 m of the core is dominated by clay and silt deposits correlative with the Great Plains Quaternary paleosol-loess sequence. The core below 14 m is composed chiefly of fine- to medium-grained sand, with some gravel beds, and numerous clay- and silt-rich intervals comprising the Ogallala Formation.

Cooper, D.L. and O'Neill, H.A., Department of Chemistry, Washburn University. HOW SMALL IS TOO SMALL: PUSHING THE LIMITS OF APERTURE SIZE FOR USEFUL FTIR DATA COLLECTION FOR FORENSIC AUTOMOTIVE PAINT SAMPLES. The collection of trace automotive paint samples in a forensic laboratory is a tedious and time-consuming process. Most forensic laboratories require analysts to isolate individual layers of the automotive paint chip to maximize the aperture area available for analysis by a Fourier Transform Infrared Spectrophotometer (FTIR) Microscope. The FTIR spectra are interpreted to obtain information regarding the binders present in each layer. In this study, a complex 6-layer automotive paint chip was prepared and analyzed using two different slicing methods. The automotive paint chip was first sliced to isolate each layer then analyzed using an FTIR microscope and a variety of aperture sizes ranging from 25 microns x 120 microns to 4 x 120 microns. The resulting spectra from each aperture size were overlaid and compared. The same FTIR analysis was then performed for a cross-section slice of the same paint chip, and the spectra from all aperture sizes were overlaid and compared. Finally, the spectra from the smallest aperture size for each slicing technique were overlaid and compared. Initial results of this study show that while the baseline has some variation, spectra from the small aperture sizes have consistent overlap with spectra from the larger aperture sizes in the areas that lead to the classification of the binder. A comparison of the isolation spectra and the cross-sectional data shows similar results as well.

Drees, R.G.[1], Tucker, A.[2] and Greer, M.J.[1], [1]Department of Biological Sciences, Fort Hays State University; [2]Department of Agriculture, Fort Hays State University. RESTORING MAGNESIUM TO THE WORLDS FOOD SUPPLY THROUGH SOIL NUTRIENT ADDITIONS. Lack of nutrition is a problem that faces numerous people across the world. To add to this problem many are unaware that they are being deprived in their diet of fundamental sources of bodily nourishment. One of the most important macro minerals that much of the world's population is lacking is Magnesium. Research has shown the mass benefits that Magnesium has on several key functions within the body and more importantly, what the absence of sufficient amounts can cause. Past and current research shows that Magnesium is critical in performing hundreds of activities within the body. Humans receive only a percentage of the minimum amount of Magnesium needed on a daily basis from their diets. It may seem unusual that a mineral so important is so scarce in our food sources when in actuality, it is one of the most abundant elements on Earth. This decline is due to the overuse of agricultural soil throughout the last two centuries depleting many of the nutrients within the soil and as a result, in our food. We aim to determine what results traditional and Magnesium fertilizers have on a few common food crops. This experiment will focus on nutrient content of edible grain in plants exposed to magnesium fertilizer, traditional fertilizer (nitrogen, phosphorus, and potassium), and both fertilizers in combination. By increasing the Magnesium content in common crop species, we hope to help counteract the magnesium deficiency in the diet of much of the world's population.

Durr, A.N. and Packauskas, R.J., Department of Biological Science, Fort Hays State University. ANTS FROM WESTERN KANSAS. The Dr. Howard Reynolds Nature Trail area (at the Sternberg Museum, Fort Hays State University) was burned in the spring of 2017 to manage invasive plant species. Under the leadership of Fort Hays's Entomologist, Dr. Packauskas, pitfall trapping was conducted that summer to survey the diversity of insect fauna after the burn. The research presented focuses on the ants (Formicidae) collected. The diversity of ant species caught in the traps will be discussed along with their morphology, ecology, and economic importance.

Edwardson, K.D., Department of Ecology, Evolution, and Organismal Biology, University of Kansas. THE EFFECTS OF PARASITISM ON NUMBER OF NESTS CREATED IN *COLLETES INAEQUALIS*. As species diversity across the globe declines, it becomes increasingly important to protect our native species and monitor their populations. Some individuals are more crucial than other to beneficial interspecific interactions. One classic example is bees as pollinators. *Colletes inaequalis*, an American Midwest native ground nesting bee, is one of the first pollinators present in the spring, and therefore is vital to the reproduction of early flowering plants. These bees nest in aggregations, which may invite parasites and to spread disease among the individuals nesting in the small area. In this study I surveyed frequency of fly, *Leucophora* sp. (Anthomyiidae), or beetle, *Tricrania sanguinipennis* (Meloidae, parasites at nest entrances, and scored nests where a brood parasite was observed as "parasitized". In order to have a simple and easy method of detecting the effect of parasites on an aggregation, I looked for correlation between the number of nests dug by "parasitized" individuals against the mean number of nests dug by the entire aggregation. Comparing these numbers would show if there is a difference between the number of nests normally created by an individual compared to that of a parasitized bee. Knowing the effect of parasitism would help monitor the fitness of the local population, and could inform further restoration or conservation work to protect *Colletes inaequalis*.

Emoto, J.L.[1], Peterson, C.[2] and Pruett, C.L.[1], [1]Science Department, Tabor College; [2]Bok Tower Gardens. CONSERVATION GENETICS OF *WAREA AMPLEXIFOLIA*, AN ENDANGERED PLANT. *Warea amplexifolia* (wide-leaf warea) is a federally and state endangered plant species in Florida. The wide-leaf warea is endangered primarily due to habitat loss and small population size. In order to fulfill the goals of the endangered species recovery plan, information is needed on the level of connectedness of populations and whether or not the species as a whole has lost genetic diversity due to small size. Our primary objectives in this project were 1) to identify a set of genetic markers that would be useful in the conservation of wide-leaf warea and 2) to compare the genetic diversity of *W. amplexifolia* with two congeners (*W. cuneifolia* and *W. sessilifolia*). *W. cuneifolia*, like *W. amplexifolia*, is state endangered and likely to be less genetically diverse than *W. sessilifolia*, a species that has a large population size. We identified five microsatellite loci that amplified all three species and were polymorphic. We compared levels of heterozygosity and allelic richness among locations and performed a genetic structure analysis to determine if each species formed a discrete unit. The results of this study will help facilitate the recovery of *W. amplexifolia* by focusing conservation efforts on maintaining genetic diversity.

Engelbert, J.G.[1], Stark, W.J.[1] and Spalsbury, D.[2], [1]Department of Biological Sciences, Fort Hays State University; [2]Department of Wildlife, Parks, and Tourism.. RELATING ESTIMATED BIRTH YEAR OF COMMON CARP (*CYPRINUS CARPIO*) TO HEAVY RAINFALL EVENTS AT SHERIDAN STATE FISHING LAKE IN NORTHWESTERN KANSAS. Angling and other water related recreational activities are limited in Northwest Kansas and so even relatively small water bodies like Sheridan State Fishing Lake are prized by local communities. Invasive Common Carp (*Cyprinus carpio*) can have negative effects on water quality and local sportfish populations. In responds to these concerns, data were collected during an extensive Common Carp removal project performed by Kansas Department of Wildlife, Parks, and Tourism at Sheridan State Fishing Lake. A total of 825 individuals were removed. Total lengths ranged from 200 mm to 720 mm. I removed otoliths (asteriscus) from approximately 10 individuals within each 10-mm length group (n = 169). Otoliths were sectioned and the age of each individual was estimated. Inspection of the age distribution indicated that 111 of 169 or 66% of individuals were age 9; 2008 year-class. Another 22 individuals (13%) were age 14 (2003 year-class). These two year-classes were likely produced as the result of individual and atypical water level increases that favored recruitment of Common Carp. The limited nature of these recruitment events suggests that it might be cost effective to use removal methods to improve water quality and fishing opportunities in Sheridan State Fishing Lake.

Everhart, M.J., Sternberg Museum of Natural History, Fort Hays State University. ONE HUNDRED AND FIFTY YEARS OF SCIENCE IN KANSAS; THE BEGINNING. Kansas had been a state for just seven years before Professors Benjamin F. Mudge, John D. Parker established the Kansas Natural History Society in September 1868. The name was changed to the Kansas Academy of Science at the fourth annual meeting in 1871. From the beginning, the purpose of the academy was "to encourage education in the sciences and [the] dissemination of scientific information." Even then, the need for education had been recognized and state universities had already been established. Mudge was teaching science and math classes at the Kansas Agricultural College while Parker was teaching a similar curriculum at Lincoln College [now Washburn University]. Mudge had also served as the State geologist in 1865-66, and both men had articles published in the American Journal of Science: Mudge on meteorites and fossil trackways; Parker on the 1867 Kansas earthquake. Immigrants were flooding into the state and eastern Kansas was booming. Oil and coal resources had been discovered and were being exploited. Agriculture spread rapidly across the plains with settlement westward. The growth of railroads, especially the Kansas Pacific, demanded resources, hastened the settlement of the state, and assured markets for agricultural products. Cities were growing quickly, and with that growth came concerns about water supplies, sanitation and disease. The bones of strange, extinct animals even created a fossil rush to western Kansas. A review of KAS publications from the 1870s onward shows that the sciences were an integral part of the growth and prosperity of Kansas from the earliest days.

Everhart, M.J.[1] and Hawkins, R.A.[2], [1]Sternberg Museum of Natural History, Fort Hays State University; [2]Algonquin Consultants, Inc., Miami, Oklahoma. DISCOVERY OF MIOCENE BEAR JAW IN SEDGWICK COUNTY RAISES QUESTION OF THE GEOLOGIC AGE OF THE SEDIMENTS. In March 2017, a reasonably complete right lower jaw of the giant Miocene bear, *Agriotherium* sp., was recovered from the sandy sediments of a paleo stream channel in northern Sedgwick County, Kansas. The jaw includes the canine, p4 premolar, and m1-m3 molars. The size and worn condition of the teeth suggest that the bear was an older adult at the time of death. The genus *Agriotherium* was cosmopolitan, with specimens known from North America, Europe, Asia and Africa. Fragmentary remains have also been previously identified from Kansas. The discovery presents a problem with the assumed age of the locality from which the specimen was collected. Kansas Geological Survey reports indicate the age of the area including the stream channel is Pleistocene (< 5 ma), yet all of the documented North American specimens of *Agriotherium* are Miocene in age. The nearest Miocene sediments are remnants of the Ogallala Formation, and are located about 50 miles north of the bear jaw locality in eastern McPherson County. The un-abraded condition of the jaw would preclude long distance stream transport. Volcanic ash residues in the Ogallala Formation have been radiometrically dated from Middle to Upper Miocene (16 to 5 ma). However, the original extent of the Ogallala sediments during Miocene time is unknown. It is likely that millions of years of erosion have substantially reduced the coverage of the Ogallala Formation in central Kansas. Additional work is necessary to confirm the age of the sediments at the site of this discovery.

Flickinger, H.D., Department of Ecology, Evolution, and Organismal Biology, University of Kansas. PARASITE EXPLOITATION OF C. INAEQUALIS MATING PHEROMONES. The species *Colletes inaequalis* is a solitary, ground nesting bee native to North America. Female *C. inaequalis* bees emit pheromones to attract male mates. This

pheromone communication system of the bees, while being highly beneficial to reproduction, also has its downsides as some parasitic species are able to exploit this mechanism. Some flies, for example, have been observed being attracted to dead bees or tumulus soil although there were no live bees nesting nearby (Batra 1980). This suggests they were attracted to the scent of the pheromones. Additionally, the blister beetle *Tricrania sanguinipennis* is thought to use pheromones in their invasion of *C. inaequalis* nests. To investigate the possibility of parasite exploitation of bee mating pheromones, I conducted an experiment. I used pheromone lures containing pheromones that mimic *C. inaequalis*, lures without pheromones, and lures with different pheromones. I monitored these lures with the goal of identifying and quantifying the flies, beetles, and bees that were attracted to each of the lures. The observations were made both near a nest aggregation and away from an aggregation. The prediction is that the *C. inaequalis* individuals will be more attracted than parasitic species to the lures that mimic *C. inaequalis* pheromones. I also expect both *C. inaequalis* and parasitic insects to favor the *C. inaequalis* pheromone lure to the control lures. Batra, S.W.T. (1980) Ecology, behavior, pheromones, parasites and management of the sympatric vernal bees *Colletes inaequalis, Colletes thoracicus* and *Colletes validus*. Journal of the Kansas Entomological Society 53: 509-538.

Forster, H. and Shuai, B., Department of Biology, Wichita State University. HOST-DELIVERED RNA INTERFERENCE MAY CONFER PLANT RESISTANCE AGAINST CHARCOAL ROT DISEASE. *Macrophomina phaseolina*, the causative agent of the plant disease charcoal rot, impacts over 500 plant species, and causes devastating crop failures globally. It attacks plants primarily through fungus-infested soil. Once infected, plant tissues become clogged, leading to yellowing and death of the leaves. Traditional means of pathogen control, such as crop rotation and fungicides have proven ineffective or otherwise problematic. This study aims to evaluate using host-delivered RNA interference (HD-RNAi) to manage charcoal rot. HD-RNAi exploits the natural process of RNA interference found in many organisms and may provide a new path toward conferring plant resistance against *M. phaseolina*. In this process, small interference RNAs (siRNAs) are designed, manufactured, and incorporated into plant genomes, and can then enter invading fungus and prevent the expression of genes necessary for successful infection. HD-RNAi has been successful against some nematodes, insects, and other fungal pathogens. In the current study, we have identified ten genes as candidates against which to test the viability of HD-RNAi. All ten genes code for enzymes necessary for synthesis of major components of the fungal cell wall, chitin synthase and β-1,3-glucan synthase. We hypothesize that preventing the synthesis of chitin and β-1,3-glucan, which are needed when new fungal tissues are rapidly forming, can slow down the infection process. We present preliminary findings of the gene expression pattern of these cell wall components in rapidly-growing *M. phaseolina* hyphae. These data will be used to generate siRNAs for use in HD-RNAi, which can lead to decreased crop losses from *M. phaseolina*.

Garofalo, I.[1] and Bell, A.K.[2], [1]Department of Geosciences, Fort Hays State University; [2]The Dinosaur Institute, Natural History Museum of Los Angeles County. NEW SPECIMENS OF THE HESPERORNITHIFORM BIRD *FUMICOLLIS* FROM THE UPPER CRETACEOUS OF WESTERN KANSAS. Hesperornithiforms are an extinct group of foot-propelled diving birds from the Cretaceous Period. Currently, four genera are known from the Smoky Hill Chalk of Kansas: *Hesperornis*, *Parahesperornis*, *Baptornis*, and *Fumicollis*. While *Hesperornis* is represented by hundreds of specimens, the remaining three genera are only known from a handful of individuals. A collection of previously undescribed hesperornithiform fossils housed at the Fick Fossil and History Museum in Oakley, Kansas includes a left femur (FFHM 1972.121.7f.1) and left tarsometatarsus (FFHM 1972.121.7f.4), which display features consistent with *Fumicollis*. FFHM 1972.121.7f.1 shows a curved shaft, similar to *Fumicollis* and unlike *Baptornis*, but has enough differences from the holotype of *Fumicollis* that it cannot be confidently assigned to *Fumicollis hoffmanni*. Due to the isolated nature of FFHM 1972.121.7f.1, we do not consider it appropriate to erect a new taxon, so the specimen is designated *Fumicollis sp.* FFHM 1972.121.7f.4 is very similar to the holotype of *F. hoffmani* and is here assigned to this species. These remains demonstrate the morphological variability in hesperornithiforms and emphasize the need for additional specimens to clarify our understanding of this variation.

Goodrow, E.K. and Adem, S., Department of Chemistry, Washburn University. ANALYSIS OF MELAMINE IN PET FOOD WITH GOLD NANOPARTICLES AND UV-VIS SPECTROSCOPY. The purpose of this research is to develop a colorimetric sensor using gold nanoparticles (GNPs) to detect the presence of melamine in solid pet food samples. Due to its low cost and high nitrogen content, there has been evidence that melamine has been illegally added to various products, such as pet food and infant formula, to falsely increase the apparent protein

content. The currently used methods, such as liquid chromatography/mass spectrometry (LCMS) and capillary electrophoresis/mass spectrometry (CE/MS), are expensive, time-consuming, and require skilled personnel. Thus, there is a need to develop cheap, fast, and portable technique to detect and analyze melamine contamination. Techniques based on gold nanoparticles are being developed for this purpose. When GNPs are in their colloidal state they exhibit a wine-red color, however, in the presence of melamine, GNPs aggregate which causes the solution to change color to blue or purple. This immediate color change is particularly useful when portable detection is required. The aggregation-based change in color can also be monitored through the use of UV-Vis spectroscopy. In the presence of melamine, the absorption band of GNPs shifts from 520 nm to above 750 nm. The limit of detection for this method was determined to be 0.12 ppm. Interference study was conducted to evaluate the selectivity of the technique using many substances found in pet foods. Only melamine caused a color change and a shift to longer wavelength of the absorption band of the gold nanoparticles, indicating the selectivity of the technique for melamine detection.

Green, C.C. and Wilson, L.E., Geosciences, Fort Hays State University. OSTEOHISTOLOGY AND SKELETOCHRONOLOGY IN AN ONTOGENETIC SERIES OF *CLIDASTES* (SQUAMATA: MOSASAURIDAE). *Clidastes* was a large, predatory reptile that inhabited the Western Interior Seaway during the Late Cretaceous. Isotopic studies indicate *Clidastes* maintained body temperatures closer to endothermic animals, leading to speculation they were gigantothermic and able to keep a high body temperature due to size. Based on vascularity, previous studies have also hypothesized higher growth rates in *Clidastes* than in modern varanids, mosasaurs closest living relative. Whether the growth rates in *Clidastes* are comparable to endothermic or ectothermic animals has not been studied. Osteohistology and skeletochronology are well-documented techniques used to investigate growth and life histories of extinct animals. This study used these tools to investigate ontogenetic changes in internal microstructure, determine age at the time of death, and estimate growth rates in *Clidastes*. Four humeri representing a size gradient in *Clidastes* were histologically analyzed. Skeletochronology calculations age the four specimens as a neonate (>1 year), juvenile (3-4 years), sub-adult (6-7 years), and adult (18-19 years). No growth marks are visible in the neonate, so exact growth rates cannot be calculated. The juvenile and subadult humeri had growth rates averaging 1.7µm/day and 1.6µm/day respectively. The largest humerus had a growth rate averaging 0.4µm/day. Because growth slows after sexual maturity, only the largest humerus is considered sexually mature. No humeri show a cessation of growth or evidence of skeletal maturity. Overall, these growth rates indicate *Clidastes* grew more like ectothermic varanid lizards which grow 0.0 to 2.0µm/day. This evidence, coupled with previous isotopic temperature evidence, supports the gigantothermic metabolic hypothesis for *Clidastes*.

Growe, A.L. and Packauskas, R.J., Department of Biological Sciences, Fort Hays State University. MOSQUITOES IN WESTERN KANSAS. During the summer of 2017, a BG-Sentinel mosquito trap was set up in Hays, KS. Use of this trap is presented, along with use of various bait lures. Traps were set at dusk to be collected after dawn the next day for three days a week over the period of three weeks. Results of this trapping are presented, along with an enumeration of species occurring in western Kansas. Some of the differences in morphology of species are discussed along with the vectoring of disease by some of these species.

Hamblin, M. and Morrison, W.R., III, Department of Entomology, Kansas State University; USDA-ARS, Center for Grain and Animal Health Research, Manhattan, KS. BEHAVIORAL RESPONSES OF *RHYZOPERTHA DOMINICA* AND *TRIBOLIUM CASTANEUM* TO VARIOUS MULTI-SPECIES LURES IN LABORATORY RELEASE-RECAPTURE AND WIND TUNNEL ASSAYS. *Rhyzopertha dominica* (Fabricius) (Coleoptera: Bostrichidae), the lesser grain borer and *Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae), the red flour beetle, are two important pests for stored grain products. Commercially available attractants show effectiveness in monitoring primary and secondary taxa of stored grain product pests. In this study, we assessed a range of commercial products for potential inclusion in an attract-and-kill trap. Our goal was to determine the relative attractiveness of commercially available monitoring products from Trécé, Insects Limited, and JF Oakes to adult R. dominica and *T. castaneum*. We assessed their attraction in wind tunnel and release-recapture assays in the laboratory. We observed differential attraction to the commercial lures, depending on stored product species, but in both cases, the Insects Limited lure resulted in the greatest attraction and captures. Our results suggest that several of the lures in this study may provide good baseline attraction in an attract-and-kill device, depending on species.

Hamm, S. WILL THE REAL *PTYCHODUS ANONYMUS* PLEASE "SWIM" UP? In what was the first comprehensive report on sharks from the Cretaceous of Kansas, S. W. Williston (1900) described a new species of

Ptychodus based on "seven teeth of nearly uniform size, four of them united in the matrix," as *P. anonymus*. Williston noted that the specimen "probably" occurred in the Benton, an outdated term originally used to describe the Greenhorn Limestone and Carlile Shale formations. The teeth were removed from the matrix and figured separately in a photograph (Plate XXIX). Williston did not record which teeth were associated in the original matrix or their relationship to the others. A recent review of this specimen (KUVP 55255) in the collections of the University of Kansas indicates that not all of the teeth are from the same shark, and that there is more than one species of *Ptychodus* present in this group. The recent discovery of an associated tooth set of *P. anonymus* (FHSM VP-19170) has indicated a distinct pattern of heterodonty, providing additional resolution in the diagnosis of this species. Additional work is necessary to designate a lectotype from the original seven teeth.

Harford, M., Pham, T. and Anderson, S., Department of Ecology, Evolution, and Organismal Biology, University of Kansas. GENETIC DIFFERENTIATION OF VARIOUS AGGREGATIONS OF *COLLETES INAEQUALIS* ON THE CAMPUS OF THE UNIVERSITY OF KANSAS. *Colletes inaequalis* (Hymenoptera: Colletidae) is a solitary ground-nesting bee that forms large nesting aggregations. Aggregations are located on the University of Kansas campus and elsewhere in Lawrence, KS. Earlier studies using microsatellite markers showed relatedness within aggregations was slightly higher than in a randomly selected group of individuals, and relatedness was higher among females within an aggregation than among males, suggesting gene flow among aggregations may be primarily though males. We used sequence variation in the maternally-inherited mitochondrial genome of female bees to determine whether multiple maternal lineages were present in an aggregation (indicating colonization of the site by multiple unrelated females), and whether maternal ancestry of aggregations differed. We carried out non-lethal sampling of at least 5 female bees from 4 aggregations separated by different distances. We clipped a wing tip from each female, extracted DNA by boiling in a 5% Chelex-100 solution, and used standard "bar-coding" primers (Lep-F and Lep-R) to PCR amplify a portion of the mitochondrial Cytochrome Oxidase I gene. Sequencing was carried out at a commercial sequencing facility. We scored the number and identity of haplotypes in each sample of females to determine if aggregations contained more than one matriline and used a version of F-statistics for haploid data to determine to quantify maternal movement (or lack of it) among nest aggregations. Information on maternal gene flow among the *Colletes inaequalis* aggregations could have implications for conservation of aggregations around campus.

Harper, A.C. and Maccarone, A.D., Biology Department, Friends University. COMPARISONS OF FORAGING BEHAVIOR AND ENERGETICS BY GREAT EGRETS (*ARDEA ALBA*) AND SNOWY EGRETS (*EGRETTA THULA*) ACROSS THREE MICROHABITATS. Long-legged wading birds feed in a variety of aquatic microhabitats, all of which have the potential to alter foraging behavior based upon differences in abiotic factors such as water depth and clarity and biotic factors such as the energetic value of prey. In order to measure differences in foraging behavior across microhabitats, we observed Snowy Egrets (*Egretta thula*) and Great Egrets (*Ardea alba*) for a total of thirty-six hours from May-August 2017. For both species, we completed six hours of observations in rivers, ponds, and weirs (small waterfalls). During each session, we recorded strike and capture rates per minute, and prey lengths relative to culmen length. We then calculated foraging efficiencies by dividing successful strikes total strikes. Lengths, weights, and energetic values were estimated for all captured prey. Snowy Egrets (55%) had higher overall foraging efficiencies than Great Egrets (48%), but foraging success for both species differed by microhabitat. Both species had the highest foraging efficiency at weirs. Snowy Egrets had higher foraging efficiencies than Great Egrets in rivers and weirs, but not in ponds. There were also significant differences by microhabitat and between species in strike rates, capture rates, and prey sizes. Snowy Egrets had higher strike rates and capture rates than Great Egrets in all three microhabitats. However, Great Egrets caught fish in all three microhabitats that were larger and of greater energetic value than those caught by Snowy Egrets. Aggression rates at weirs were three times higher than at both rivers and ponds.

Harrison, S.M. and Greer, M.J., Department of Biological Sciences, Fort Hays State University. PLANT-SOIL MICROBIOME FEEDBACK IMPACTS ON NATIVE AND NON-NATIVE GRASSES THROUGHOUT KANSAS. Old World Bluestems (OWBs) were introduced to increase forage for livestock and reduce soil erosion on deteriorated rangelands. This group of non-native perennial grasses are causing problems by outcompeting native grasses and taking over native prairies across the central and southern Great Plains. Several studies show importance of soil microorganisms on plant communities through organisms such as arbuscular mycorrhizal fungi (AMF), nematodes, and bacteria. These microbes can benefit plant communities via increased mineral solubilization, nitrogen fixation, and access to other soil resources. Conversely, microorganisms can be parasitic or

pathogenic to plants. This study aims to determine non-animal soil microbial community differences (i.e. species richness and community composition) between native and non-native grasses across the precipitation gradient in Kansas. Soil samples will be collected from the two invasive species yellow bluestem (*Bothriochloa ishaemum*) and Caucasian bluestem (*Bothriochloa bladhii*), as well as the two native species little bluestem (*Schizachyrium scoparium*), and big bluestem (*Andropogon gerardii*). To determine microbial species presence between the grass species and across the precipitation gradient, AMF small subunit ribosomal (SSU) DNA, bacterial 16S ribosomal RNA, and algal chloroplast DNA will be sequenced. ANOVA will be used to determine if richness and/or community structure varies between the grass species and/or across the precipitation gradient. We expect to see lower species richness in soils surrounding the OWBs than native grasses, and lower species richness moving east to west across the precipitation gradient. We also anticipate a higher proportion of generalist microbes associating with OWBs than native grasses.

Hays, K.J. and O'Neill, H.A., Department of Chemistry, Washburn University. FORENSIC FIBER ANALYSIS OF VEHICLE INTERIORS FOR POSSIBLE FORENSIC DATABASE. In the world of forensics, databases are frequently utilized as tools for comparison with case evidence either for identification of evidence or to assist in narrowing down a list of potential suspects. Currently, however, there is no database for the interior fabrics of vehicles, though many crimes are committed in vehicles. The purpose of this research was to evaluate the potential usefulness of such a database. Interior fibers from a randomly chosen sample set of vehicles (5 different makes and models) were collected and characterized using polarized light microscopy (PLM) and relative refractive index comparison. Fourier transform infrared (FTIR) microscopy was then used in transmission mode to help identify the vibrational modes of the functional groups in each fiber and assign each fiber to a polymer fiber class (if indeed they were man made). Results show that 3 major classes of fibers are used in vehicle interiors including polyester (PET), polypropylene and nylon, although more data is needed to determine if there is a general trend for fiber classes used in certain makes and models of vehicles.

Heffren, P.M., Herken, A.M., Powell, R.P., Radford, G.M., Shapiro, S. and Sadikot, T., Department of Biology, Washburn University. ANNOTATION OF GENOMIC ELEMENTS AND CODING SEQUENCES.. Since the completion of its genomic sequence in 2000, *Drosophila melanogaster* has served as a model organism for studying many developmental and cellular processes common to higher eukaryotes. Here *Drosophila melanogaster* is used as a reference for cross-species identification and annotation of genes and genomic elements. Using a number of open-source computational genomic tools for sequence alignment, gene-prediction and Drosophila genome browsing, such as Gene Model Checker, Gene Browser Mirror, and Gene Record Finder (via Flybase.org), we annotated over 265,000 bp of genomic sequence from Drosophila eugracilis. Data files and resources were available through the Genomics Education Partnership (GEP) sponsored by Washington University, Saint Louis. Overall, our results highlight the presence of several orthologous genes between the two Drosophila species. There are 26 gene features predicted to be present within the genomic sequences that were analyzed, but our research showed that only about 10 of these predictions are truly congruous. Our findings will be submitted for inclusion into the Drosophila database to the Genomics Education Partnership.

Heffren, P.M. 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. Acid hydrolysis deprotection from tosylamide to amine is problematic, but microwave-assisted deprotection has shown promise. Microwave-assisted acid hydrolysis of tosylamides was investigated using varying solvent composition and heating schemes. Microwave-assisted base hydrolysis using high-boiling solvent was tested as an alternative. In both major microwave-assisted schemes, an Anton Paar Monowave 400 pressurized microwave reactor was used. In addition, reductive cleavage methods were explored using sodium naphthalenide at standard temperature and pressure. Complete deprotection was achieved using microwave-assisted acid hydrolysis. Microwave-assisted base hydrolysis and reductive deprotection produced a mixture of partially deprotected tosylamides and unknown side-products. While complete deprotection was achieved using microwave-assisted acid hydrolysis, the reactor vessel remained pressurized after the heating cycle was complete, and most of the reaction mixture was lost due to explosive effervescence of the mixture. Future investigations will focus on optimization of this procedure and its compatibility with the pressurized reaction system.

Herken, A.M. and Herbig A.F., Department of Biology, Washburn University. REPLICATION CHARACTERISTICS OF A LYTIC BACTERIOPHAGE INFECTING *BACILLUS SUBTILIS*. Bacteriophages (phages) are viruses that infect bacteria and are the most abundant microorganisms on Earth. Lytic phages replicate within the bacterium and are released into the environment upon lysing the cell. Use of lytic phages have been proposed as an alternative to treat antibiotic resistant bacteria and have been employed to control food-borne bacterial pathogens. We have begun to characterize a bacteriophage isolated from creek bed sediment on a farm in southeast Kansas. This phage infects *Bacillus subtilis* and forms opaque to clear plaques on a lawn of cells. Preliminary data reveals adsorption of the phage to the cell within 20 minutes. Investigation of growth kinetics indicates that this phage has a latent time of approximately 60 minutes, lyses *B. subtilis* cells by 100 minutes, and results in a burst size of ~200 phage particles per cell. In addition to defining these replication parameters, we have prepared phage for transmission electron microscopy and have begun to characterize its genome by restriction endonuclease analysis.

Higdon, N.B.A. and Bjerke, S.L., Department of Biology, Washburn University. ANALYZING PROTEIN INTERACTIONS OF THE HERPES SIMPLEX TYPE 1 UL34 PROTEIN. Herpes Simplex Virus Type-1 (HSV-1) is easily communicable and infections can present in varied forms including cold sores, genital herpes, and herpes whitlow. HSV-1 proliferates within the host cell nucleus. Once replication is complete the virus exits the nucleus. Viral protein UL34 is essential for virus departure of the nucleus. It is unknown which nuclear proteins UL34 is interacting with during this phase. UL34 is a highly conserved protein in all human herpesviruses and could be an ideal candidate for future drug treatments. If UL34 function could be blocked, HSV-1 would be unable to exit the nucleus and infect other cells. To determine interaction partners for UL34, pulldown assays were performed. In a pulldown assay, purified UL34 protein was mixed with HEp-2 cell lysate; UL34 and any binding partners were then removed from the mixture. Our past results showed some potential UL34 binding partners, however, upon replication of the experiments, inconsistent results were obtained. To try and obtain more similar results from our assays, we expressed a new GST control protein in *E. coli*. We will use this control to compare to the proteins that are being pulled down by a GST-tagged UL34 protein. Additional adjustments were made to our pulldown procedures. We hope our results will again show potential UL34 binding partners. If more convincing protein interactions occur, isolation experiments will be performed to identify the binding protein(s).

Hoffman, B.L. and Hageman, S.A., Department of Natural and Physical Sciences, Park University. PRELIMINARY EXAMINATION OF ENAMELOID BUNDLING PATTERNS IN THE EXTINCT REQUIEM SHARK *PHYSOGALEUS CONTORTUS* FROM THE PUNGO RIVER FORMATION OF NORTH CAROLINA (PALEOCENE: MIOCENE). *Physogaleus contortus* is an extinct species of requiem shark commonly found in the Pungo River Formation of North Carolina. Teeth from this shark, especially the anteriors, have a design very similar to that of *Squalicorax* and *Galeocerdo*, with a distally directed blade-like crown and a pronounced distal heel. The distal cutting edge of the tooth is coarsely serrated and mesial serrations are less pronounced. A unique characteristic of *Physogaleus* teeth is a twisting of the crown. Intact teeth and sectioned teeth were etched with 10% hydrochloric acid and examined using a scanning electron microscope. The enameloid of *P. contortus* is a triple-layered enameloid with easily distinguished shiny layered enameloid, parallel bundled enameloid and tangle-fibered enameloid. The parallel bundles are oriented with the long axis of the crown, turning at the serrations into the long axis of the serration. The twisting structure of the crown is reflected in parallel bundles starting to turn into the serrations at a greater distance than is seen in *Squalicorax* teeth. This is the first report of the dental enameloid structure of *Physogaleus*.

Holman, P.L.[1] and Wilson, L.E.[2], [1]Department of Geoscience, Fort Hays State University; [2]Sternberg Museum of Natural History. FIRST DESCRIPTION OF AXIAL HISTOLOGY FOR THE GENUS *DOLICHORHYNCHOPS* (SAUROPTERYGIA; PLESIOSAURIA). *Dolichorhynchops osborni* is a species of polycotylid plesiosaur that roamed the Western Interior Seaway during the Campanian age of the Late Cretaceous. FHSM VP-404 is a nearly complete specimen from the Niobrara Formation, Smoky Hill Chalk Member of Logan Co., KS. The purpose of this study is to test if ontogeny can be assessed for *D. osborni* by using the microanatomy of thoracic ribs. From this specimen the mid-thoracic rib was histologically sectioned at the midpoint and proximal part of the shaft. Previous research shows that the most complete record of growth is retained in the proximal 20% to 30% of the rib in some reptiles. The medullary cavity is small with endosteal trabeculae composed of fibrolamellar bone. The cortex is relatively thick on the lateral and medial horns of the shaft and is composed almost entirely of cancellous bone tissue that appears isometric under cross polarized light. The cortex is also dominated by secondary osteons showing

extensive remodeling. There is a very thin layer of non-continuous lamellar bone near the periosteal surface that is often interrupted by secondary osteons. This result mirrors the osteoporotic condition that has previously been seen in the ribs of some adult plesiosaurs and is not consistent with the compact cortex of lamellar bone and growth marks seen in an adult elasmosaur specimen. Due to the highly remodeled nature of these rib sections, they cannot be used to estimate ontogeny in this specimen of *D. osborni*.

Houk, A.N. and Williams, D.R., Department of Biology, University of Saint Mary. THE UTILITY OF DENTAL LANDMARK ANALYSIS FOR THE IDENTIFICATION OF DIRE WOLF (*CANIS DIRUS*). *Canis lupus*, Gray Wolf, is the largest living species in the Canidae; this is the only wolf relatively close in size to the extinct Dire Wolf (*Canis dirus*). The dire wolf has a large body and a wide skull, which has been the main characteristics used to identify the species. Given the ability of climate to affect body size within a species, it would be useful to have other diagnostic characters to differentiate the Dire Wolf from modern canids. We used the first lower molar (m1) because it is more likely to preserve than other smaller teeth and should be more species-specific due to its use in shearing meat. We collected a dataset of modern canids: Gray Wolf (*Canis lupus*), Red Wolf (*Canis rufus*), Coyote (*Canis latrans*), and the Domesticated Dog (*Canis familiaris*). We also input a single specimen of Dire Wolf (*Canis dirus*). We digitized m1 conids, transformed them into Procrustes landmarks, and then used the landmarks to perform a discriminant function analysis. The function had an 82% successful ID rate on modern specimens. We compared the average landmark location for Gray Wolf to our single Dire Wolf using thin plate spline analysis and found difference is the trigonid and lingual torsion of the talonid. We found the m1 is diagnostic for Gray Wolves compared to other extant wolves and could be useful for differentiating Gray Wolves from Dire Wolves.

Hubbell, E.M., Department of Biology, Sterling College. WATER QUALITY OF THE ARKANSAS RIVER AFTER RUNNING THROUGH URBANIZED AREAS. With a growing human population, urban areas are rapidly expanding. Urbanization impacts streams and rivers that run through or close to towns and cities. The objective of our study is to determine if the level of urbanization impacts water chemistry in the Arkansas River. This will provide evidence that could potentially be useful to address water quality issues. We believed that the quality of the Arkansas river will decrease after it runs through more urbanized areas. From October - December 2017, we used LaMotte test kits to measure pH, dissolved oxygen, phosphate, and nitrate-nitrogen at six different sites before and after Ellinwood, Hutchinson, and Wichita. Specifically, we hypothesized that the nitrate-nitrogen and phosphate levels would increase, the dissolved oxygen levels would decrease, and the pH would be impacted. Instead, with little rainfall this past fall, there was not a significant difference between average water quality measurements at sites located before and after urban areas. We found that the average change in all three sites was 0.125 for pH, -0.269 for phosphate, 1.425 for dissolved oxygen, and -0.61 for nitrate-nitrogen. We concluded, therefore, that due to a dry semester, there was not enough runoff to attain any conclusive evidence about the effect of urbanization on the Arkansas River and we will continue collecting data this spring to try and obtain more samples during times following rainfall runoff events.

Hullinger, A.[1], Cordes, Z.[2], Riedle, D.[2] and Stark, W.[1], [1]Department of Biological Sciences, Fort Hays State University; [2]Ecological Services Section, Kansas Department of Wildlife, Parks, and Tourism. HABITAT ASSESSMENT OF A SOUTHEASTERN KANSAS SQUAMATE ASSEMBLAGE WITH EMPHASIS ON A THREATENED LIZARD. The Broad-headed Skink is a semi-arboreal skink that occupies the deciduous forests of the southeastern United States. Eastern Kansas comprises the northwestern extent of their range. The Broad-headed Skink is listed as threatened in Kansas and a better defined critical habitat is needed to make management decisions regarding the conservation status. During the summers of 2016 and 2017, visual encounter surveys and drift fence arrays were used to survey populations of the Broad-headed Skink and other squamates in Miami, Linn, Bourbon, Crawford, Cherokee, and Neosho counties. A habitat assessment was performed at each site. A Canonical Correspondence Analysis (CCA) was performed to determine which variables explained the variation in the observed squamate community and a logistic regression was used to determine which habitat variables are significant in predicting presence of the Broad-headed Skink. Average log length and overstory tree size were the significant variables from the logistic regression model and indicate that the Broad-headed Skink occurred in mature patches of the forest. This information will be used to guide management decisions regarding the status of the Broad-headed Skink and implement a recovery plan for the species.

Isidori, T.I, Royon, C.R. and Minafra, N.M., Department of Physics and Astronomy, University of Kansas. PARTICLES TIMING DETECTORS. During the last years various science fields experienced a huge improvement

on sensors technology and capability. In particular, a great effort has been made to develop new prototypes of fast timing detectors. Their purpose consist in detecting the energy released from the an incident particle and reconstruct, like really accurate clocks (~ ps), the time of its passage through the sensor. These features make them perfect candidates for movement sensors, precise distance detectors, interferometers and many more. Christophe Royon's group at the University of Kansas developed a multi-purpose hybrid board for timing applications . The fast timing reconstruction capability (< 30 ps) and the simple design allows the board to be a really performant plug and play detector. Moreover, the possibility to be adapted and optimized to host a wide variety of different sensors, makes it suitable for multiple projects, such as: high energy particle physics, medical applications, commercial and industrial use. This talk will present the basic concept of Timing measurements and present the results obtained during the tests performed at the medical facility at St.Luke hospital of Dublin during November 2017. During that data taking the board was used to characterize a Linear accelerator used for radiotherapy, exploiting the promising qualities of new generation Low Gain Avalanche Diode (LGAD),technology already tested with high energy particle beams inside the LHC.

Jimenez, J., Sills, A. and Burgess, K., Biology Department, School of Science and Health, Avila University. INHIBITION OF HEDGEHOG SIGNALING VIA CYCLOPAMINE TREATMENT INDUCES ANTERIOR-POSTERIOR PATTERNING DEFECTS IN REGENERATING PLANARIA. Hedgehog (Hh) signaling is important in developmental patterning and regeneration biology. Components of the Hh pathway are present in planaria, and anterior-posterior patterning in regenerating planarian requires functional Hh signaling. To further analyze the role of Hh signaling in planarian regeneration, a pharmacological inhibitor (cyclopamine) was applied to regenerating worms. Planaria were pretreated in 25mM of cyclopamine for 7 days. The midsection of the worm was transected and cyclopamine treatment continued for another 7 days. While overall length was not affected, anterior and posterior abnormalities were seen. Cyclopamine exposure significantly decreased the average distance between eyes and caused many abnormalities in eye development. Our result was surprising, as planaria with increased Hh signaling via Ptc RNAi also were shown to develop a cyclopic phenotype. RNA from regenerating planaria exposed to cyclopamine is currently be analyzed to determine changes in Ptc and Gli gene expression.

Jolayemi, A., Fields, S. and Crupper, S.S., Department of Biology, Emporia State University. MICROBIOME ANALYSIS OF BLOWFLIES. A rapidly expanding and emerging field in forensic science is the area of microbial forensics. Science has routinely shown that the microbiome is unique for every individual and can potentially serve as a complement to DNA profiling. Although most microbiome studies focus upon humans, expanding our thinking outside of this realm lead us to hypothesize that the gut microbiome of blowflies would be a forensically valuable resource that warrants further investigation. Furthermore, since the use of blowflies to establish a postmortem interval is well established in forensic science, the merger of forensic entomology and microbial forensics may provide new tools available to the crime scene investigator. In this research, the objective was to validate the methodology to obtain a blowfly microbiome. Total DNA was obtained from the blowfly gut followed by next generation sequencing of PCR amplified 16S rRNA gene sequences. Bacterial communities present in different samples were identified and comparative analysis done between them. Data obtained will aid in the development of a reference library that can be used in future research to address forensically relevant questions.

Jones, R., Physical Sciences Department, Emporia State University. ALTERNATE REALITIES; RECONCEPTUALIZING REALITY. "The philosophers Plato and Descrates claimed to have had, at certain moments in their lives, a new view of the world, its basic constituents, and its rules which were totally different from our conventional view of reality." (Reflections on Kurt Gödel, H. Wang, MIT Press, 1987) Two identical learners, observing different example input, or the same examples, but in different order, can form different categories and so judge newer/later input differently. The Sapir-Whorf hypothesis claims that a speaker's language influences his category structure and the way he thinks. It seems certain that each of us experiences a somewhat different reality, the question is just how widely these realities can vary, one from another. Quite large scale differences are experienced by young earth creationist Republicans who reject evolution but believe in a strong free will as compared to communist atheists who believe in evolution and multiverses but reject the notion of free will. There are a number of concepts which can force a reconceptualization of the reality we experience: concepts of, spirit(s), souls(s), god(s), free will, life after death, Platonism, backward causation, multiverse(s), non-Markovian laws of nature, recurrence, action-at-a-distance, dimensionality>4, entanglement, the computing universe, value pluralism... Alternate conceptualizations of reality underscore the need for scientific pluralism. (R. Jones, *TKAS*, 2013, pg 78)

Intelligent beings, even when doing physics or mathematics, or philosophy, are not dealing with ultimate reality, rather, we are dealing with models of the world, and many different models are required.

Keehn, A.K. and Emry D.J., Department of Biology, Washburn University. COMPARING EFFECTIVENESS OF LECTURE STYLE TO ACTIVE LEARNING STYLES IN COLLEGE SETTINGS. Students learn in different ways and there has long been discussion on which technique works with the greatest efficiency. By comparing studies done in both different subjects as well as at different universities, a clearer picture of the effectiveness of these methods may be obtained. Initial article selection was based on studies comparing lecture only to various active learning styles such as flipped and blended, problem based, and collaborative. Final article selection was limited to studies with quantitative data in college-level classrooms. Data focused on exam scores, comparing lecture only to all other active learning techniques from the various courses. Differences in the scores as well as averages were used to make comparisons across and within a range of academic disciplines. Overall, the data were inconclusive in proving one technique to be more effective. To obtain conclusive results, uniform studies with more consistent parameters should be utilized. Such studies can also help to determine if different teaching styles are more effective in some fields than others or if widespread change should be adopted across disciplines.

Kostner, D., Dougherty, M., Schmidtberger, A. and Kobayashi, Y., Department of Biological Sciences, Fort Hays State University. EXAMINATION OF DEDICATOR OF CYTOKINESIS 2 (DOCK2) MRNA IN CHANNEL CATFISH. With the coming of the new century, obesity and other diseases associated with obesity have been a growing concern in the United States. This has yielded an increased effort in investigating mechanisms and treatments for such diseases. The study in mice has shown that Dedicator of Cytokinesis 2 (DOCK2) has been linked to several inflammatory diseases. Our laboratory has been exploring the possibility of using channel catfish as a model organism to investigate the development of obesity in humans, due to their genetic predisposition towards collecting fats in order to grow. However, the role of DOCK2 in catfish growth and metabolism has not previously been investigated. Objectives of this study were to identify the DOCK2 gene in channel catfish and examine its mRNA expression in various tissues. Specific primers were designed based on the channel catfish DOCK2 sequence available in GenBank and used to amplify 729 bp product. The DOCK2 mRNA expression varied among samples from brain, liver, muscle, and small intestine. The PCR product shared sequence similarities with the DOCK2 of various fish species (>80%) and mammals (73%), suggesting that DOCK2 is evolutionary conserved among species. Tissue expression of DOCK2 mRNA was examined using quantitative RT-PCR and showed that the expression of DOCK2 mRNA was detectable in all tissues examined. However, the DOCK2 mRNA expression was more readily detectable in the spleen, heart, and kidney. Currently, we are exploring the relationship between the expression of DOCK2 mRNA and food intake, as well as initiation of inflammation, in channel catfish.

Kramer, D.L. and Stark, W.J., Department of Biological Sciences, Fort Hays State University. POPULATION DEMOGRAPHICS AND SPATIAL ECOLOGY OF THE ORNATE BOX TURTLE (*TERRAPENE ORNATA*) AT QUIVIRA NATIONAL WILDLIFE REFUGE. Historically, management strategies at Quivira National Wildlife Refuge (QNWR) focused on conserving migratory waterfowl. The recent adoption of the Comprehensive Conservation Plan at QNWR provided for new priorities and a more holistic approach to the management of the refuge. Subsequently, QNWR formed a partnership with Fort Hays State University (FHSU) to investigate the wildlife populations on the refuge, including *T. ornata*. To address how *T. ornata*, a resident species on the refuge, might be affected by current management practices, a mark recapture survey was initiated. Two hundred and eighteen individuals were marked and released in the 2017 field season. The habitat association in this species was investigated by radio-tracking 19 individuals over a 24-week period. These data and that collected from other surveys on the refuge will inform the development of long-term monitoring protocols that will assess and guide management strategies in the future.

Lambert, S.[1], Hodges, C.[2], and Bailey, M.M.[1], [1]Emporia State University, MSFS Program; [2]Kansas Bureau of Investigation, Topeka, KS. IMPACT OF STORAGE TEMPERATURE, GLUCOSE, AND MICROORGANISMS ON BLOOD ALCOHOL CONCENTRATION (BAC) IN NON-DECOMPOSED WHOLE BLOOD. This study shows the effects of sample volume, storage temperature, and presence or absence of excess glucose and microorganisms on BAC over a 6-month period. Two sets of stock solutions (with or without excess glucose) of seven different ethanol concentrations were prepared in defibrinated sheep's blood : 0g/dL- 0.30g/dL. The appropriate blood was then added to 10mL gray-stoppered BD Vacutainer™ blood collection tubes (GST) in volumes of either 2.5mL, 5mL, 7.5mL and 10mL. For each BAC, four groups of 8 samples were prepared varying

storage temperature (room temperature or 4 ºC) and the presence of microorganism contamination. A mixture of *Saccharomyces cerevisiae, Candida albicans, Acinetobacter johnsonii, Fusarium oxysporum,* and *Staphylococcus aureus* were added to half of the tubes to simulate microbe contamination. Each month, the set of samples designated for that month were analyzed in duplicate with an internal standard of 0.02% 1-propanol in water by headspace GC/MS with 0.10 g/dL standards every 46 vials. Samples from each BAC level were streaked on blood agar plates and incubated to determine the viability of the microorganisms. The greatest ethanol losses were observed within the first 3 months; ethanol loss plateaued after month 3. Microorganisms can survive for months at room temperature and 4 °C storage conditions, despite the presence of NaF; however, their effect on ethanol concentration appears to be minimal. While statistical analysis yielded significant interaction among the variables and BAC, the differences in BAC over time do not appear to be large enough to be forensically significant.

LeBeau, G. J., Murphy, P. M., Stedwill, JP. F. and Penwell, W. F., Department of Biology, Benedictine College. CHARACTERIZING THE ROLE OF THE *BAUF* GENE IN THE HUMAN PATHOGEN ACINETOBACTER BAUMANII. In low iron conditions, *Acinetobacter baumannii* utilizes a siderophore-mediated iron acquisition system, known as acinetobactin in order to acquire the essential micronutrient, iron. The genome of the type strain ATCC 19606^T harbors a cluster of genes including the gene, *bauF*, which is predicted to encode an esterase that could be involved in the release of iron from this iron-siderophore complex. To test the hypothesis that the BauF protein is needed for the release of iron from acinetobactin, the coding region of *bauF* was disrupted by allelic exchange in the type strain ATCC 19606^T. This was possible by generating an isogenic derivative, with a *bauF* mutation. The *bauF* isogenic derivative showed reduced growth when compared to the parental strain under iron-chelated conditions. Amplification of the ATCC 19606^T genomic DNA from *A. baumannii* was performed in order to clone into Zero Blunt Topo cloning kit. Following the sub-cloning of the amplicon into a restriction site on the polylinker of the expression vector pET-30ax, the vector was transformed into *E. coli* BL21pLysE for overexpression using the inducible T7 RNA polymerase system. Expression of this construct produced a fusion protein containing the BauF enzyme and a His-tag. The cells were lysated in order to isolate the BauF-His-tag protein using the freeze thaw method. High affinity chromatography was performed using a nickel column in order to purify the BauF protein. Further testing with the purified protein will be performed to determine the esterase activity.

Lindsey, C., Department of Physics and Astronomy, University of Kansas. PROTON STRUCTURE AND GLUON BEHAVIOR AT HIGH ENERGIES. The proton is one of the most fundamental particles in nature but it is far from being elementary. Since its discovery in 1920 experiments have continued to probe various aspects in order to further our understanding but there is still much that eludes us. I will discuss the current understanding of its structure and of gluons in particular which are the subatomic particles which hold the proton together. Gluons are theorized to have extremely large densities at high energies but this has never been observed and using recent data from the Large Hadron Collider it may be possible to see if gluons behave at high energy in the way we expect.

Maccaone, A.D. and Brzorad, J.N., Biology Department, Friends University; Biology Department, Lenoir-Rhyne University. CHARACTERIZING GREAT EGRET (*ARDEA ALBA*) BEHAVIOR AND ESTIMATING ENERGY EXPENDITURE USING ACCELEROMETRY DATA. Like all animals, birds obtain energy exclusively through the food they consume, but expend this energy in a number of ways. Energy expenditure has been shown to exhibit seasonal variation as energy demands are seldom constant throughout the year. We have spent more than 10 years conducting field research whose goal is to quantify the annual energy-and-activity budget for Great Egrets (*Ardea alba*)**.** recently, we began at attach GPS-enabled transmitters to adult birds captured at feeding sites in Kansas and along the East Coast. The GPS units enable us to track birds throughout the breeding season (May-August), and to follow birds along migratory routes and eventually to wintering sites in Mexico and elsewhere. Here, we report our latest findings on activity patterns, habitat use, and energy expenditures. For example, the lowest average levels of energy consumption were recorded during the post-breeding season and winter, whereas mean energy consumption spiked during migrations abd other flights, and during the nesting period. As chicks grow and their energy demands increase, adults respond with more flying time each day and therefore higher rates of energy expenditure. We discuss some of these findings from the perspective of habitat conservation.

Maley, C. and Simons, K.T., Department of Physical Sciences, Emporia State University. MUTAGENESIS DsRed2 INTO mPlum. The goal of the project is to convert DsRed2 (a fluorescent red protein) into mPlum (a fluorescent purple protein). There are a total of 41 nucleotide differences between the two genes of the proteins. To

make these changes, we are using site-directed DNA mutagenesis to mutate DsRed2 into mPlum. 14 oligonucleotide pairs were designed to make the 41 DNA mutations. 12 of the 14 oligos have been successfully used to combine 10 of these events. The overall goal is to determine the most effective and/or significant change to structure and properties. By identifying the crucial amino acid positions that contribute to color, the goal is to use this information to understand the role of each position in the color of fluorescent proteins.

Masarirambi, P.T. and Crupper, S.S., Department of Biological Sciences, Emporia State University. AN INVESTIGATION TO RECOVER AND INDIVIDUALIZE VERTEBRATE DNA FROM THE GI-TRACT OF FLESH EATING BEETLES (*DERMESTES MACULATUS*): A PILOT STUDY. Mass disasters and acts of violence may leave bodies in pieces, burned beyond recognition, or decayed. Flesh eating insects are known to colonize decomposing bodies and feed upon their remains. Corpses may not be found immediately or never found at all. Therefore, in a forensic investigation being able to sample local insects for human remains would aid in recovery and identification efforts of a missing person. In this study, the objective was to determine if DNA can be recovered from GI-tract of adult *Dermestes maculatus* beetles and larvae that were reared in three separate colonies. Each colony fed on either *Bos taurus* (beef), *Sus scrofa* (pork) or *Meleagris meleagris* (poultry). A commercial kit was used to extract total DNA followed by a Polymerase Chain Reaction (PCR) that utilized species specific primers. Furthermore, human blood was mixed with beef to mimic a missing human being or body part and then exposed to beetles. The PCR assay successfully amplified DNA fragments and a genetic profile was generated that could be used in the Combined DNA Index System (CODIS) to identify a person. Thus, from this research, it is indeed possible to recover and individualize vertebrate DNA from the GI-tract of flesh eating insects. This method can be used in forensic cases to identify human remains from a crime scene.

Mayes, D.M., Anderson, S., Denning, K.R. and Smith, D.R., Department of Ecology & Evolutionary Biology, University of Kansas. BODY SIZE RESPONSES OF *HERIADES SPP*. (HYMENOPTERA: MEGACHILIDAE) TO LOCAL AND LANDSCAPE LEVEL RESOURCES IN TALLGRASS PRAIRIE SYSTEMS. Native wild bees provide important pollination services to wild and cultivated plants, yet little is known about the current status and factors that affect particular species in their natural habitats. In this project we studied *Heriades carinata* Cresson, a common, native solitary above-ground nesting bee species colonizing tallgrass prairie remnant and restoration sites, using trap-nests situated in fields across eastern Kansas. We examined the relationship between bee body size and local forb diversity and landscape composition over a two-year period. We reared a total of 196 *H. carinata* individuals across both study years. We did not find a significant difference in the body size of bees collected in remnant versus restoration sites. We found a marginally significant negative relationship between body size and local forb richness, but did not find any relationship with landscape composition. Our results suggest that *Heriades* are more likely affected by local habitat factors than landscape scale factors.

Mead, J.J. and Stark, W.J., Department of Biological Sciences, Fort Hays State University. COMPARISON OF HOME RANGE ESTIMATORS WITH DATA FROM A SMALL RATTLESNAKE. Insights into the basic biology of animal populations is required for conservation and important to our understanding of their unique ecology. This information can be difficult to collect with secretive taxa, particularly for analyses that require relocating specific individuals. Radio-telemetry allows for this obstacle to be overcome. We used radio-telemetry to investigate the spatial ecology of the Western Massasauga (*Sistrurus tergeminus*) in Cheyenne Bottoms in Barton County, Kansas. Eighteen individuals were implanted with VHF radio transmitters during 2016-2017 and tracked twice weekly throughout the active seasons. These data were used to calculate home range estimates for each individual with more than 30 unique locations. The appropriateness of various methods of estimating home range and core use areas is debated so here we compare four methods: 1) minimum convex polygon, 2) kernel density estimators, 3) harmonic mean, and 4) frequency ellipse. We compare these results and discuss the concerns with each estimator when considering our data.

Mers, A.N., Rezzelle, R. and Bailey, M.M., Emporia State University. THE HUMAN FACTOR IN CRIME SCENE MEASUREMENT ACCURACY: A COMPARISON OF THREE MEASURING DEVICES AND THREE CRIME SCENES. Measurements in crime scene sketches need to be accurate, as they are used in court and to recreate a scene. The accuracy of devices used in crime scene measurements has been studied; however, there is little research on the amount of measurement variability introduced by the user. This research investigated the average human error along with the accuracy of three different measuring devices. Three mock crime scenes were set up – 2 indoor scenes (with and without furniture) and 1 outdoor scene. Twenty-one volunteers were used to

measure 10 predetermined measurements in each of the three scenes using 3 different measuring devices. Volunteers had no previous experience measuring crime scenes, and were provided with the same instructions. Each volunteer measured all three scenes. Measurements were taken in the same sequence first using a class 2 measuring tape (a TR Industrial 88016 FX Measuring Wheel™ was used on the outdoor scene), then Bosch GLM 35™ and Leica DISTO 810™ electronic measuring devices, The data from each measurement was averaged for each measuring device within a scene, and compared. Angles and the presence of furniture increased measurement variability in indoor scenes. In the outdoor scene, measurements that were not taken along walls (e.g. from one marker to another) had significant variability. The measuring device used does not appear to have a significant impact on measurement variability when scenes are "easy" to measure, but may make a difference in large scenes or scenes with angles or obstacles, particularly in novice investigators.

Michels, A.N., Department of Geosciences, Fort Hays State University. STATISTICAL ANALYSIS, FUNCTIONAL MORPHOLOGY, AND PRESERVED GUT CONTENTS PROVIDE INSIGHT INTO THE TROPHIC ECOLOGY OF ACTINOPTERYGIAN CLADES FROM THE WESTERN INTERIOR SEAWAY. Actinopterygian fish of the Cretaceous Western Interior Seaway (WIS) had diverse body morphologies specialized for procuring food in warm, shallow seas with muddy seafloors. In this study, I performed linear regression on fossil fish collected in the Niobrara and Carlile formations, as well as their extant relatives, to investigate the relationship between orbital diameter, jaw length, and body length. Residual values from the linear regression were plotted to create a functional morphospace. Jaw length to body length ratios estimate the largest possible gape of the fish. Orbit diameter to body length ratios permit inferences regarding visual acuity and sensitivity. Together, these values aid in determining feeding ecologies. The WIS taxa primarily occupy the region of morphospace that is characterized by fish with relatively small eyes and jaws. However, taxa including Pachyrhizodus, Cimolichthys, and Saurodon all occupy morphospace characterized by relatively large eyes and long jaws. In modern assemblages, the fish that occupy this morphospace are primarily nocturnal hunters, pelagic piscivores, or planktivores. This may suggest the WIS had low light conditions with selective pressure for increased visual sensitivity. Comparing results among clades provides insight into how feeding ecologies vary geographically and temporally. Additionally, known gut contents of fossil taxa were analyzed when possible to determine diet, and were compared to results from the statistical and functional morphological approaches.

Mikkelsen, M.S. and Mercader, R.J., Department of Biology, Washburn University. EFFECTS OF AGING ON OVIPOSITIONAL BEHAVIOR OF *PIERIS RAPAE*. Ovipositional behavior is considered to play a key role in determining host range evolution in plant feeding insects. Identifying the factors that influence host-selection behavior will therefore help gain a mechanistic understanding how associations between plants and plant feeding insects evolve. Due to its effect on the time available for host selection and learning, butterfly age is expected to have a significant effect on host selection. As adult females age they are expected to become less selective as they become time limited, but also have the potential to be more efficient foragers due to prior experience. Here, we were interested in testing if a) age does have an effect on *P. rapae* ovipositional selectiveness and b) if ovipositing females exhibit behaviors consistent with learning with age. To test this, *P. rapae* were reared in laboratory conditions and female ovipositional behavior recorded 4, 8, and 12 days after emergence and subsequently behavioral sequences were analyzed. Females were recorded with three host options, a preferred host, a lower quality host, and a non-host. Results did not suggest a reduction in selectivity, as the proportion of eggs laid on the preferred host increased with age. However, a significant decrease in time spent drumming per host and an increase in approaches and landings on the preferred host compared to the other two was observed. These results suggest that *P. rapae* can learn and that learning may be able to override any effects of time limitation as female butterflies age when preferred hosts are available.

Miller, R.[1], Curwen-McAdams, C.[2] and Arterburn, M.[1], [1]Department of Biology, Washburn University; [2]Department of Crop & Soil Sciences, Washington State University, Mt. Vernon. KARYOTYPE VARIATION IN EARLY GENERATION POLYGENERIC WIDE HYBRIDS OF PERENNIAL WHEAT. Perennial wheat breeding lines are produced by crossing annual hexaploid bread wheat (*Triticum aestivum*, 2n = 6x = 42, AABBDD) with perennial wheatgrass species such as tall wheatgrass (*Thinopyrum elongatum*, 2n = 14, EE) and intermediate wheatgrass (*Thinopyrum intermedium*, 2n = 6x = 42, EEJJSS). The hybridization process is usually followed by doubling chromosome content with colchicine so that each chromosome has a pairing partner. These hybrids exhibit a perennial life cycle and are useful in sustainable agriculture systems. When these

perennial wheat lines are used in crosses to other wheat varieties, subsequent generations experience considerable chromosome number variation. We performed cytological examination of a unique set of perennial wheat crosses, involving various *Thinopyrum* parents, that were performed without the use of colchicine. We examined F1, F2 and F3 specimens of these crosses. Expectedly, chromosome number varied considerably in the specimens examined. Fertility rates were very low and multiple specimens were completely sterile. We used genomic in situ hybridization (GISH) to identify the genome origins of the chromosomes present, and detected considerable variation among the alien chromosomes.

Miller, W.R.[1], Cotten, H.[2], Kimball, S.A.[1], and Lowman, M.D.[3], [1]Department of Biology and Chemistry, Baker University; [2]Fifth Grade, Hill Elementary School; [3]Californian Academy of Science. TARDIGRADES OF THE CANOPY: FROM OUTREACH TO CLASSROOM TO SCIENCE. It is a National Science Foundation objective to reach out with science and educate the public about the mystery, the discovery, and the facts of our sciences. Tardigrades, or water bears, are a charismatic animal that every school child knows as tough survivors that have been travelers in space. We describe our experiment of educating the public with "Water Bear Hunts" at National Park BioBlitzs, major Natural History museums such as the California Academy of Sciences, and smaller venues. We explore the process of educating a 5th grade class through learning to collect habitat samples of moss and lichen, through seeing their first "cute" water bear, to learning the process of catching tardigrades and making slides for scientific analysis. From there we discuss the challenge of guiding students thorough identification of specimens to genus. We relate the experience of helping students formulate hypotheses, and design investigations to answer ecological research questions about density and diversity and distribution. We guide the students through the process of reporting their results and data. Tardigrades are a great tool for teaching research because so little is known about them, they are easy and inexpensive to work with, and we can put students on the edge of knowledge where most any question they ask does not yet have an answer.

Miller, W.R.[1], Nor, S.A.M.[2] and Lowman, M.D.[3], [1]Department of Biology, Baker University; [2]Department of Biology, Universiti Sains Malaysia; [3]Institute for Biodiversity Science and Sustainability, California Academy of Sciences. NEW RECORDS OF TARDIGRADES FROM PENANG, MALAYSIA, A PRELIMINARY REPORT. During October, 2017, the California Academy of Sciences and the Universiti Sains Malaysia hosted a BioBlitz in Penang, Malaysia to support the application of the Habitat on the Hill for a UNESCO World Heritage site designation. More than 100 scientists from around the world converged on the island of Penang to document the flora and fauna of the undeveloped tropical forest preserve and its canopy. The site is at 800 meters elevation above the city of Georgetown on the top of the island of Penang on the west coast of peninsular Malaysia. A world class nature tail and new canopy walkway makes the Habitat a unique place for public outreach, scientific research and forest conservation. The Baker Tardigrade team was invited to participate in the BioBlitz. A review of the literature suggested that only one species of tardigrade existed in Malaysia. During the 10 days of collections from ground level to more than 30 meters into the canopy two Classes, three Orders, five Families, and 12 species of water bears were separated and identified as new to the country of Malaysia, South East Asia and the Asian Ecological realm. At least one species is thought to be new to science and with more samples to process even greater diversity is expected to be discovered beyond this preliminary report.

Mogle, M.J.[1], Kimball, S.A.[1], Miller, W.R.[1] and McKown, R.D.[2], [1]Department of Biology and Chemistry, Baker University; [2]Mid America Parasitology Services, LLC, Juniata, NE. TARDIGRADES IN BIRD PLUMAGE SUPPORT AVIAN-MEDIATED LONG DISTANCE DISPERSAL. Terrestrial tardigrades are a phylum of microscopic, aquatic invertebrates famous for cryptobiosis and space travel, but little is known about their modes of long distance dispersal (LDD) on Earth. Wind is assumed, but not truly demonstrated, to be the major method of global dispersal. Yet, some water bear distribution patterns cannot be explained by prevailing winds because prevailing winds move east-west (or vice versa) but do not cross the equator. Because most neotropical migrant birds move north and south, with many crossing the equator, and because most associate closely with tardigrade habitats during foraging and nesting, we propose that birds serve as ectozoochorous vectors for LDD in tardigrades. When multiplied by billions of birds over millions of years, the number of tardigrade dispersal events facilitated by birds would explain both regional and intercontinental biogeographic patterns of tardigrade distribution better than wind dispersal alone. To test for the potential role of birds in tardigrade dispersal, the carcasses of eight birds (6 species) found recently dead from window strikes and a Sandhill Crane (Grus canadensis) found dead during routine surveys were examined for tardigrades. Of the birds examined, 66% yielded tardigrades from two classes, three orders, and five species, including juveniles, adults, and eggs, suggesting that many bird species may serve as

vectors for many species of tardigrades. Our data support the hypothesis of avian-mediated long distance dispersal of tardigrades and provide evidence that further investigation is warranted.

Moore, A.[1], West, M.[2], Tibbs, L.[3], Cortes, B.V.[4], Miller, W.R.[1], Johansson, C.[5] and Lowman, M.D.[6], [1]Department of Biology and Chemistry, Baker University; [2]Department of Biology, Missouri Western State University; [3]Interdepartmental Genetics and Genomics Program, Iowa State University; [4]Interdepartmental Microbiology Program, Iowa State University; [5]Department of Biology, Fresno City College; [6]Californian Academy of Science. TARDIGRADES OF THE CANOPY: A NEW GENUS FOR *ACANTHECHINISCUS GOEDENI* (HETEROTARDIGRADA: ECHINISCOIDEA: ECHINISCIDAE) FROM OREGON, U.S.A. Recently, the new genus, *Acanthechinscus* was described based on the presence or absence of lateral and dorsal appendages (cirri) and a serrated color on leg IV. The tardigrade *Pseudechiniscus goedeni* Grigarick, Mihelcic & Schuster, 1964 was provisionally moved into the newly described genus. Because the species has only been reported twice in its 50 year history, the authors remarked that the move needed to be verified as this species might also fit into the genus *Multipseudechiniscus*. During the summer of 2017, the students of the NSF: Research Experience for Undergraduates (REU) program at Baker University acquired several specimens of *A. goedeni* while collecting in the canopy of the old growth forests at the H.J. Andrews Experimental Station in west-central Oregon. Since they were close to the location where the original specimens had been discovered, a side trip was organized and additional specimens were captured. The holotype for the species was acquired on loan from the University of California at Davis Bohart Museum of Entomology and a paratype in the collection at the University of Modena and Reggio Emilia, Modena, Italy was examined. The new examples were compared to 55 morphological characteristics for the genera of the *Pseudechniscus* line of the family Echiniscidae. It was concluded, that based on the hierarchy of characters that have been used in the past to discern genera, that this species cannot be assigned to any currently described genus. Thus it is necessary to propose a new genus for the species.

Morphew, A.R.[1], Jameson, M.E.[1], Houseman, G.[1], Jensen, W.[2] and Reichenborn, M.[1], [1]Department of Biological Sciences, Wichita State University; [2]Deparment of Biological Sciences, Emporia State University. DOES CONSERVATON RESERVE PROGRAM LAND SUPPORT DIVERSE AND ABUNDANT NATIVE BEE COMMUNITIES? Declines in native bee diversity and abundance in agricultural ecosystems has been largely attributed to habitat loss and fragmentation. Studies show that the establishment of natural habitats regularly distributed throughout farming landscapes can mitigate these losses, and land under the USDA's Conservation Reserve Program (CRP) has been targeted as an opportunity to augment restored pollinator habitat. This study focuses on CRP land across the state of Kansas (which spans 650 km and a precipitation gradient of 25 cm) and aims to quantify the extent to which these areas can support abundant and diverse pollinator communities. In 2017, we sampled the cavity-nesting bee populations and plant communities at 58 sites throughout the state. We used nest abundance, cell density, and bee identity to measure the pollinator responses of abundance, richness, and fecundity to forb community traits and precipitation. Our preliminary results suggest that native forb richness is the most significant indicator of cavity-nesting bee community abundance and diversity. The management implications of this study could facilitate the development of strategies to create restored pollinator habitat that is more capable of supporting diverse and abundant native bee communities.

Nedblake, H.J., Zitter, R.C., Hahn, Z.M., Harris, T.D., Hageman, S.A., Department of Natural and Physical Sciences, Park University. COMPARISON STUDY OF MARINE TRACE FOSSILS FROM THE UPPER CARBONIFEROUS OF THE ROCK LAKE SHALE IN KANSAS CITY, MO. The Rock Lake Shale of the Upper Carboniferous of the Kansas City Group is interpreted to have been a shallow marine or brackish environment that could facilitate high biodiversity. The organisms previously living within this area can only be identified by trace fossils found in siltstone. Slabs of the Rock Lake Shale were excavated from an outcrop (39°15'09'N 94°41'09'W), washed, and catalogued before being randomly reduced to a 120-slab sample size. Each slab was examined for trace fossils using multiple angles and light sources. Once a trace was discovered, it was classified and compared to literature pertaining to the Rock Lake Shale ichnology. In total, 1,274 traces, from six phyla, made up of 16 different ichnogenera, were found. Traces representing Mollusca (45.4%), Annelida (30.7%), Echinodermata (21.4%), Arthropoda (1.3%), Brachiopoda (0.6%), and Cnidaria (0.6%) were identified. The specific ichnogenera and abundance of the trace fossils from the Rock Lake Shale at the study locality are *Lockeia* (480), *Asteracites* (267), *Planolites* (191), *Trichichnus* (164), *Didymaulichnus* (85), *Oniscoidichnus (Isopodithnus)* (17), *Tomaculum* (15), *Taenidium* (12), *Tigillites* (12), *Chondrites* (9), *Lingulichnus* (8), *Bergaueria* (7), *Cochlichnus* (3), *Chevronichnus* (2), *Curvolithis* (1), and *Zoophycos* (1). Compared to a 1976 study, 68% of previously identified ichnogenera of the

Rock Lake Shale and 1 additional ichnogenera (*Zoophycos*) were identified at this location. Varying depositional environments between outcrop localities during the time of preservation may explain the differences in traces found.

Nickel, T.[1], Welch, W.[1], Cope, C.[2], Schneegurt, M.[3], [1]Derby High School, Derby, KS; [2]Kansas Department of Wildlife and Parks, Great Plains Nature Center, Wichita, KS; [3]Department of Biological Sciences, Wichita State University. SHIFTING UNIONID MUSSEL ASSEMBLAGES OF THE WALNUT RIVER BASIN. The Walnut River Basin is a large watershed in south-central Kansas, with reaches that have become more urbanized in Butler County near Augusta. Sessile unionid mussels are sensitive bioindicators for pollution and siltation in aquatic environments. We have performed mussel surveys along reaches of the Hickory, Walnut, and Whitewater Rivers. Mussels were counted previously at these locations using similar methods during unpublished surveys in 1979 and 2001. Segments of the riverbed (200 yards) were swept for mussel valves using a wade method with at least six effort-hours devoted to each site. Counts suggest that mussel abundance and diversity have continued to decrease over the last 40 years, with declines observed since the 2001 survey. The relative abundance of mussel species at these locations has changed with each survey. There continues to be a trend towards fewer species being represented by live or freshly dead material. Overall, the most abundant live species today were *Corbicula fluminea* (Asian clam), *Leptodea fragilis* (Fragile Papershell), *Quadrula pustulosa* (Pimpleback), and *Tritogonia verrucosa* (Pistolgrip). Note that invasive *Corbicula* was found in both 2001 and 2017. Invasive zebra mussels (*Dreissena polymorpha*) were observed in 2017, but not in these previous surveys. Major threats to mussels include pollution, siltation, channelization, and dams. Any of these could have negatively impacted the Walnut River Basin over the last 40 years, with damming of the Walnut River creating El Dorado Lake. An award from the Chickadee Checkoff Small Grant program supported this work.

Nonnenmacher, H., Biology Department, Pittsburg State University. A PRELIMINARY STUDY OF THE FLORAL ECOLOGY OF TALL THISTLE, *CIRSIUM ALTISSIMUM* (L.) SPRENG., IN SOUTHEAST KANSAS. Tall thistle, *Cirsium altissimum* (L.) Spreng., is a roadside species native to southeast Kansas that flowers during August, September, and October. Study of floral insect visitors on tall thistle was conducted from 2013 to 2015 in Crawford and Cherokee Counties, Kansas. Data based on collections of insects, and pollen removed from them, suggest that native bees, especially bumblebee (*Bombus*) species, appear to be the major pollen moving foragers for tall thistle, and that native bees may rely increasingly on thistle pollen to maintain colonies as flowering resources decline in September. Control of tall thistle populations appears to be achieved partly by herbivory on seeds by species of tephritid fly and microlepidoptera larvae. Literature suggests that seed herbivores of tall thistle may effect seed mortality in nearby populations of non-native thistles. Conservation of native bees and some control of non-native thistles may be connected to presence of tall thistle populations. Control of non-native thistles in southeast Kansas may unintentionally impact tall thistle, native bees that take pollen from it, and a potential natural control against non-native thistles.

Nonnenmacher, H., Biology Department, Pittsburg State University. A STUDY OF *CALLOSAMIA PROMETHEA* (DRURY) AT THE WESTERN EDGE OF ITS RANGE IN AND NEAR CRAWFORD AND CHEROKEE COUNTIES, KS. The spicebush silk moth, *Callosamia promethea* (Drury) produces two broods per year in Missouri. Crawford and Cherokee counties, Kansas, are part of the species' westernmost range. All life stages of *C. promethea* have been collected by the author in Missouri, but in Kansas have been limited to males responding to pheromone-releasing females. From 1997 to 1998, and 2000 to 2005, a study was conducted to determine the potential for, and presence of, a reproductively persisting population of *C. promethea*. Observations of life history stages were made through the use of sleeve enclosures. Diversity of food plants accepted, mortality, eclosion phenology of imagos, and sex ratios of imagos in spring and summer generations were noted for changes in cocoon-spinning success by season and foliage condition. From these data, the status of *C. promethea* as a persistent breeding resident in southeast Kansas was promising but inconclusive. Although food plant species were abundant and diverse, foliage quality available to the summer broods, compared to foliage available to the spring broods, appeared to decline in abundance and quality and may present a fitness challenge in the form of a seasonal nutritional failure to fourth and fifth instar larvae. Complete mortality of larvae was observed in both broods exposed to predation. Countershading potential for larvae appears to vary between food plant species. Presence and abundance of *Sassafras albidum* (Nutt.) Nees may be important in establishment and persistence of a *C. promethea* population in southeast Kansas.

Peeler, A. and Maricle, K., Thomas More Prep-Marian. HOW STEM CELLS MIGHT BE USED TO BIOENGINEER A VITAL ORGAN. Scientists are continuing to make human induced pluripotent stem cells (hiPSCs) while trying to make a new model system for other biology engineers to use. In this project, hiPSCs, their soluble factors, and extracellular matrix (ECM) proteins are discussed and evaluated in order to determine which soluble factors and ECM proteins would be the best to use in an hiPSC; specifically, in a kidney. The procedure consisted of background research in order to find out what hiPSC would work best and with what ECM protein. It was through data tables and continuous research that this experiment was done. The results of the experiment were as follows: the first combination that included TGFA, INHBA, TGFB1, IGF, PDGFA and FN1 looked like it would be the best expressed in the kidney and create the best environment.

Peterson, A., Smith, J.J., Layzell, A. and Bidgoli, T., Kansas Geological Survey, Lawrence, Kansas. STRUCTURAL MAPPING IN THE HUMBOLDT FAULT ZONE USING REMOTE SENSING, CHASE COUNTY, KANSAS. The Humboldt Fault Zone (HFZ) is a complex series of basement faults that extend southwestward from Nebraska through eastern Kansas into Oklahoma. While general trends and major lineaments of the HFZ in Kansas are well understood, there are likely many associated faults and deformation structures yet to be discovered. In Chase County, an abundance of horizontally deposited marker beds, sparse vegetative cover, and relative absence of surface disturbing agricultural activity, makes this area a prime location for remotely investigating and interpreting geological structure. Faults, seen as offsets in geologic contacts, may be mapped from a wide variety of high-resolution imagery. The orientation of geological contacts can be derived remotely using precise surface elevations from LiDAR and by solving three point problems of selected marker beds. An array of these three point problems may be used in combination to build a structural model for the area. LiDAR hillshades also allow for high-resolution interpretation of geomorphology. Using these techniques, we have identified hundreds of previously unmapped surface faults as well as traced the precise surface expression of the Humboldt Fault Zone and its subsidiary faults. The extent of these faults, their record of paleoseismicity, and their potential for moderate to large earthquakes has yet to be determined. Such information is vital for accurate probabilistic seismic hazard assessments and of great interest to a variety of stakeholders, including federal and state agencies involved in permitting and maintenance of major infrastructure and in regulation of industrial activities and facilities.

Pittenger, M.S.[1], Maricle, K.L.[1], Baer, S.G.[2], Johnson, L.C.[3] and Maricle, B.R.[1], [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 several genetically distinct ecotypes. Each ecotype adapts to abiotic and biotic factors within its 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 herbivore pressure, so ecotypes adapted to wetter conditions might have evolved greater herbivore defense mechanisms; therefore, a trade-off may exist between drought resistance and herbivore resistance. We hypothesized 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 56 to 74 percent of leaf area remained, with the more mesic ecotypes being favored by herbivores. We also hypothesized that leaves with more tannins would be less preferable to herbivores. This was tested with measures of leaf tannin concentration from five ecotypes of *A. gerardii* from four common gardens across a precipitation gradient. Leaf tannin concentrations ranged from 0.0 to 5.5% of leaf dry mass, and were different among both sites and ecotypes, indicating environmental and genetic influences on leaf tannin concentration. More mesic ecotypes had lower tannin concentrations and were preferred by herbivores, indicating ecotypes of *A. gerardii* are responsive to environmental factors involving herbivory.

Queiroz, A.R. and Maricle, B.R., Department of Biological Sciences, Fort Hays State University. INFLUENCE OF LIGHT INTENSITY ON GERMINATION, VEGETATIVE DEVELOPMENT, AND REPRODUCTION OF THREE SPECIES OF ASTERACEAE NATIVE TO KANSAS. Plants are strongly influenced by a continuously changing light environment and their ability to detect light provides them vital information for their survival. However, most of the studies on photobiology are about commercial species and little is known about native species to Kansas and its region. Therefore, our objective is to analyze responses of three Asteraceae species native to Kansas under three light intensities during germination, vegetative development, and flowering. Seeds of *Ageratina*

altissima, *Eutrochium purpureum*, and *Solidago ulmifolia* were measured for germination daily in conditions of dark, 10%, 50%, and 100% of natural light. Seedlings were later planted in soil and exposed to the same light conditions, and height, number of leaves, and survivability were measured. Preliminary results show *A. altissima* is the fastest species for germination and its germinability is consistent across light treatments. Germination in *S. ulmifolia* was also consistent across light treatments. For *E. purpureum*, germinability is higher in the light treatments than in the dark. *A. altissima* plants growing in 50% and 100% of light are taller and have more leaves than plants growing under 10% of light. Conventional plant responses to low light include growing taller under shaded conditions, although these plants respond differently. Most habitats in the prairie are exposed to bright sunlight and these results indicate these Asteraceae species are adapted to live and grow under bright light.

Quispe, N.C., Westerhaus, K.O., Kobayashi, Y. and Maricle, B.R., Department of Biological Sciences, Fort Hays State University. EFFECT OF SULFIDE AND LACTIC ACID ON CYTOCHROME C OXIDASE ACTIVITIES IN PLANT ROOTS AND CATFISH LIVER. Sulfide is well known as a metabolic toxin and lactic acid can affect muscle function, yet specific effects of sulfide and lactic acid on respiration enzymes have not been characterized. The objective of this study was to characterize sulfide and lactic acid toxicity on activities of cytochrome *c* oxidase (CytOx), an essential enzyme in oxidative phosphorylation. CytOx activity was measured in tissue homogenates from roots of several plant species and catfish liver samples in the presence of increasing concentrations of sulfide (0 to 20 µM) or lactic acid (0 to 100 mM). Increasing sulfide and lactic acid concentration significantly decreased activity in CytOx. Sulfide had a greater effect on the enzyme compared to lactic acid. Activity of CytOx in catfish liver samples was 40-fold higher than in plant roots and was almost 50-fold more sensitive to sulfide. The inhibition constant (K_i) for sulfide was of 0.1 µM in catfish liver and 4.6 µM in plant roots. Lactic acid also reduced CytOx activities. However, the K_i for lactic acid in catfish liver and plant roots was approximately 80 mM and 50 mM, respectively. Our results indicated that sulfide and lactic acid negatively influenced CytOx activities, but to different degrees. CytOx in catfish liver is more susceptible to sulfide toxicity compared to plant roots. Specific mechanisms of inhibition are currently under investigation.

Rivers, K., Department of Geosciences, Fort Hays State University. FACILITATING THE DEVELOPMENT OF AN ADULT EDUCATION PROGRAM FOR USE IN THE STERNBERG MUSEUM OF NATURAL HISTORY. The Sternberg Museum of Natural History (FHSM), located in Hays, KS, hosts successful children and family education programs, but has struggled with attendance at programs targeting adults. To facilitate the development of successful adult programs at FHSM, a survey has been developed to gather data on adult programs at natural history museums across the United States. Target museums vary in size and location to model program success across diverse demographics. Survey questions focus on a recently held adult education event at their natural history museum. The success of the surveyed event is measured by the audience size in relation to the population of the surrounding region of the museum (attendees per capita), and profits from the event (in US Dollars, if it is ticketed). Surveyed museums are also asked for their qualified subjective opinion of the success of the event. Additional metrics include: event description, day and time it is held, if food/beverages are provided, intended target audience, and marketing efforts. All the information collected will be used to draft a range of educational programs to test at FHSM. In the future, FHSM can then use customized templates based on successful events to deliver successful adult education programming.

Roemer, J.[1], Bain, M.R.[2] and Greer, M.J.[1], [1]Department of Biological Sciences, Fort Hays State University; [2]The Nature Conservancy. THE PURPLE PLAGUE: EFFECTS OF GRAZING POST FIRE ON PURPLE THREEAWN COVER AND REPRODUCTIVE EFFORT. Purple threeawn (*Aristida purpurea)* is a native warm-season bunchgrass quickly gaining attention in western Kansas on The Nature Conservancy's Smoky Valley Ranch. Upon reaching maturity, grazing/clipping pressure decreases for this bunchgrass due to poor forage quality and extreme unpalatability for cattle (*Bos Taurus*) and Black-tailed prairie dogs (*Cynomys ludovicianus*). This decrease in grazing/clipping has led to near monocultures which cause negative impacts to the prairie ecosystem including decreases in suitable habitat for prairie dogs; a keystone species. This directly affects many species on the ranch that rely on prairie dogs for habitat and/or food including the Black-footed ferret (*Mustela nigripes*), North America's most endangered mammal. This study aims to determine a large-scale management strategy using natural processes such as fire and grazing to decrease purple threeawn. Treatments will investigate the effects of high intensity grazing by cattle, at season long and short duration as well as the effects of clipping by prairie dogs, post burn. Live crown density, reproductive stems of purple threeawn, and species composition will be measured. Initial data collection revealed there was a significant decrease in the number of reproductive stems of purple threeawn on plots that were

grazed. The greatest decrease was seen in short duration grazing (120 stems/m^2) as compared to long duration (230 stems/m^2). With further data, an appropriate management plan can be developed against purple threeawn to increase economic benefits while creating better quality habitat for prairie dogs and all organisms that rely on them.

Roy, P.R. and Gleason, J.M., Department of Ecology and Evolutionary Biology, University of Kansas. DANCING IN THE DARK: ASSESSING THE USE OF WING ORNAMENTATION IN FEMALE CHOICE SEXUAL SELECTION. Sexually dimorphic ornamentation used during courtship is often indicative of sexual selection. In the spotted winged *Drosophila* species, males have patches of melanization at the tip of each wing (known as wing spots) that they display to females in a series of wing movements. Visual courtship signals, specifically the wing spot, are therefore presumed to be under female choice sexual selection. We explore the use of such signals in three species of spotted winged *Drosophila* to assess the importance of vision and wing spot in mating success by using choice, no choice, and light-dark mating assays. We find that females use visual cues to assess mates, but do not use the presence of the wing spot to make mating decisions.

Salazar, V., Noland, M.A., Schmidt, C.J. and Greer, M.J., Department of Biological Sciences, Fort Hays State University. SMALL SCALE RESTORATION OF THE STERNBERG NATURAL AREA CONTINUED: INFLUENCES ON COMMUNITY STRUCTURE OF SMALL MAMMALS. Human influence on abiotic and biotic forces are continuing to change ecosystems structure and function over time. Habitat restoration is critical to maintain the diversity in ecosystems. The Howard Reynolds Natural Area located on the Sternberg Museum property has been undergoing restoration using multiple techniques (e.g. tree removal, forb garden establishment, and prescribed burn) to increase the ecological integrity of the ecosystem and provide the public with a suitable outdoor recreation area. Our objective is to determine if the restoration activities have an influence on the community structure of small mammals. Trapping seasons consisted of four trap nights per season with five transects comprised of twenty Sherman live traps spread ten meters apart. The trapping results for year two have resulted in the capture of the same five species as year one with the addition of the Least Shrew (*Cryptotis parva*). In comparison to year one, the Hispid Cotton Rat remains the most abundant species at 89% but saw an overall drop in its relative abundance (94% 2016) due to increased relative abundance of other species. The abundance and diversity of small mammals in an ecosystem have profound impacts on the vegetation, soil structure, and upper trophic levels.

Saldana, C.L.[1], Crupper, S.S.[1] and Kennedy, J.[2], [1]Emporia State University; [2]Kansas City, Missouri Police Crime Laboratory. Y-SCREENING ASSAY TO STREAMLINE SEXUAL ASSAULT SAMPLE PROCESSING AT THE KANSAS CITY POLICE CRIME LABORATORY. Sexual assault is one of the most serious and common crimes facing society, and it is one of the most challenging offences to investigate in forensic laboratories. The analysis of evidence recovered from rape cases is usually labor intensive, time consuming and problematic because of the significant number of samples that do not yield the presence of male DNA. This results in a high percentage of unresolved and backlogged cases. To address this problem, the main objective of this research consisted of testing and validating a screening technique to rapidly determine the presence of male DNA in sexual assault samples for the Kansas City Missouri Police Crime Laboratory. Semen obtained from female swabs were analyzed in the presence of different body fluids to determine if the screening technique accurately and precisely reflected the presence of minimal amounts of male DNA. Our results indicate that saliva, blood and urine does not affect the amount of male DNA that can be quantified, while mixtures of semen with feces resulted in a better chance to detect male DNA. Using well plates also improved the efficiency of the method. This screening technique is a simple, versatile and efficient method to assist DNA analysts in streamlining sexual assault sample processing. Ultimately, it will reduce the number of backlogged cases in Kansas and surrounding communities and aid in the proper prosecution of sexual crimes.

Schoeck, C.S. and Edds D.R., Department of Biological Sciences, Emporia State University. LEMUR USE OF HANDS VS. MOUTH. Several hypotheses have been offered to explain handedness in primates. In prosimian primates, including lemurs, left-hand orientation has been demonstrated; however, few studies have examined hand vs. mouth orientation. We compared preference for use of hand vs. mouth, single hand over both hands, and right hand vs. left hand in captive ring-tailed lemurs (*Lemur catta*), black-and-white ruffed lemurs (*Varecia variegata*), and collared brown lemurs (*Eulemur collaris*). For a male and female of each species, plus twin female offspring of ring-tailed lemurs, we made 100 observations per individual, recording hand vs. mouth use every 30-seconds as individuals performed enrichment and routine daily activities. Overall, these lemurs tended to be more handed than mouth oriented, preferred to use a single hand more than both hands, and used their left hand more than their right.

Males were more left handed than females. Analysis of specific activities showed that eating was hand oriented, while grooming was mouth oriented. Results are also reported by species. Research on lemur use of hands vs. mouth could provide insight into the evolution of handedness in primates.

Schrock, J.R., Department of Biological Sciences, Emporia State University. UNETHICAL PUBLISHER PRACTICES. Virtual publication, the surge in predatory publishers, and unmerited reliance on "publication metrics" in education and research have resulted in serious erosion of the peer review process and in the quality of "published" science. Specific cases are presented of: 1) solicitation of unneeded proofreading for non-English authors, 2) "editors" who fail to edit, 3) "editors" using only reviewers suggested by authors, 4) acceptance of too many "authors," and 5) widespread use of indirect citation. The success of predatory journals in eliminating a blacklist of those journals is particularly alarming.

Schumacher, K.W., Tanner, L.E., Channell, R., Greer, M.J. and Stark, W.J., Department of Biological Sciences, Fort Hays State University. COMPARISON OF VEGETATION MEASUREMENT TECHNIQUES FOR ESTABLISHMENT OF LONG TERM MONITORING PROTOCOL FOR GRASSLAND BIRD COMMUNITIES AT QUIVIRA NATIONAL WILDLIFE REFUGE. In 2014, Quivira National Wildlife refuge in central Kansas initiated a collaborative research project with Fort Hays State University to develop a protocol for long-term monitoring of the refuge's ecological communities. As part of this monitoring effort breeding bird point-count surveys focused on grassland bird species were established. Survey transects contained 30 observation points arranged to investigate grassland bird community associations with habitat classifications as defined by the US Fish and Wildlife Service's National Vegetation Classification System. Surveys yielded 14,061 observations of 48 species in 2016 and 26,704 observations of 57 species in 2017. Occupancy modeling was conducted to assess bird community relationships to vegetation characteristics measured at each observation point. The results will assist refuge staff in developing and adjusting management practices in response to changes in bird communities.

Silverman, J., Center for Environmentally Beneficial Catalysis, University of Kansas. 'LIVING' CHEMISTRIES: METABOLIC AND REPLICATIVE SYNERGY IN ABIOTIC CYCLES. From the origin of life evolved the complex question of what life is, in no small part because of the increasingly elaborate nature of modern biology. Nevertheless, certain fundamental patterns shared between all biotic cycles may be spotted amongst simple abiotic components. A self-organizing replicative organic cycle linked to a photolithoautotrophic metabolism, comprising a homeostatic buffered solution and atmosphere ripe for carbohydration serve as a useful example to demonstrate the plausibility of not merely spontaneous life on earth, but chemicals in coincident cycles that create a framework to sustain life and allow for further evolution. The confluence of an abiotic calcium-carbon cycle, coupled with the autocatalytic formose reaction serves to produce a diverse mixture of chiral sugars from carbon dioxide and water providing a fuel for future biology. Though this system shares the functions and not the structure of modern life, it may serve as a starting point to scale these patterns towards more complex life. The origin of life may well not be an accurate way of understanding life, instead life may discerned among existing cycles at the confluence of function and form. With calcium, carbon, oxygen, and hydrogen alone one can have a surprising amount of life, but with a few more elements and many millions of years, perhaps life as we know it.

Sloop, N.E. and Leung, S.H., Department of Chemistry, Washburn University. OXIDATION OF BENZYLIC METHYL GROUPS ON PYRROLE COMPOUNDS USING OXONE ON SILICA GEL. Based on the work by Fields *et al*, Oxone ($KHSO_5$) was used as an oxidizing agent with silica gel to pursue surface-mediated reactions to oxidize α-methylpyrroles to α-formylpyrroles. Previous work by research students Long and Flohrschutz provided a simple reaction that was carried out successfully and easily reproducible. However, the reaction time was long. In this study, to speed up the reaction, heat was applied and the ratio of Oxone and silica gel was adjusted. The reaction times were shortened from the 4-day range to as little as 1 day.

Smith, D.R., Department of Ecology and Evolutionary Biology, University of Kansas. USING A NATIVE BEE, *COLLETES INAEQUALIS* (COLLETIDAE) IN RESEARCH-INTENSIVE CLASSES. The solitary, univoltine, ground-nesting bee, *Colletes inaequalis*, is an ideal subject for research-intensive undergraduate courses. It occurs widely across the eastern US and southern Canada, forming aggregations of a few to hundreds of nests. On the University of Kansas campus, females emerge and initiate nests in the second-third week of March and are largely finished with nesting activities by late April-early May. This fits nicely with university Spring semester schedules. In 2016-2018, we offered a 2-3 credit course focused on this bee. The main teaching goal is to provide students an

opportunity to design a research project of their choice on the biology of *Colletes inaequalis*, write a short research proposal, carry out their study and present results in the form of a poster. The first 1/3 of the course, prior to the bees' emergence, is devoted to study of bee biology and the Colletidae. A week's activities include a topical lecture; reading and discussion of a research paper related to the topic of the week; and a hands-on activity. When bees emerge, regular classes are suspended and students work on their projects. Weekly progress meetings are held during the regularly scheduled class time. The last few weeks are devoted to data analysis and preparation of posters. All students present their posters to the department and are encouraged to present their results at a university-wide undergraduate research symposium (and other venues). I have found that this increases student familiarity with primary scientific literature, critical thinking, and formulation of testable questions.

Smith, J.J., Ludvigson, G.A., Layzell, A. and Dunham, J.W., Kansas Geological Survey, Lawrence, Kansas. OVERVIEW AND DIRECTION OF THE GEOLOGIC MAPPING PROJECTS AT THE KANSAS GEOLOGICAL SURVEY. Geologic mapping conducted by the Kansas Geological Survey (KGS) is supported in large part through a USGS-awarded annual competitive grant program called STATEMAP. In recent years, efforts have focused on areas where geologic mapping can address surface- and groundwater issues, aggregate resources; and, in recent years, wide public concern over induced seismicity related to petroleum production in south-central Kansas and Oklahoma. Mapping projects in Haskell, Finney, Reno, Harvey, McPherson, and Harvey counties investigated Cenozoic deposits of the economically vital High Plains Aquifer (HPA). The aquifer is under increasing developmental stress and geologic mapping aids in the delineation and correlation of hydrostratigraphic subunits. Recent mapping projects in Miami, Rice, and Lincoln counties have focused on the delineation of surface and subsurface geologic units to meet the ever-increasing demand for construction aggregate. South-central Kansas is experiencing an extraordinarily high number of earthquakes since 2013. The recent spate of seismicity in Kansas and other parts central United States has revealed faults that were previously unknown and raised concerns about the hazard that these structures may pose. Quaternary alluvial deposits are the priority-mapping units in Harper, Sumner, and Cowley counties because they supply much of the local groundwater demands. These alluvial deposits are also of special interest for close examination as possible recorders of seismic paleoliquefaction structures; such as sand blows, fissures, clastic dikes, and areas of localized subsidence. Dating such features may help to estimate regional potentials for moderate to large earthquakes and improve the accuracy of probabilistic seismic hazard assessments.

Smith, L., Department of Physical Science, Emporia State University. IDENTIFYING SINKHOLES IN NORTHWEST BARBER COUNTY USING LIDAR, HISTORICAL AIRPHOTOS, AND GIS: QUANTIFICATION, ACCURACY, AND TEMPORAL CHANGE. Northwest Barber County, Kansas lies within the Red Hills physiographic region of south-central Kansas. The area is known for its stunningly beautiful mesas, oil and gas production, ranching, and gypsum mining. It is also known for its many caves and sinkholes. While the presence of caves and sinkholes has been known by locals and scientists for many years, the number of sinkholes has never been quantified and their spatial and temporal patterns have not been studied. The goal of this research was to use GIS analysis of modern digital aerial photography (NG911, 2015 and 2017 NAIP) and LiDAR coupled with fieldwork to quantify the number of sinkholes and their spatial patterns in Northwest Barber County. To determine if there have been changes in quantity and spatial patterns of sinkholes historical aerial images from 1950 were registered and rectified using 2015 NAIP images as a reference layer using ArcGIS 10.4.1. A preliminary digitization of depressions using a shaded relief rendering of LiDAR imagery was created. A field excursion to the study area in February of 2018 was undertaken to determine if digitized depressions were sinkholes. Digitizing protocol for sinkholes was modified based on field observations and digital imagery overlain on LiDAR. More than 2000 topographic depressions, approximately 1000 of which are believed to be sinkholes have been digitized. While some sinkholes are also visible on 1950 imagery it have insufficient resolution to accurately digitize all sinkholes present in 1950. Additional research is needed to determine factors affecting spatial patterns of sinkholes.

Steffen, D.D., Sternberg Museum of Natural History. DETERMINING SUTURE COMPLEXITY IN AMMONITES: DOES EQUIPMENT MATTER? Throughout ammonite evolution, shell suture patterns grew increasingly more complex, possibly relating to structural integrity. The purpose of these immovable joints has long been debated. Researchers have often used a variety of ways to study these sutures, including fractal analysis. The extension FracLac analyzes photographs to determine a fractal dimension for each image. In this study, suture patterns of ammonites were quantified using box-counting fractal analysis. Photographs were taken using two different cameras to determine the sensitivity of this method. One camera was a basic Canon PowerShot 20

megapixels and the second was a Nikon D5300 24.2 megapixel DSLR. The fractal dimensions were then compared to the dimensions calculated using the step-line method developed by Jacobs in 1997. Preliminary results show that, while the images were clearer using the DSLR camera, the calculated fractal dimensions from the two cameras were not significantly different.

Stone, R.L., Engasser, E.L., and Jameson, M.L., Department of Biological Sciences, Wichita State University. HEADS OR TAILS: AN ANALYSIS OF DUNG BEETLE (COLEOPTERA: SCARABAEIDAE: SCARABAEINAE & APHODIINAE) ATTRACTION TO SMALL MAMMAL CARRION. Necrophilous insects occupy a biologically interesting ecological niche because carrion is a highly coveted but ephemeral food source. Insects that feed on carrion are widely studied in forensic and entomological disciplines, but many taxa attracted to decomposition are often overlooked. Dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae and Aphodiinae) are frequently found at carrion, but very little is known about their attraction to this resource. Are dung beetles attracted to the carrion itself or are they attracted indirectly because the gastrointestinal contents of the animals are exposed? This research attempts to disentangle the association between dung beetles and carrion as resource by examining the distribution of dung beetles on the head-end and tail-end of rat carrion, delimiting a resource more attractive to necrophagous insects (head-end) and a resource more attractive to coprophagous insects (tail-end). Comparisons were also made of dung beetle distributions on rat carrion with carrion beetle (Coleoptera: Silphidae) distributions, serving as a model of distribution patterns for a taxon known to target carrion. A total of 25,081 dung beetle individuals from 21 total species and 3,333 individual carrion beetles from 9 species were collected in our year-long study. Results indicate that dung beetles show higher attraction to the head-end of rat carrion than the tail-end. This distribution pattern is also found in carrion beetles. When dung beetles are grouped by behavioral guilds, rollers and tunnellers also share this pattern of greater abundance at the head-end than the tail-end, but dwellers show no discernable difference between the head-end and tail-end.

Stramel, D.A., Alexander, J., Black, L. F., Salazar, V., Stroyan, E.C., Greer, M.J., Fort Hays State University. UNDERGRADUATE RESEARCH AT THE STERNBERG MUSEUM NATURAL AREA. The Sternberg Museum of Natural History at Fort Hays State University was granted land and a building in 1991. An area of 22 acres of the property was an old pasture. The area was idle for years. In 2010 a grant from the Environmental Protection Agency was received, and restoration efforts began in 2016. Some efforts to date have been removal of encroaching species, seeding of native forbs, and a prescribed burn. Today the area is being used as a study site for undergraduate FHSU students. Research projects on herpetology, small mammals, insects, and native plant distribution have been completed, or are in progress. giving students experience in research at a site conveniently located.

Stroyan, E.C. and Greer, M.J., Department of Biological Sciences, Fort Hays State University. SMALL SCALE RESTORATION OF THE STERNBERG NATURAL AREA: POTENITAL INFLUENCES ON THE SOIL MICROBIAL COMMUNITY. Restoration potentially alters the diversity and relative abundance of numerous communities within an ecosystem. The Sternberg Natural Area is currently undergoing numerous restorations activities (e.g. tree removal and forb garden establishment, and periodic burning) to increase the ecological integrity of the area and make it more appealing to the public. Our objective is to determine if these restoration activities will have an influence on the soil microbial community, with specific focus on five plots subjected to burning and planted with a native forb mixture at the Sternberg Natural Area. Preliminary soil composition data was collected once in September, with three transects across five plots. Each transect consisted of sampling from directly within the given forb plot, two meters outside the forb plot, and five meters outside the forb plot, with individual forb plots differing in vegetative composition and position on the physical landscape. Bacteria (gram positive and gram negative) and fungi (Arbuscular Mycorrhizal and Saprophytic) biomass were tested to determine diversity and stress levels of the soil community, which can further be used to determine overall soil quality and health. This is a preliminary study, with the results to be referenced and compared to further sampling and data collection in the future.

Tauber, G.O., Carvalho, C. M. and Greer, M.J., Department of Biological Sciences, Fort Hays State University. SOIL MICROBE ISOLATION SURROUNDING NATIVE AND INVASIVE GRASSES TO TEST FOR ANTIMICROBIAL PROPERTIES AGAINST E.S.K.A.P.E. RELATIVES. As non-native species (such as *Bothriochloa ischaemum* and *B. blahdii*) continue to invade native lands, they alter the landscape. *Bothriochloa* spp. have been shown to have allelopathic effects. These allelochemicals need more investigation as to whether or not

these biochemicals alter the microbes in the surrounding soil and/or have antimicrobial properties. If so, these antimicrobial properties could lead to new antibiotics. Antibiotic and antimicrobial resistance such as in the E.S.K.A.P.E pathogens, has begun to run rampant around the globe and has caused great dilemma to many physicians. The E.S.K.A.P.E. pathogens present a real threat to our society today. Samples were taken from soil surrounding *Bothriochloa ischaemum, B. blahdii*, and *Andropogon gerardii* - a native grass. After initial serial dilution and selection of colonies, the isolated colonies were tested against E.S.K.A.P.E. pathogen relatives for antimicrobial properties. There were zero zones of inhibition from samples taken near the invasive species, while two colonies from *Andropogon gerardii* samples showed zones of inhibition (both against S*taphylococcus epidermidis*). The bacteria were found to be a gram-negative cocci and a gram-negative bacilli. Further testing will be performed to determine the identity of the bacteria.

Tullis, V.R., De Los Santos, B., Russell, F.L., Department of Biological Sciences, Wichita State University. CHARACTERIZATION OF TREE SPECIES COMPOSITION IN RELATION TO SLOPE ASPECT IN CROSS TIMBERS WOODLANDS. Through much of eastern North America oak dominance of forests is decreasing as fire regime change and regeneration of mesophytic tree species increases. However, oak woodlands have been hypothesized to be stable communities on the most xeric sites. The Cross Timbers ecosystem represents the xeric extreme of eastern deciduous forest and south and west-facing slopes represent the driest sites in the Cross Timbers. As a first step to understanding oak community stability in the Kansas Cross Timbers, we addressed effects of slope aspect upon the structure and species composition of tree communities. Point-quarter sampling was used to quantify tree species composition on two xeric (south- and west-facing) and two mesic (north- and east-facing) slopes in four Cross Timbers woodland. There was no difference in tree density, tree species diversity or size structure of the tree community between slope aspects. Tree community size structures at three of the four sites were dominated by individuals in small size classes, indicating prolific recent recruitment. Aspect affected the abundance of non-oak species at only one, of four sites. We found evidence supporting niche differentiation between post oak (*Quercus stellata*) and blackjack oak (*Q. marilandica*), the two dominant tree species, with post oak associated with xeric slopes and blackjack oak associated with mesic slopes. In conclusion, we find that effects of slope aspect upon woodland composition are much weaker than variation among sites.

Watson, D.F., Houseman, G.R., Jameson, M.L., and Reichenborn, M.M., Department of Biological Sciences, Wichita State University. EFFECTS OF PRECIPITATION, GRAZING, AND INITIAL PLANTING PRACTICE ON CRP PLANT DIVERSITY ACROSS KANSAS. The Conservation Reserve Program (CRP) is a federally funded program that has converted marginal cropland to native plant communities over the past 30 years with the goal of preventing erosion, improving water quality, and reducing loss of wildlife habitat and biodiversity. Nationwide, 23.5 million acres are currently enrolled in CRP, yet few studies have examined the re-establishment of CRP plant communities at a large scale. As part of a larger three-year study, we collected vegetation data from 108 CRP sites across the precipitation gradient in Kansas to determine the effects of planting practices (CP2 and CP25) and periodic grazing on plant communities. In 2017, plant species richness increased linearly across the precipitation gradient from an average of 5 species per m2 in the west to 10 species per m2 in eastern Kansas. Across sites, 88 plant species were identified in the western region, 125 in the central, and 143 in the eastern region. Collectively, 237 species were found across the 108 sites, representing over 11% of all plant species that occur in Kansas. Across all regions, neither grazing nor planting practice had a detectable effect on plant species richness or evenness. However, within the western and eastern regions, plant communities differed significantly between CP2 and CP25 planting practices. These differences were caused by shifts in the abundance of dominant grass species as well as differences in forb composition between the two planting practices.

Waymire, A.[1], DuBuc, M.[2], Miller, W.R.[3] and Lowman, M.D.[4], [1]Department of Biology, Bethany College; [2]Department of Biology, University of Connecticut; [3]Department of Biology and Chemistry, Baker University; [4]Californian Academy of Science. TARDIGRADES IN THE CANOPY: AN ANALYSIS OF ARBOREAL HABITATS.. With the support of a National Science Foundation (NSF) Research Experience for Undergraduates (REU) grant to Baker University, 22 students, some with ambulatory disability, collected more than 3,500 samples of two different tardigrade habitats (moss & lichen) from as high as 30 meters in the canopy of 493 substrate trees of 37 species in four different forest types from Massachusetts and Florida thru Kansas to Oregon. From these, more than 28,600 water bears of 30 different species were extracted. The habitat acidity and alkalinity was measured by pH and based on a hypotheses of expected similarity both significantly different and expected results were obtained within and between locations (states), between substrates (tree species), and at different levels (heights with in the

canopy). The results support discussion of suitable habitat for the growth and development of tardigrade populations considering the dispersal and distributional challenges of an aquatic, non-self-mobile micro metazoan with global distribution patterns. The complex relationships of habitat suitability for tardigrades is examined while recognizing that trees are a relatively short lived substrate for the epiphytic habitat and that the canopy is the youngest part of the tree.

Whittemore, D.O., Butler, J.J., Jr. and Wilson, B.B., Kansas Geological Survey, University of Kansas. COMPARISON OF GROUNDWATER RESOURCE CHANGES IN THE OGALLALA AND QUATERNARY REGIONS OF THE HIGH PLAINS AQUIFER IN KANSAS. The major regions of the High Plains aquifer in Kansas are the Ogallala area in the western third of the state and the Quaternary area of south-central Kansas. Although the aquifer in both regions is composed of sand and gravel interbedded with silt and clay, differences in climate result in large differences in the sustainability of the regions. The range in normal annual rainfall over the Ogallala region is 17–23 inches compared to 23–35 inches over the Quaternary region. Although average annual groundwater use per area during the last two decades (1996–2016) for the Quaternary region (2.42–2.46 inches) is within the range for the Ogallala region (1.63–4.37 inches), the greater precipitation results in substantially more groundwater recharge and stream-aquifer interactions. Therefore, groundwater pumping over the Quaternary region has caused only small average annual water-level declines (0–0.2 ft/yr) during 1996–2016 compared to 0.5–1.7 ft/yr over the three groundwater management districts (GMDs) in the Ogallala region. Plots of average annual water-level change versus annual water use can indicate the short-term sustainability of an aquifer area, i.e., the reduction of annual water use needed to achieve a zero water-level change. The reduction in water use needed for the three GMDs over the Ogallala region ranges from 27% to 33% based on 2005–2016 data. In comparison, the pumping reduction needed for the two GMDs in the Quaternary region ranges from <1% to 2% for 2005–2016. However, the sustainability of the Quaternary region is highly dependent on recharge during very wet years.

Wilkins, R.V. and Morrison, W.R., III, Kansas State University and USDA-ARS Center for Grain and Animal Health Research. REDUCTION IN MOVEMENT AND DISPERSAL CAPACITY OF IMMATURE STAGES OF *TROGODERMA VARIABILE* (COLEOPTERA: DERMESTIDAE) AND TRIBOLIUM CASTANEUM (COLEOPTERA: TENEBRIONIDAE) AFTER EXPOSURE TO LONG-LASTING INSECTICIDE NETTING. The warehouse beetle, *Trogoderma variabile*, and red flour beetle, *Tribolium castaneum*, are two widespread and damaging secondary pests of stored products. Long-lasting insecticide netting (LLIN) on mosquitoes has proved effective in controlling the spread of malaria. Our lab has previously demonstrated that LLINs are effective at preventing the dispersal by adult *Tri. castaneum* and *Rhyzopertha dominica*, but no study has thus far evaluated their behavioral effect on immature life stages of stored product insects. In this study, a movement and dispersal assay were performed. In the movement assay, the video-tracking software, Ethovision, recorded the movement of *Tro. variabile* and *Tri. castaneum* larvae after 1 to 10 min exposure to LLIN or control netting and a post-exposure holding duration of 1 min, 24 hr, 72 hr, or 7 d. In the dispersal assay, the larvae of each species were observed after 5 minutes of exposure to LLIN or control netting to measure the insects' ability to reach new food patches at three different distances. The results from the movement assay showed a significant reduction in horizontal movement and significant increase in angular velocity for larvae exposed to LLINs, indicating that movements were more erratic and less directed. The dispersal assay revealed that exposure to LLIN had a significant effect on the dispersal ability of both species reaching the new food patch. These results indicate that LLINs can be an effective tool for the prevention of establishment and colonization by immature life stages of stored product insects.

Williams, T.M., Department of Geosciences, Fort Hays State University. DESIGNING A MEASURE OF EVOLUTIONARY EDUCATION EFFECTIVENESS IN MUSEUM EXHIBITS AT THE STERNBERG MUSEUM OF NATURAL HISTORY. In recent decades, some natural history museums have begun to design their exhibits in ways that explain specific evolutionary processes and refute common evolutionary misconceptions. At the Sternberg Museum of Natural History (FHSM) of Hays, Kansas, there are two exhibits that explain evolutionary processes in their text: "Rattlerssss" and "Bringing Fossils to Life". A survey has been designed with two objectives: to measure the exhibits' ability to encourage scientific thinking in adult visitors and to identify any misconceptions in visitors that inhibit their comprehension of evolutionary theory. This survey is a localized adaptation of a data collection method from a previous study, where exhibits designed for evolutionary education were examined in other Midwestern natural history museums. FHSM visitors volunteer to give open-ended written responses to questions referring to evolutionary scenarios covered in the exhibits' text; these responses are then examined for evidence of evolutionary misconceptions in the answers and qualitatively coded with keywords and phrases linked

to specific conceptual models. The three conceptual models potentially represented in responses include: (1) informed scientific, (2) naïve naturalist, and (3) supernatural belief. With the same questions being asked before and after viewing the exhibits, qualitative analysis shows if there is any significant change in evolutionary conceptual models utilized by visitors after viewing the exhibits. This survey is the first formal evaluation of FHSM's exhibits and will provide museum staff with feedback on current exhibit design, which will help ensure that visitors are being educated in an effective manner.

Wu, Y., Aguirre-Mendez, C. and Peroza, C., Department of Physical Sciences, Emporia State University. ADAPTING AN INQUIRY-BASED APPROACH TO AN INSTRUMENTAL METHODS LABORATORY EXPERIMENT FOR UPPER-LEVEL FORENSIC SCIENCE STUDENTS: CREATING SPECTRAL LIBRARIES TO ADDRESS THE CLASSIFICATION PROBLEM IN FORENSIC LABS. The purpose of this research is to implement the inquiry-based approach in Instrumental Analysis laboratories and document the critical thinking process, as well as the chemical based structured knowledge used to solve a given comparison problem in the area of forensic science. Two questions are related to this research. The first one is the way that using inquiry-based learning approach promote students' learning and skills in argumentation, problem solving, and data analysis in a forensic lab. The second question is determining the aspects of the evaluation of the evidential value of physicochemical data students learned in the process. This research uses mixed method, which combines quantitative and qualitative approaches, to collect and analyze data. There were 12 students who took part in this research in Fall 2017. Pre and post interviews were used to collect qualitative data. In addition, students' exams and quizzes were recorded and analyzed as quantitative data. I hope through this project to offer implications to science education in science areas such as forensic science and chemical education.

Yang, R. and Greer, M.J., Department of Biological Sciences, Fort Hays State University. PEOPLE, BIKES, AND SKATEBOARDS: IT'S A SCARY WORLD FOR SQUIRRELS. The human population continues to grow with most of this growth occurring in urban areas. With this growth comes an increased impact on the environment and the organisms within it. These impacts can range from decreased population sizes to local extinctions to alterations in behavior. At Fort Hays State University, squirrels are naturally distributed around two areas, the quad and Custer Hall. These two areas represent different levels of human impact: the quad (heavy human activity) and Custer Hall (low human activity). We observed squirrel behavior in response to human presence in these two areas. In order to reduce the influence of time of day and day of week, observation periods were randomly assigned. Different observation spots within the two areas were also picked from time to time to avoid observing the same group of squirrels in every sample period. For all observation days the temperature, time, and season of year were recorded. For each interaction with humans, group size and mode of movement (walking, running, biking) were recorded for humans as well as distance ran and if a tree was climbed were recorded for the squirrel. The main objective of this research is to determine if increased human activity has caused a change in the "fear" response in squirrels. It is important to balance the relationship between humans and animals for the safety of both groups and this will become more important as there is increased interaction between humans and wildlife.

Young, H.R. and Kimball, S.A., Department of Biology and Chemistry, Baker University. EVIDENCE OF PRECIPITATION AND TEMPERATURE PATTERNS IN TREE RINGS OF URBAN AND RURAL TREES IN NORTHEAST KANSAS. Trees respond to environmental factors through trade-offs in growth, survival, and reproduction. In temperate latitudes, tree growth (in the form of wood arranged in annular rings) is constrained by patterns of precipitation and temperature. Comparing locations that differ in weather patterns may help us better understand how tree growth rings reflect historical changes in climate. Urban and rural areas present an opportunity to compare tree growth rates in areas with otherwise similar climates but that differ in temperature and water availability. We propose the hypothesis that tree growth in eastern Kansas urban landscapes is buffered against changes in climate. We tested the prediction that trees growing in an urban, park-like landscape, and those growing in a nearby natural woodland grow at different rates as a response to changing weather patterns. We measured growth rings in tree species found in both locations, keeping within-species sample sizes equal at each location. Using annual regional climate data, we compared tree growth with precipitation and temperature across all years of growth. Only Green Ash (*Fraxinus pennsylvanica*) showed a significant growth relationship to either climate variable (precipitation) and this was only true at one location (natural woodland). Tree growth was more strongly correlated with changes in temperature in an urban setting than in the natural woodland. No other effects were detected in our sample, providing only limited support for our hypothesis. Nevertheless, these results suggest that

future investigators should remain cautious when using tree growth ring data to interpret tree response to changing climatic conditions.

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