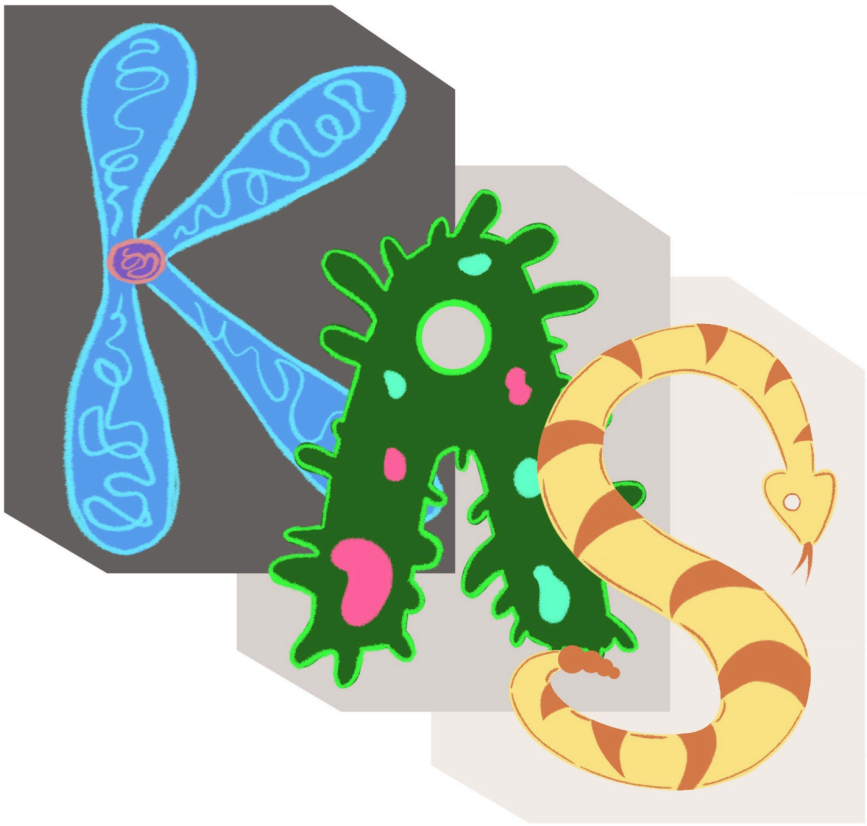
156th Annual Meeting of the

Kansas Academy of Science

Emporia State University

April 5 & 6, 2024



Program & Abstracts

Welcome To Emporia State University

Thank you to our planning committee:

Dr. Joanna Gress

Oliver-Elias Hiszczynskyj

Meghan Cashell

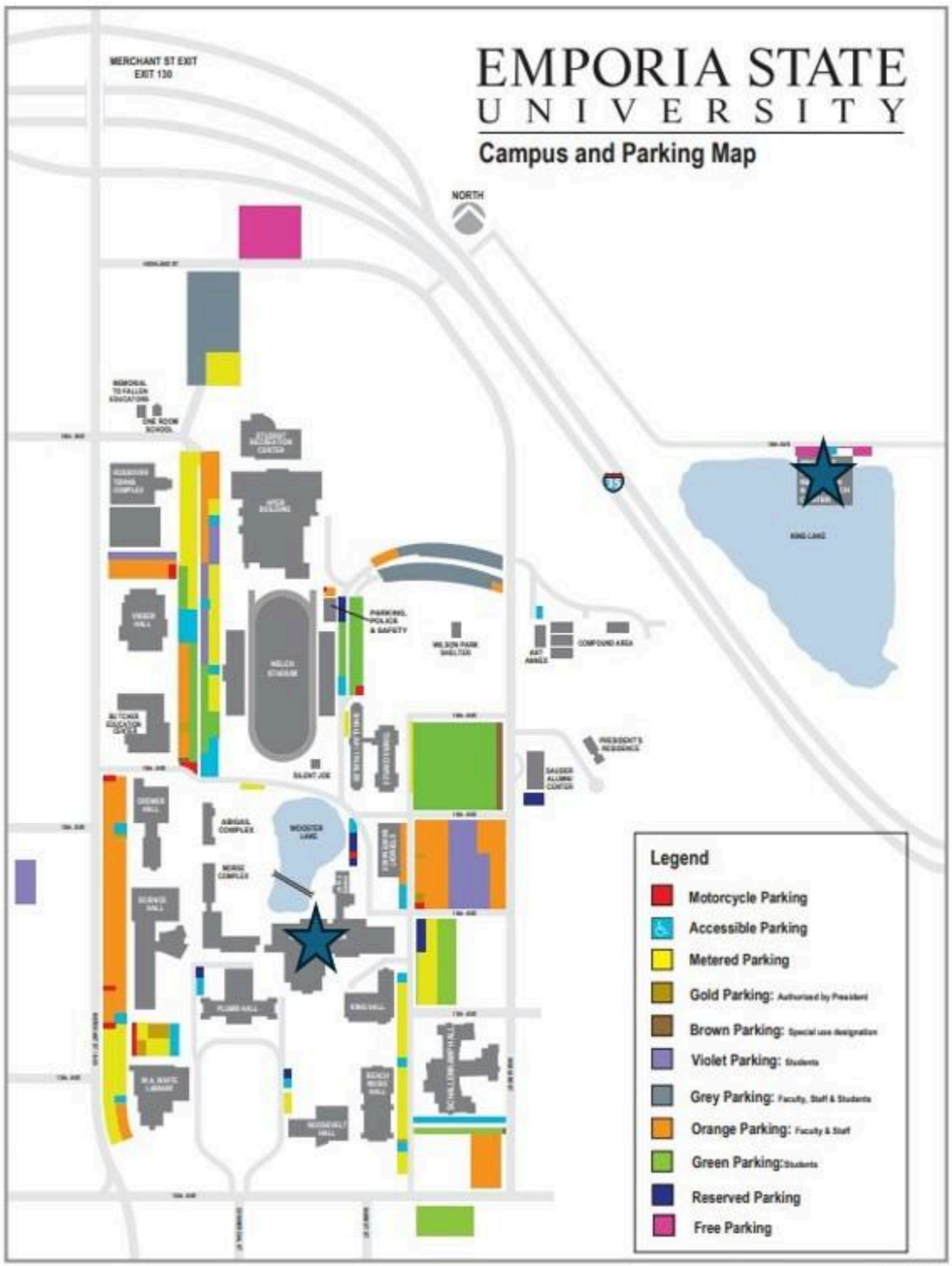
Meagan Fernandez

Alex Swider

David Claridge

And thank you to Andre Johnson for designing the logo!

Emporia Campus Map



PAROC Address: 601 E 18th Ave, Emporia, KS 66801

On Friday, PAROC parking is free

On Saturday, all parking except for Gold and Metered is free

2024 KAS Meeting Schedule

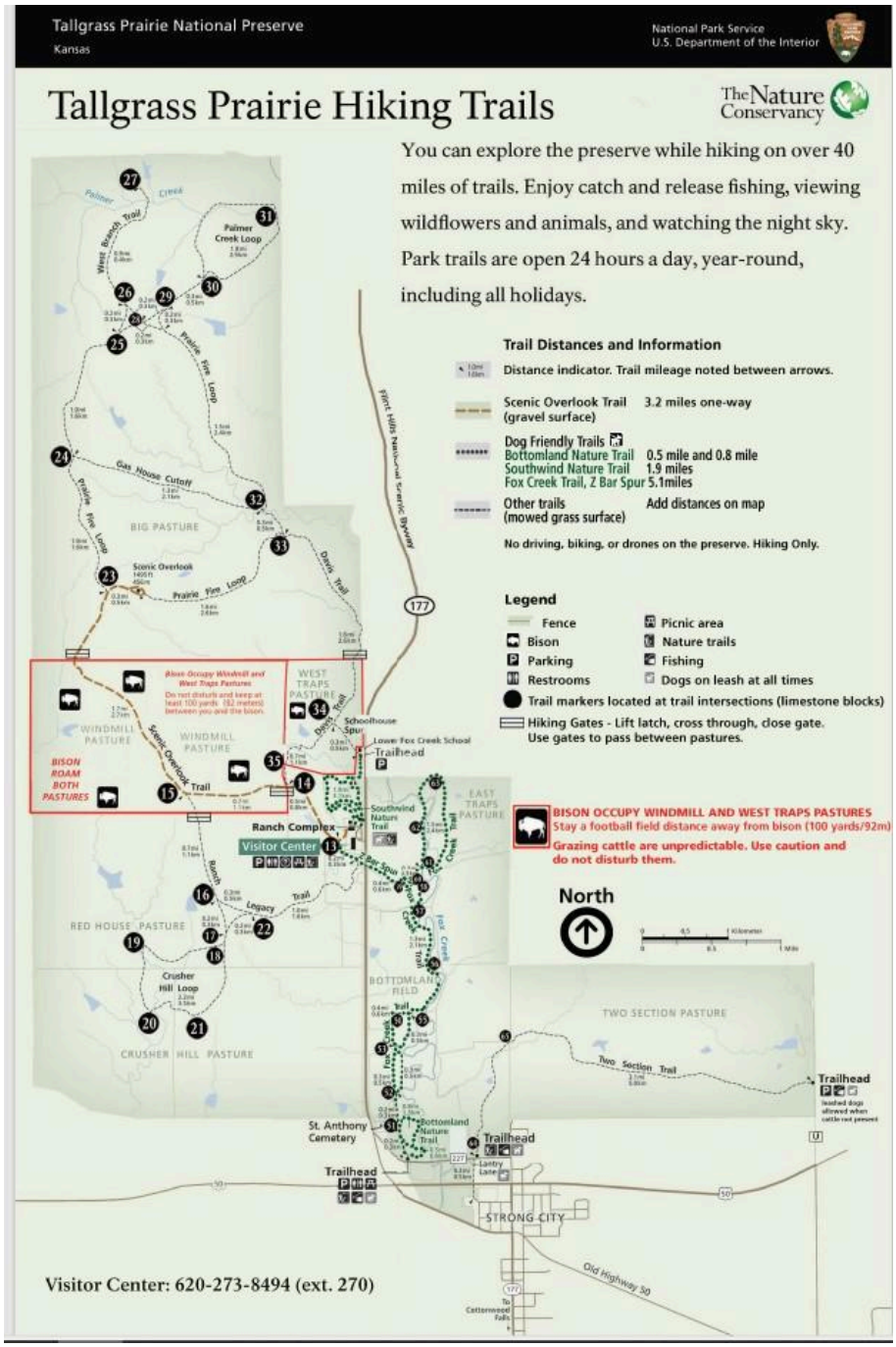
Friday, April 5th:

2:30 pm	Tallgrass Prairie Hike	Meet at PAROC
5:00 - 6:30 pm	Registration	PAROC
6:00 - 7:00 pm	Dinner	PAROC
7:00 - 8:00 pm	Keynote Speaker: Dr. Dennis O'Rourke "Human Population History: Ancient DNA and the Power of Proxies"	PAROC
8:00 - 9:00 pm	Business Meeting	PAROC

Saturday, April 6th:

7:30 - 10:00 am	Registration	Memorial Union Skyline Foyer
7:30 - 9:30 am	Poster Set Up	Memorial Union Skyline Foyer
7:30 - 8:30 am	Breakfast Pastries	Memorial Union Skyline Room
8:30 - 9:50 am	Oral Presentations	Memorial Union: See Detailed Schedule
9:50 - 10:20 am	Break	
10:20 - 11:40 am	Oral Presentations	Memorial Union: See Detailed Schedule
12:00 - 1:00 pm	Poster Session	Memorial Union Skyline Foyer
1:00 - 2:00 pm	Lunch	Memorial Union Skyline Room
1:00 - 2:00 pm	Keynote Speaker: Dr. Kristen Baum "Translating Research Into Conservation"	Memorial Union Skyline Room
2:00 - 2:30 pm	Awards Ceremony	Memorial Union Skyline Room

Friday, April 5th Excursion:



Please be sure to bring plenty of drinking water, wear weather appropriate clothing, and engage in proper tick prevention measures. Due to safety concerns, it is mandatory to keep at least 100 yards away from the bison at any given point in time.

Keynote Presentations:

Friday April 5th 7:00-8:00 pm

"Human Population History: Ancient DNA and the Power of Proxies"

Dr. Dennis O' Rourke

Foundation Distinguished Professor of Anthropology, University of Kansas, Director of KU Ancient DNA Laboratory

My research focuses on the use of molecular genetic methods to address long-standing questions in prehistory. My students and collaborators have conducted fieldwork and research projects in Mexico, the Caribbean, the US Southwest and California, and the North American arctic. Most recently, my group has focused attention on ancient DNA methods to investigate the colonization and dispersal of the North American arctic, and how this informs us about the earlier initial colonization of the Western Hemisphere. Utilizing genomic analyses of both human and archaeofaunal and archaeobotanical materials, my research interests and efforts increasingly are at the intersection of anthropological genetics, bioarchaeology, and paleoecology.

Saturday, April 6th, 1:00-2:00 pm

"Translating Research into Conservation"

Dr. Kristen Baum

Director of Monarch Watch
Professor, Ecology and Evolutionary Biology
University of Kansas

Dr. Baum's research focuses on the effects of land use and management practices on pollinators, with an emphasis on native bees and monarch butterflies. Recent projects have evaluated pollinator responses to prescribed fire and seeding in grasslands, prescribed fire and grazing in rangelands, mowing in roadsides and pesticide applications in canola-wheat-pasture systems. Dr. Baum has served on numerous state, regional and national working groups to support conservation efforts for pollinators.

Oral & Poster Presentations

Undergraduates= (U) Graduates= (G) Faculty= (F)

Oral Presentations Group 1: Kanza Room, MU 233

8:30 - 8:50	U	**Austin Medley and Wai-Foon Hong, Sterling College**, THE BICEPS: THE LONG AND SHORT
8:50 - 9:10	U	**Michael Tweed, Debbie Rogers, and Daniel Giese, Sterling College,** ANALYSIS OF TORQUE ON THE ELBOW, ARM SPEED, AND ARM ANGLE BETWEEN THROWDOWN AND STANDING THROWS AT HIGH INTENSITY
9:10 - 9:30	G	**Andre Johnson and Lynnette Sievert, Emporia State University,** BITE FORCE OF THE GREAT PLAINS SKINK
9:30 - 9:50	U	**Nathan R. Neufeld and Scott A. Kimball, Baker University,** RISK TOLERANCE IN EASTERN GRAY SQUIRREL (*SCIURUS CAROLINENSIS*) AND FOX SQUIRREL (*SCIURUS NIGER*) ON COLLEGE CAMPUSES IN EASTERN KANSAS
10:20 - 10:40	G	**Zachary Schneider and Alexis Powell, Emporia State**

		University, ONE SIZE CATCH ALL: MODIFIED MINNOW TRAPS TO INCREASE CAPTURE RATES OF MUDPUPPIES (*NECTURUS MACULOSUS*)
10:40 - 11:00	G	**Trevor Jones, Rachel Bowes, Chris Steffen, and Tim Burnett, Emporia State University,** NOT SET IN STONE: PHENOTYPIC PLASTICITY AND MORPHOMETRIC RESPONSE OF NATIVE FISH DUE TO INVASIVE CARP PRESENCE IN THE KANSAS RIVER
11:00 - 11:20	G	**Binuri Thotagamuwa and Russell Leland, Wichita State University**, SPATIAL SCALE DEPENDENCY OF ASSOCIATIONAL EFFECTS ON WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) BROWSE SELECTION
11:20 - 11:40	G	**Brandon Franta, Alexis Powell, Shelly Wiggam, and Darren Rebar, Emporia State University**, WHAT'S ALL THE WALLOWING ABOUT? BISON WALLOWS AND GRASSLAND BIRDS IN THE FLINT HILLS

Oral Presentation Group 2: Veterans Hall, MU 270

8:30 - 8:50	F	**Belkasim Khameiss and Scott Ishman, Kansas Geological Survey,** GEOCHEMICAL AND MINERALOGICAL CHARACTERIZATION OF SIDERITE IN LATE PENNSYLVANIAN STRATA UTILIZING BENTHIC FORAMINIFERA ANALYSIS: A CASE STUDY OF CORES PNR#1 AND EDMONDS A1, EASTERN KANSAS, UNITED STATES
8:50 - 9:10	U	**Sophia Hodge and Wai-Foong Hong, Sterling College,** *BACILLUS MOJAVENSIS*, FOUND IN KANSAS, AS A CANDIDATE FOR BIOFERTILIZER IN HIGH-SALINITY ENVIRONMENTS
9:10 - 9:30	G	**Jack Sytsma[1], Helen Winters[1], Adam Smith[2], Erica Newman[2,3], Sonny Lee[1], Ari Jumpponen[1], and Loretta Johnson[1], [1]Kansas State University, [2]Missouri Botanical Gardens, and [3]University of Texas at Austin,** INTRASPECIFIC TRAIT VARIATION OF BIG BLUESTEM *ANDROPOGON GERARDI* ACROSS ENVIRONMENTAL GRADIENTS OF THE US: IDENTIFYING POTENTIAL SOURCES OF CLIMATE ADAPTATION

9:30 - 9:50	G	**Tucker Eckols, Erika Martin, Richard Sleezer, and David McKenzie, Emporia State University,** WOOD YOU LIKE TREES WITH THAT? THE RELATIONSHIP BETWEEN WOODLANDS AND WOODY ENCROACHMENT IN TALLGRASS PRAIRIE
10:20 - 10:40	F	**John Richard Shrock,** WHY THE U.S. DECLINES IN SCIENCE
10:40 - 11:00	F	**Rajarshi Dey and Ana Clare Elizarraras, Emporia State University,** INTENDED USAGE OF CHATGPT AMONG MATHEMATICS EDUCATORS
11:00 - 11:20	F	**Alan E. Peterson, Kansas Geological Survey, The University of Kansas,** SPATIAL DISTRIBUTION OF MIMA MOUNDS IN THE FLINT HILLS, CHASE COUNTY, KANSAS
11:20 - 11:40	G	**Jacqueline Maille[1], Dan Brabec[2], Kun Yan Zhu[1], William R. Morrison III[2], and Erin D. Scully[2], [1]Department of Entomology, Kansas State University, and [2]USDA – ARS Center for Grain and Animal Health Research, Manhattan, KS,** ENHANCED DETECTION OF STORED PRODUCT PEST INFESTATIONS IN WHEAT USING ELECTRONIC NOSE TECHNOLOGY

11:40 - 12:00 pm	U	**Richard J. Wolf and Scott A. Kimball, Baker University,** TAIL PLUMAGE CHARACTERISTICS IN AMERICAN KESTRELS (*FALCO SPARVERIUS*) AS AN INDICATOR OF MATE QUALITY.

Poster Session: Skyline Foyer

F1	**R. Jones, Emporia State University**, ALTERNATE REALITIES
F2	**James S. Aber and Susan E.W. Aber, Emporia State University,** KANSAS WIND-ENERGY DEVELOPMENTS
F3	**Alan E. Peterson and Jon J. Smith, Kansas Geological Survey, The University of Kansas**, A LIDAR DERIVED STRUCTURAL CONTOUR MAP OF THE COTTONWOOD LIMESTONE, DEEP CREEK AREA, RILEY COUNTY KANSAS
F4	**Darren Cox[1], Scott Kimball[2], and William R. Miller[2], [1]Kansas State University and [2]Baker University,** TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: AUTOMATED MICROSCOPIC SLIDE BOXING
F5	**Belkasim Khameiss, Scott Ishman, Kate Andrzejewski, and Jay Kalbas, Kansas Geological Survey.** PALEOENVIRONMENTAL DYNAMICS AND BIOTIC COMPOSITION OF UPPER

	CRETACEOUS MARINE DEPOSITS: INSIGHTS FROM WILSON LAKE, KANSAS
G5	**Austin Smith, Emporia State University,** CARPING THE DIEM: A LOOK AT THE IMPACT OF INVASIVE CARP ON THE NATIVE FISHES OF THE KANSAS RIVER
G6	**Elizabeth Murdock and Darren Rebar, Emporia State University,** BLINDED BY THE LIGHT; ANTHROPOGENIC LIGHT IMPACTS LIFE-HISTORY TRAITS AND INDUCES A TRADE-OFF IN FEMALE FIELD CRICKETS
G7	**Jacob G. McGehee, Oluwafifeyemi Babatope-Ojo, and Jennifer M. Gleason, University of Kansas,** FEMALE-FEMALE AGGRESSION IN THE FRUIT FLY *ZAPRIONUS INDIANUS*
G8	**Meghan Cashell, Oliver-Elias Hiszczynskyj, David Claridge, Meagan Fernandez, Jacob Spidell, Jae Horn, and Joanna Gress, Emporia State University,** EFFECTS OF MANAGED HONEY BEES (*APIS MELLIFERA*) ON NATIVE BEES IN TALLGRASS PRAIRIES
G9	**Jacob Spidell, Oliver-Elias Hiszczynskyj, Meghan Cashell, David Claridge, and Joanna Gress, Emporia State University,** INVESTIGATING THE ROLE OF PHYTOCANNABINOIDS IN ENHANCING HONEYBEE HIVE SURVIVAL
G10	**Marielena Banos[1], Alexis F. L. A. Powell[1], Stephen D. Fields[1], and William R. Miller[2] [1]Emporia State University; [2]Baker University,** ABUNDANCE AND DIVERSITY OF TARDIGRADES IN CAMPUS WOODS

G11	**Forster, Heather D. Forster;, Joel T. Steyer, Joel T.; Hopkins, Sara M. Hopkins,; Todd, Richard B. Todd, Kansas State University** The *Aspergillus nidulans sarB* gene encodes a putative UDP-N-acetylglucosamine transporter involved in amino acid utilization
U12	**Jordon Hansen[1], Levi M. Hansen[2], and Wai-Foong Hong[1], [1]Sterling College and [2]Hansen Orthodontics,** CASE STUDY-INHERITANCE OF SUPERNUMERARY TEETH IN A FAMILY WITH A SYSTEMIC CONDITION
U13	**Madison Moses, Luke Dixon, and John C. Simmons, Friends University,** THE EFFECTS OF COVID 19 ON LUNG CAPACITY IN COLLEGE STUDENTS
U14	**Hunter Nelson, Elaina Jone, and Patrick Matthews, Friends University,** A NOVEL POPULATION OF ITALIAN WALL LIZARD (*PODARCIS SICULA*) IN WICHITA, KANSAS
U15	**Johan Knoff, The University of Kansas,** THE HERPETOLOGICAL FAUNA OF EOCENE BALKANATOLIA.
U16	**Primavera Trevino and Russell, F. Leland, Wichita State University,** FACTORS INFLUENCING LOCATIONS OF WHITE-TAILED DEER (*ODOCOILEUS VIRGINANUS*) TRAILS IN KANSAS CROSS TIMBERS WOODLANDS.
U17	**Chase Nash and Ryan Calvert, Tabor College,** CAUSES OF WHITE-TAILED DEER MOVEMENT IN SOUTHEAST KANSAS.

U18	**Nicole Krieg, Emporia State University,** WISH FOR FISH: BRIEF ASSESSMENT OF THE FISH COMMUNITIES ON PRIVATE PROPERTY.
U19	**Madison Atha and Wai-Foong Hong Sterling College.** EFFECTS OF *BACILLUS AMYLOLIQUEFACIENS* AF AND AW ON STEM-ROOT RATIO
U20	**Meagan Fernandez, Oliver-Elias Hiszczyskyj, Meghan Cashell, David Claridge, Jacob Spidell, Jae Horn, and Joanna Gress, Emporia State University,** BEE ALARMED: THE IMPACT ON NEONICTINOIDS ON HONEY BEE (*APIS MELLIFERA*) LEARNING AND MEMORY
U21	**Connor R. McCready and Jennifer M. Gleason, University of Kansas.** MULTIPLE MATING AND REPRODUCTIVE SUCCESS IN *ZAPRIONUS INDIANUS* FEMALES

U22	**Cole VandeVelde and Jennifer M. Gleason, University of Kansas,** LARVAL AGGREGATION IN DROSOPHILA SPECIES
U23	**Justin Castaldi[3], Rupinder Singh[1,4], Jaymi Peterson[2,3], Adina L. D. Santana[2,3], Kun Yan Zhu[1], Kaliramesh Siliveru[2], Dmitry Smolensky[3], and Erin Scully[1,4] , [1]Department of Entomology, [2]Department of Grain Science and Industry, Kansas State University; [3]Grain Quality and Structure Research, [4]Stored Product Insect and Engineering Research, USDA Agricultural Research Service,** REDUCED LESSER GRAIN BORER PROGENY PRODUCTION IN POLYPHENOL RICH SORGHUM VARIETIES

U24	**Jaden Reed[1], Jacqueline Maille[2], Nicholas Sixbury[3], William Rust[3], Daniel Brabec[1], William Morrison[1], Kun Yan Zhu[2], and Erin Scully[1] , [1]USDA-ARS, Manhattan, KS; [2]Kansas State University; [3]USDA, Manhattan, KS** FOOD DRIVEN LONG-TERM FLIGHT PATTERNS OF INDIAN MEAL MOTHS
U25	**Tyler Matthews, Anthony Warnecker, and Patrick Matthews, Friends University,** FIRES BUGGING YOU?: THE EFFECTS OF CONTROLLED BURNS ON ARTHROPOD POPULATIONS
U26	**Helen Winters[1], Jack Sytsma[1], Ari Jumpponen[1], Sonny Lee[1], Adam Smith[2], Erica Newman[3], and Loretta Johnson[1], [1]Kansas State University; [2]Missouri Botanical Gardens; [3]University of Texas at Austin** IDENTIFYING POTENTIAL CLIMATE-ADAPTED FUNCTIONAL TRAITS OF A DOMINANT PRAIRIE GRASS ACROSS PRECIPITATION AND TEMPERATURE GRADIENTS
U27	**Mason P. Moore and F. Leland Russell, Wichita State University,** THE INFLUENCE OF ABOVE GROUND RESOURCES VERSUS BELOW GROUND RESOURCES IN LIMITING POST OAK SAPLING GROWTH IN KANSAS CROSS TIMBERS WOODLANDS
U28	**K. Morgan and W-F. Hong, Sterling College, Kansas,** THE EFFECTS OF *BACILLUS AMYLOLIQUEFACIENS* (AF AND AW) AND *BACILLUS MOJAVENSIS* (BM) ON HUMAN BACTERIA
U29	**Jerah Schmidt and Ryan Calvert, Tabor College,** DEVELOPMENT OF PROTOCOLS FOR TRANSCRIPT ANALYSIS OF COMBED OF

	PUBLICALLY AVAILABLE TRANSCRIPTOMIC DATA WITH THE GOAL OF IDENTIFYING NOVEL TARGET GENES IN EXTRA-NODAL NK T CELL LYMPHOMA (ENKTL): PROGRESS REPORT
U30	**Laura Savage and Ryan Calvert, Tabor College,** DIETARY EFFECT ON MEAT TENDERNESS GENES CALPAIN AND CALPASTATIN (PROGRESS REPORT).
U31	**Kaiya McKie and Erin R. Morris, Baker University,** OBSERVING UPD GENE EXPRESSION IN *DROSOPHILA MELANOGASTER* AFTER SEPTIC INJURY.
U32	**Oliver-Elias Hiszczynskyj, David Claridge, Meghan Cashell, Megan Fernandez, Jacob Spidell, and Joanna Gress, Emporia State University,** ASSESING THE PROTECTIVE EFFECTS OF PLANT-BASED ANTIOXIDANTS IN NEONICTINIOD TREATED *APIS MELLIFERA*
U33	**Maggie Stadler and Erin R. Morris, Baker University,** EFFECT OF LIGHT WAVELENGTH ON EXPRESSION OF TOC1 IN *ARABIDOPSIS THALIANA*
U34	**Taylor Evans. Christian Gomez. Erin R. Morris, Baker University,** EFFECT OF SALT CONCENTRATION ON EXPRESSION OF GPDH-1 IN *C. ELEGANS*
U35	**Sydnee Hammond, Emporia State University,** USING THE DEREG KNOCK-IN MOUSE MODEL TO INVESTIGATE THE ROLE OF THE T-REGULATORY CELL IN VACCINE EFFICACY

U36	**Annalyse Gilmore, Jeffrey Horinek, Lindsay Pruett, Ryn Sprague, Tristian Stevens, Kelsie Tucker, and Charles J. Neef, Pittsburg State University,** EFFECT OF HALIDE IN AMMONIUM SALTS IN THE ADDITION OF BENZOIC ACID TO STYRENE OXIDE
U37	**Annalyse Gilmore, Jeffrey Horinek, Lindsay Pruett, Ryn Sprague, Tristian Stevens, Kelsie Tucker, and Charles J. Neef, Pittsburg State University,** EFFECT OF ALKYL LENGTH IN AMMONIUM SALTS IN THE ADDITION OF BENZOIC ACID TO STYRENE OXIDE.
U38	**William R. Miller[1], Darren Cox[2], and Scott Kimball[1], [1]Baker University and [2]Kansas State University,** TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: ROBOTIC ASSISTED DISSECTING MICROSCOPE STAGE FOR MAKING RESEARCH SLIDES
U39	**Jordyn Lowrie and Ryan Calvert, Tabor College,** STUDENT PERSPECTIVES ON VIRTUAL REALITY AS AN ALTERNATIVE TO PHYSICAL MODELS IN A COLLEGE ANATOMY COURSE.

Abstracts: Oral Presentations

THE BICEPS: THE LONG AND SHORT
Austin Medley and Wai-Foong Hong
Department of Natural Science and Mathematics, Sterling College

The biceps brachii muscle is a large fusiform muscle located along the upper arm. It is characterized by a central belly of muscle fibers that tapers off at both ends into tendons. These tendons attach proximally to the scapula: long head attaches to supraglenoid tubercle and the short to the coracoid process. The distal tendon of the biceps attaches to radial tuberosity. It is this connection that helps produce movement of the forearm as to range of motion in lifting and pulling. Two significant phenotypes of the biceps have been shown in the body builder competition: the long biceps and the short biceps. With the long biceps the muscle fibers extend further along the tendon to the distal insertion resulting in a shorter tendon. The short biceps muscle fibers stop at a shorter distance and work through a longer distal tendon. Both

phenotypes are normal. This study presents results from a family pedigree tree of a family having long and short biceps. Seventeen individuals were interviewed. Ten were male and seven were female. Testing for long or short biceps revealed that 10 individuals had long biceps whereas 6 had short biceps and one is unknown. Pedigree analysis of the family tree indicate that the phenotype of the bicep's length is not sex related but is probably regulated by autosomal dominant gene(s).

ANALYSIS OF TORQUE ON THE ELBOW, ARM SPEED, AND ARM ANGLE BETWEEN THROWDOWN AND STANDING THROWS AT HIGH INTENSITY

Michael Tweed, Debbie Rogers, and Daniel Giese
Department of Natural Sciences Sterling College

In baseball, catchers utilize a unique set of throwing mechanics for throwdowns, a type of throw that is quick and from either a crouched position or on the knees for throwing out runners attempting to advance to second base. This study compares the torque, arm speed, and arm angle of throwdowns from a crouched position and upright throws from a standing position at maximum effort for both. All data was collected using the Driveline Pulse sensor positioned on the medial side of the elbow. The data for throwdowns (n=125) and standing throws (n=122) were collected over three different days by catchers (n=3) from the Sterling College baseball team. The torque on the elbow was about the same in both types of throws (p-value = 0.1298 n.s.). The arm speed for standing throws was higher on average than for throwdowns (p-value = 0.0383). The arm angle for standing throws was lower on average than throwdowns (p-value = 0.0071). The torque for both throws is similar, but throwdowns produce less arm speed. This data shows balls thrown from the throwdown position are less efficient than standing throws. Further statistical analysis showed that the effect size for the type of throw was small, so even though throwdowns seem to be slightly less efficient, they are efficient enough to be able to successfully throw runners out at second base.

BITE FORCE OF THE GREAT PLAINS SKINK

Andre Johnson and Lynnette Sievert
School of Science & Mathematics, Emporia State University

Bite performance data in lizards are used to determine the kinds of prey available to a species, illuminate sexual selection patterns, and to diagnose the results of male-male combat and other social interactions. Therefore, bite force data are crucial to comprehending the ecology of a given lizard species. Many factors can influence bite force including head and jaw length, head height, jaw width, diet, body length, and body temperature. Here I parcel out the specific morphological and thermal factors that contribute to the bite force of the Great Plains Skink. I measured head height, jaw width, jaw length, gape width, mass, SVL, and total length and tested bite forces of 32 animals at different temperatures (22, 26, and 32°C) to determine which factors had the greatest impact on force output. Each animal was measured for bite force at jaw tip at all temperatures and left jaw angle at 26°C.

RISK TOLERANCE IN EASTERN GRAY SQUIRREL (*SCIURUS CAROLINENSIS*) AND FOX SQUIRREL (*SCIURUS NIGER*) ON COLLEGE CAMPUSES IN EASTERN KANSAS

Nathan R. Neufeld and Scott A. Kimball
Department of Biology and Chemistry, Baker University

In order to successfully forage and avoid predation, animals must balance feeding with predation avoidance. Risk tolerance can be defined as the threshold amount of perceived risk an animal is willing to take on before it flees to seek shelter. One way to assess risk tolerance is to measure an animal's Flight Initiation Distance (FID), the straight-line distance between an animal and its perceived risk when it initiates a flight to safety. Closely related species may express different FIDs if they differ in ability to perceive risk or capacity to defend against a risk. In this study we measured FID in two closely related

species of tree squirrels, eastern gray squirrel (Sciurus carolinensis) and eastern fox squirrel (Sciurus niger), to better understand risk aversion in these species. We presented a potential threat to squirrels foraging in two tree-rich Kansas college campus locations, the Baker University Ivan L. Boyd Arboretum, and the University of Kansas Marvin Grove. We found no significant difference in FID between these two species, suggesting that these species assess risk similarly. These results provide a good starting point for future research into the topic of predator avoidance behavior in squirrels, while helping to better understand the basic ecology of two species whose ranges are expanding in Kansas.

ONE SIZE CATCH ALL: MODIFIED MINNOW TRAPS TO INCREASE CAPTURE RATES OF MUDPUPPIES (*NECTURUS MACULOSUS*)

Zachary Schneider and Alexis Powell
School of Science & Mathematics, Emporia State University

In North America, the Mudpuppy (Necturus maculosus) has the largest distribution of any fully aquatic salamander and is found both in lotic and lentic waters. It has much potential as an indicator of water quality and ecological health, being widespread in eastern North America, a top-level predator, and spending its entire life cycle in water. Although sometimes abundant, none of the methods for finding mudpuppies (e.g. electroshocking, seining, Briggler's traps, Gee's minnow traps, trotlines) are very successful, capture rates being 0.020–0.045 individuals per unit effort. A reliable capture method would make feasible many studies (e.g. of distribution, population sizes, physical health) that are currently impractical. My aim is to develop a better live-trap for mudpuppies by modifying Gee's minnow traps, which are widely available, relatively inexpensive, and easy to transport and work with in the field. I line the inner sides of each trap with a sheet of dark plastic so that the interior might be perceived as a potential hiding spot. Some traps also have drift fences attached to guide mudpuppies into the trap. Non-modified Gee's minnow traps serve as my control. I am testing these traps designs at Melvern and Pomona lakes. Preliminary results will be discussed.

NOT SET IN STONE: PHENOTYPIC PLASTICITY AND MORPHOMETRIC RESPONSE OF NATIVE FISH DUE TO INVASIVE CARP PRESENCE IN THE KANSAS RIVER

Trevor Jones, Rachel Bowes, Chris Steffen, and Tim Burnett
School of Science & Mathematics, Emporia State University

Invasive carp species were introduced to the United States in the 1970s having drastic effects on native aquatic systems because these large bodied fish primarily feed on zooplankton suspended in the water column (planktivore). Feeding mode and diet of native fish may have environmental factors causing change in body shape and gill raker morphology, this study aims to assess phenotypic plasticity and morphometric response of native planktivores in the presence/absence of invasive carp in the Kansas River. We sampled at three different sites located on the Kansas River separated by a series of manmade barriers preventing invasive carp from traveling freely upstream. Nine native species were collected from three stretches in the Kansas River, where we looked at whether body shape and gill raker morphology in native species shifted in response to a diet shift caused by invasive carp presence at two of our three sites. We quantified the change in gill raker morphology by measuring RNA (gene expression) of specific genes, here we show there are specific shifts in morphology of native species dependent on size class and density of carp. In conclusion, this study provides a greater understanding of the impacts of invasive carp invasions on native ecosystems. The results of this study can be used for predicting future river invasions and tracking invasive pressure on native species.

SPATIAL SCALE DEPENDENCY OF ASSOCIATIONAL EFFECTS ON WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) BROWSE SELECTION

Binuri Thotagamuwa and Leland Russell
Wichita State University

The species composition of vegetation surrounding saplings may affect herbivore browse decisions at fine spatial scales. The quality and quantity of the neighborhood plant community may either attract or deter herbivores, generating associational defense or susceptibility. White-tailed deer (Odocoileus virginianus) are over-abundant, generalist herbivores in eastern North America that can strongly affect forest vegetation by browsing. In Kansas and Oklahoma, the Cross Timbers ecosystem occupies the forest-prairie transition region and high deer densities appear to affect regeneration of these woodlands. This study addresses 1) what types of associational effects influence deer browse decisions in Cross Timbers woodlands and 2) at which spatial scales these associational effects occur. We sampled deer browsing intensity on post oak (Quercus stellata) and blackjack oak (Q. marilandica), across 10 study sites in Kansas and Oklahoma. Neighborhood herbaceous cover and woody species were quantified at three scales 2m²,10m² and 20m² around each sapling. We performed model selection of generalized Linear mixed Models (logistic regressions), using Akaike's information Criterion corrected for small sample sizes (AICc). Our findings are inconclusive regarding which scale is most predictive, as AICc values of best models differ by <2. Quality of the neighborhood may have a stronger influence than quantity. Shannon Diversity Index, relative preference of surrounding sapling species ('selectivity index'), and forb cover significantly affected browse intensity, at one or more spatial scale. Both Shannon Diversity Index and Selectivity Index were positively related to browsing, suggesting associational susceptibility. Conversely, forb cover demonstrates a negative effect, indicating neighbor contrast defense.

WHAT'S ALL THE WALLOWING ABOUT? BISON WALLOWS AND GRASSLAND BIRDS IN THE FLINT HILLS

Brandon Franta, Alexis Powell, Shelly Wiggam, and Darren Rebar
School of Science & Mathematics, Emporia State University

American Bison (Bison bison), which once numbered in the tens of millions in North America, were nearly slaughtered to extinction in the 1800s, but millions of old bison wallows and other micro-depressions remain on the landscape. With rain, those features may hold water and serve as ephemeral wetlands that can support many organisms, including shorebirds (Charadriiformes) and grassland birds. From 9 April – 12 May 2022 and 20 March – 17 May 2023, we measured the extent to which migrating birds that stopover in native rangeland uplands use those ephemeral wetlands during spring migration. We surveyed 46 transects (with and without micro-depressions; 11,985 m total length) at Tallgrass Prairie National Preserve and three private properties in Chase and Greenwood counties, Kansas. For each transect, burn history was obtained from the land manager and vegetation height and density were measured. Each of the 373 micro-depressions was assigned to a wetland and emergent vegetation cover class in each survey. We found six shorebird species and seven other bird species present within micro-depressions. Several species appeared to be attracted to recently burned grassland rather than to micro-depressions per se. However, spatial patterns were analyzed which helped to shed light on seemingly existing relationships amongst migrating birds and micro-depressions in the Flint Hills.

GEOCHEMICAL AND MINERALOGICAL CHARACTERIZATION OF SIDERITE IN LATE PENNSYLVANIAN STRATA UTILIZING BENTHIC FORAMINIFERA ANALYSIS: A CASE STUDY OF CORES PNR#1 AND EDMONDS A1, EASTERN KANSAS, UNITED STATES

Belkasim Khameiss and Scott Ishman
Kansas Geological Survey, The University of Kansas

This study delves into the geochemical and mineralogical attributes of siderite discovered within the late Pennsylvanian strata in cores PNR#1 and Edmonds1, situated in Northeastern Kansas. These cores represent a sedimentary succession characterized by coal beds interspersed with shale, limestone, and sandstone layers, displaying notable concentrations of siderite indicative of heightened chemical weathering in the sediment source regions. The genesis of siderite is attributed to the reducing conditions prevalent within the coal beds, prompting the reaction between ferrous iron and dissolved bicarbonate ions (HCO_3^-), thus clarifying the origin of siderite within coal-bearing formations. Employing qualitative and semi-quantitative analyses utilizing Energy Dispersive Spectroscopy (EDS), we discerned the mineralogical and geochemical compositions of the samples. Elemental distributions within cores PNR#1 and Edmonds1 provided crucial insights into the spatial distribution of siderite. Our findings highlight the biogenic origin of siderite, implicating the consumption of organic matter in its formation. This research significantly enriches our comprehension of siderite genesis within coal-bearing formations, shedding light on the intricate interplay between geochemical processes and depositional environments. Furthermore, based on the geochemical examination of these upper Pennsylvanian beds and the presence of benthic foraminifera, our results lend support to the notion that the genesis of siderite is tied to a brackish wetland environment. This further deepens our insight into the paleoenvironmental context surrounding siderite formation, offering valuable perspectives into the dynamics of ancient ecosystems and depositional settings.

***BACILLUS MOJAVENSIS*, FOUND IN KANSAS, AS A CANDIDATE FOR BIOFERTILIZER IN HIGH-SALINITY ENVIRONMENTS**

Sophia Hodge and Wai-Foong Hong
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Bacillus mojavensis (Bm1) was isolated in Kansas and identified through DNA sequencing of the 16S rRNA gene. It is a rod-shaped bacterium that forms white wrinkles when grown on tryptic soy agar (TSA). Our results show that it not only exhibits antifungal properties against Fusarium sp. isolated from dry rot potato disease and Botrytis cinerea from Botrytis Fruit Rot; it also demonstrates tolerance to salt in both Luria broth and soil collected from Quivira Salt Lake. In growth curve measurements using LB broth with 0%, 5%, and 10% salt, with an initial Bm1 concentration of 10^6 CFU/mL, populations of Bm1 in 10% salt showed a significant drop within 6 hours, followed by a further decrease at 12 hours to 10^4 CFU/mL. Subsequently, the population increased to 10^6 CFU/mL at 216 hours (9th day). The control without additional salt peaked at 10^8 CFU/mL at 6 hours, maintaining the same concentration at 72 hours, and dropping to 10^6 CFU/mL at 216 hours. Given the positive results for Bm1's salt tolerance, it was tested as a biofertilizer in high-salinity soil using rye plants. The high-salinity soil was collected from the Big Salt Lake at Quivira National Wildlife Refuge, Kansas. The experiment showed that after 17 days, the BM1 treatment with added wood chips resulted in an average plant height of 115mm, while the control averaged 85mm. Further experiments in the spring are needed to confirm these results regarding its ability to promote growth in high-salinity conditions.

INTRASPECIFIC TRAIT VARIATION OF BIG BLUESTEM *ANDROPOGON GERARDI* ACROSS ENVIRONMENTAL GRADIENTS OF THE US: IDENTIFYING POTENTIAL SOURCES OF CLIMATE ADAPTATION

Jack Sytsma[1], Helen Winters[1], Adam Smith[2], Erica Newman[2,3], Sonny Lee[1], Ari Jumpponen[1], and Loretta Johnson[1]
[1]Kansas State University, Department of Biology; [2]The Missouri Botanical Garden; [3]Department of Integrative Biology, University of Texas at Austin

Drought and climate change threaten grasslands and their future sustainability. To understand how plants response to climate we characterize climate adaptation of the dominant prairie grass, Andropogon gerardi. We compare trait variation across climates, including dry and wet range margins of where it already experiences climatic extremes. We aimed to quantify its traits and trait variation across its range and sampled 26 populations from CO to NC (325-1400mm/yr rainfall) and TX to MN (4-21 degrees C mean annual temperature). We measured morphological (height, blade width, canopy diameter, leaf thickness, and biomass) and physiological (photosynthesis, water potential, and chlorophyll absorbance) traits and abundance of A. gerardi and other plant diversity. We hypothesized that plants from dry sites would be more drought tolerant (more negative water potential and dwarfed plants with increased leaf thickness). From wetter sites, we expected traits involved in increased competition (robustness, wide leaves, and greater height). Abundance of A. gerardi should be highest in the range core and decline outside this core. Populations in the core should have lowest trait variation compared to high variation in the range periphery, because these sites experience climatic extremes. All traits responded strongly to precipitation and weakly to temperature. Height, diameter, and leaf width increased with precipitation. At drier ranges, plants had high photosynthetic rates, more favorable water balance, thick leaves, and short stature. Trait variation was greatest outside the core, suggesting greatest environmental adaptability to environmental change and potential use in future restorations.

WOOD YOU LIKE TREES WITH THAT? THE RELATIONSHIP BETWEEN WOODLANDS AND WOODY ENCROACHMENT IN TALLGRASS PRAIRIE

Tucker Eckols, Erika Martin, Richard Sleezer, and David McKenzie.
School of Science and Mathematics, Emporia State University

Grasslands are experiencing global land cover loss, and tallgrass prairie losses exceed those of any other ecosystem in North America (≈ 82-99% loss). One major reason for this is woody encroachment, which has many negative consequences, including loss of biodiversity and decreased livestock production. Prevention of woody encroachment is important, but management strategies are resource and time intensive. Dispersal and establishment of tree seedlings may be influenced by characteristics of both woodland and nearby affected prairie. Our objective was to determine if biotic and abiotic environmental characteristics of woodland and adjacent prairie can be used to predict probability of woody encroachment in prairies, allowing for more informed management efforts. We hypothesized that there would be a relationship between these characteristics and likelihood of encroachment. Two Kansas sites were used, Tallgrass Prairie National Preserve and the Flint Hills Tallgrass Prairie Preserve. Collected environmental data included characteristics of the woodland woody plant community, percent prairie coverage of biotic and abiotic features, soil characteristics, and topography. Principal component analysis and simple linear regression were used to identify relationships between environmental characteristics and prairie tree seedling occurrence. Seedlings mostly occurred underneath or next to woodlands and decreased as distance from woodland increased. More seedlings occurred in areas with larger trees. Elm seedling occurrence was significantly higher in areas with more woodland fragrant sumac, longer time since burn, and lower slope. Redbud seedling occurrence was significantly higher in areas with more fragrant sumac and roughleaf dogwood in the prairie.

WHY THE U.S. DECLINES IN SCIENCE

John Richard Shrock

Research continues to confirm China and other countries' ascent in a majority of science fields. Many reasons contribute to 40+ years of U.S. science decline. Governmental factors include: America's federal system where education is managed by each state; low science literacy among governmental and education leaders; legislators low value for funding R&D ending specific major research efforts; shift from

funding basic research to mostly applied research; and 6) taxation concerns. K–12 education factors include: long-term minimal science curricula; minimal training of K–12 teachers in science; separate KSDE/KBOR jurisdictions; Education Schools promotion of a simplistic scientific method, digital access replacing content; AAAS “Less Science, Not More” justification for minimal science; and decreases in childhood experience-base. Earlier benefit of U.S. K-16 science education was widespread use of questioning/critical thinking in science classes. Most other countries teach memorization for leaving exams, used as a college gatekeeper. In 2001, under NCLB and ESSA, K-12 science moved to teach-to-the-state-assessments. The U.S. has a history of cultural “anti-intellectualism” described by Richard Hofstadter where “common sense” is valued more highly than professional learning. Science illiteracy promotes anti-science in teaching of evolution, sex education, gender, anti-vaccination, etc. Additional factors include rejection of the metric system, a dramatic reduction of required gateway tests (ACT or SAT) for entry to U.S. higher education, replacement of efficient reading-on-paper with inefficient digital screen reading, movement to a shorter 4-day school week, a dramatic reduction in hands-on labs and genuine field trips, etc.

INTENDED USAGE OF CHATGPT AMONG MATHEMATICS EDUCATORS

Rajarshi Dey and Ana Clare Elizarraras
School of Science and Mathematics, Emporia State University

ChatGPT (and similar AI-based products) are now a part of student education with a meteoric rise in usage starting spring 2023. We, in this presentation, investigate how the mathematics educators plan to use ChatGPT (and/or similar products) in their teaching. We also investigate if there is any difference in approaches by teachers in High school and teachers in Colleges.

SPATIAL DISTRIBUTION OF MIMA MOUNDS IN THE FLINT HILLS, CHASE COUNTY, KANSAS

Alan E Peterson
Kansas Geological Survey, The University of Kansas

Mima mounds are low relief, domelike, surficial features up to 10 m in diameter and 1 m in height. In the Flint Hills, they are typically found in clusters where the distance between each mound is semi-equidistant. Similar mounds are found in many parts of the world and have been referred to as pimple or prairie mounds in the Great Plains, though they have not been previously recognized in the Flint Hills region. Theories vary regarding their origin and include, but are not limited to, seismic activity, frost heave, coppice dunes, pocket gophers, ants, and termites. LiDAR-derived hillshade imagery was utilized to map mounds in Chase County and surrounding areas. Mounds in the Flint Hills occur where bedrock is shallow and where the soils have not been subjected to agricultural modification, suggesting that the features may predate such practices that would result in their removal from the landscape. To date, nearly 6,000 have been mapped in Chase County alone.

ENHANCED DETECTION OF STORED PRODUCT PEST INFESTATIONS IN WHEAT USING ELECTRONIC NOSE TECHNOLOGY

Jacqueline Maille[1], Dan Brabec[2], Kun Yan Zhu[1], William R. Morrison III[2], and Erin D. Scully[2]
[1]Department of Entomology, Kansas State University and [2]USDA – ARS Center for Grain and Animal Health Research

Post-harvest management relies on early detection of infestations of insects to be successful. However, detecting sources of insect infestations, like Rhyzopertha dominica (Coleoptera: Bostrichidae), Sitophilus zeamais (Coleoptera: Curculionidae), Tribolium castaneum (Coleoptera: Tenebrionidae) and Plodia interpunctella (Lepidoptera: Pyralidae) are often challenging within vast storage spaces in food facilities.

Even with current early detection or management mitigation in place, stored product pests still contribute to the $2.5 billion in postharvest economic losses. Post-harvest insect detection is often labor intensive, and destructive to commodities further reducing post-harvest food security. Therefore, updated technologies like the electronic nose can help combat these loses by advantageously using multivariate sensors, machine learning and pattern recognition software to identify the odors associated with specific insects, grains, and infestation cues. Therefore, we investigated the detectability of four stored product pests in wheat using the state-of-the-art electronic nose, MSEM-160 (Sensigent, Baldwin Park, U.S.A.). Each pest species was reared on hard red winter wheat tempered to 13%. One-hundred-gram wheat samples of infested grain and clean control wheat samples by combining a strategy of selecting sensors and implementing various supervised and unsupervised machine learning.

TAIL PLUMAGE CHARACTERISTICS IN AMERICAN KESTRELS (*FALCO SPARVERIUS*) AS AN INDICATOR OF MATE QUALITY
Richard J. Wolf and Scott A. Kimball
Department of Biology and Chemistry, Baker University

Many plumage characteristics are known to reflect body condition in birds and may be used to convey information such as age, social status, and mate quality to potential mates (Delhey et. al 2007). American Kestrels (Falco sparverius) are one of the few raptor species that express sexual dichromatism, making this species well-suited for studies of the role of plumage coloration in mate choice. Between 2016 to 2023, we used a nest box population of kestrels in eastern Kansas to assess reproductive success and male plumage characteristics, specifically tail coloration, to better understand the role of tail dichromatism in mate choice in kestrels. Wiehn (1997) demonstrated a correlation in the width of the subterminal black band on the tail feather of male kestrels to reproductive success. The aim of this study is to expand on and test this correlation. We hypothesized that American Kestrel male subterminal black band width is inversely related to their reproductive success. We captured 24 male kestrels at nest boxes and collected tail feathers (L4 and R6) and morphometric measurements to compare with reproductive success. Our results support our hypothesis that black subterminal band width is corelated with body condition (measured as a scaled mass index), and that variation in reproductive success varies with black band width, suggesting a role for black band width in mate choice by female kestrels. This study helps to better understand mating system dynamics in American Kestrels, a species in steep decline throughout much of its North American range.

Poster Presentations:

ALTERNATE REALITIES
R. Jones
Emporia State University (Retired)

What the universe IS depends upon whose looking at it. Quantum entanglement says that the state of the observed is not independent of the observer's state. At the classical level different observers will have different concepts available with which to model/understand/perceive the universe. Each of us experiences a somewhat different reality. In his book Coherence In Thought and Action Paul Thagard explores the relative coherence of materialism, theism, and dualism. Each is sufficiently coherent as to each constitute its own alternative reality, each being accepted by different groups of people. Some of the alternate realities are: Materialism: the entities described by physics are all that there is. Idealism: mind is all that there is. Dualism: materialism and spirit interacting with one another. Theism:one (or more) supreme being and its creations. Multiverse: Everett quantum mechanics,inflationary bubbles, fecund universe, etc. The fragmentation of human society is quite natural, we experience some very different realities.

KANSAS WIND-ENERGY DEVELOPMENTS

James S. Aber and Susan E.W. Aber
Emporia State University

Kansas ranks fourth among states for installed wind-generating capacity. In early 2024, Kansas had approximately 4100 wind turbines deployed in 48 wind farms in all parts of the state with an estimated 8.6 gigawatts total generating capacity. Infrastructure development includes high-voltage transmission lines, substations, manufacturing plants, and railway depots. Four companies dominate the wind-turbine market in Kansas—Vestas Wind Systems (Denmark), Siemens Gamesa Renewable Energy (Spain), GE Renewable Energy (USA and France), and Nordex (Germany). Goldwind (China) and Suzlon (India) also have supplied turbines to Kansas. Turbines exhibit a clear trend becoming larger during the past two decades in terms of rotor diameter, total height, and generating capacity. For many years, 500 feet (152 m) was the de-facto height limit for turbines imposed by the Federal Aviation Administration (FAA). However, 500 feet is no longer an absolute limit according to current FAA guidelines. Since 2019, Kansas now has five wind farms in which turbines exceed 500 feet; the tallest of these reach nearly 600 feet (182 m) in total height. At night, wind farms have blinking red lights to warn approaching aircraft, another FAA regulation. In 2023, the Kansas legislature approved and Governor Kelly signed into law a bill that would mitigate this night-time distraction. It requires wind farms to have blinking red lights that activate only when radar detects an approaching airplane, a technique known as aircraft-detection lighting system (ADLS). Two new wind farms, Highbanks east of Belleville and Sunflower near Florence, are the first equipped with ADLS.

A LIDAR DERIVED STRUCTURAL CONTOUR MAP OF THE COTTONWOOD LIMESTONE, DEEP CREEK AREA, RILEY COUNTY KANSAS

Alan E. Peterson and Jon J. Smith
Kansas Geological Survey, The University of Kansas

Bedrock contacts were densely mapped in order to interpret geologic structure in a complexly faulted area near Deep Creek in Riley County, Kansas. The Deep Creek area lies within the Flint Hills and is on the margin of a major basement uplift termed the Nemaha Ridge that continues northward into Nebraska. Precambrian basement rocks are more than 1000 feet higher to the east of Deep Creek than the west. Much of the Flint Hills is burned annually to promote forage for livestock. This practice keeps the bedrock outcrops exposed and clearly visible in both aerial imagery and LiDAR. The Cottonwood Limestone is well exposed in the area and serves as datum for this study. Elevation for each outcropping limestone bench, both up and down section, were manually adjusted to fall into the same plane as the top of the Cottonwood Limestone. The resulting structural contour map, although generated using surficial outcrops, reveals important details about deeper structure. The en-echelon fault trend at the surface directly overlies the basement fault and suggests sinistral displacement as well as vertical.

TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: AUTOMATED MICROSCOPIC SLIDE BOXING

Darren Cox[1], Scott Kimball[2], and William R. Miller[2]
[1]Kansas State University and [2]Baker University

One of the most boring, slow, and costly processes in a laboratory that deals with slide mounted microscopic specimens is simply putting the finished slide into a storage box. While we handle groups of 20 slides on plastic trays, we still must transfer those slides by hand, one at a time to a plastic box of 100 for storage. This process takes from 10 to 15 minutes and requires the researcher to pay attention to the order and orientation so they can be retrieved later. We have designed and implemented a table top robot that can pick up the slide from the handling tray and insert it into the correct slot in the storage box.

Saving time (cost) and increasing accuracy of slotting. Using an Arduino controller, three stepper motors, and 3 servos the unit can sit on a back shelf or counter and work while the researcher is at lunch or being productive elsewhere in the lab. We have developed the device as a Do-It-Yourself project with the files for the 3D printed parts, instructions for assembly, and the Arduino code for operation. The apparatus can be built for a few hundred dollars and will pay for itself quickly. This robotic addition to a lab is a process improvement that teaches cross discipline integration and vision and saves operation cost in reducing researcher time on this process.

PALEOENVIRONMENTAL DYNAMICS AND BIOTIC COMPOSITION OF UPPER CRETACEOUS MARINE DEPOSITS: INSIGHTS FROM WILSON LAKE, KANSAS

Belkasim Khameiss, Scott Ishman, Kate Andrzejewski, and Jay Kalbas,
Kansas Geological Survey,1930 Constant Ave., Lawrence, KS 66047.

This study marks the first comprehensive examination of late Cretaceous marine foraminifera extracted from exposures at Wilson Lake, Kansas. Samples were collected from two distinct sections along Highway 232, denoted as the East Section and the Overview Section. The lower segment of these sections showcases the Graneros Shale, while the upper portion reveals the Greenhorn Limestone. A significant geochronometric constraint is provided by the occurrence of the "X-bentonite" within the upper part of the Graneros Shale, indicating a Cenomanian age for all collected samples. Thirteen samples were collected from these sections, considering both lithological and biological components, in an earnest attempt to target beds exhibiting the highest concentrations of foraminifera. Upon thorough examination of the biogenic fauna, two species of benthic foraminifera were identified: *Rotalipora cushmani evoluta* and *Muricohedbergella planispira.* These species, along with numerous fragments of inoceramid and pecten shells, are commonly encountered in sedimentary deposits dating to the upper Cretaceous era, particularly within shallow marine environments. The stratigraphic layers being studied show evidence of transgressive events, which often lead to the accumulation of fine-grained sediments such as shale and limestone in shallow marine areas. These environments pose challenges for the colonization and proliferation of benthic foraminifera due to factors such sedimentation rates, and light penetration. As a result, the limited establishment of diverse foraminiferal communities in these settings contributes to the observed lack of diversity in the fossil record. Additionally, the shale beds and limestone formations may have been specific habitat niches unsuitable for fostering a varied array of benthic foraminifera. Interestingly, the uppermost strata, characterized by limestone cover, harbor an abundance of the same two taxa mentioned earlier - Inoceramids and Pecten.

CARPING THE DIEM: A LOOK AT THE IMPACT OF INVASIVE CARP ON THE NATIVE FISHES OF THE KANSAS RIVER

Austin Smith School of Science and Mathematics, Emporia State University

Since the 1970’s invasive carp have expanded throughout much of the Mississippi River basin. Bighead (Hypophthalmichthys nobilis) and Silver (H. molitrix) carp are prolific, filter-feeding fish that drastically reduce plankton where their populations get too dense. This can affect resident fish communities who also rely on planktonic resources. Ecological studies often use the relative abundance of stable carbon (C) and nitrogen (N) isotopes to show trophic relationships and describe food-webs. The lower Kansas River has a highly stratified invasion gradient of Hypophthalmichthys carp due to impoundments with high-density, low-density, and absent* reaches. We collected tissue from ten species found across this density gradient to demonstrate the carps’ effect on resident communities using bulk C and N stable isotope samples. The data produced show species-specific shifts in nutrient uptake as well as constriction in overall niche space across the invasion gradient. These shifts demonstrate the trophic cascade these

carp created, more clearly elucidating the toll taken on resident fish communities. We provide a forecast for managers contending with future invasions in the sub-basin by demonstrating carp density-dependent effects on the food webs of native fishes.

BLINDED BY THE LIGHT; ANTHROPOGENIC LIGHT IMPACTS LIFE-HISTORY TRAITS AND INDUCES A TRADE-OFF IN FEMALE FIELD CRICKETS

Elizabeth Murdock and Darren Rebar
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Human-induced rapid environmental changes introduce animals to novel selection pressures that are likely quite different from those that occurred ancestrally. One pervasive anthropogenic stressor, artificial light at night (ALAN), extends into remote areas and may disrupt the day:night cycles to which animals are attuned. Here we ask how this environmental input may influence female Gryllus veletis field crickets' investment in survival and reproductive traits, and whether they trade off investment between these traits. Using the second generation of field-collected individuals from a location absent from ALAN, we reared females from the antepenultimate instar through adulthood in either a control environment or one with ALAN. We then measured their investment in survival through two aspects of immunity, encapsulation and lysozyme activity, and their reproductive investment as the number of eggs within a female. We found that ALAN reduced lysozyme activity and reproductive investment, but not encapsulation. However, females reared in ALAN traded off investment in encapsulation and reproduction, a cost that was not expressed by females reared in the control environment. Our results suggest a two-fold cost of ALAN on females: one on investment in individual traits and another on a trade-off between them. These maladaptive responses to ALAN could substantially impact natural populations over the short term, and whether populations could respond over the long term remains an open question.

FEMALE-FEMALE AGGRESSION IN THE FRUIT FLY *ZAPRIONUS INDIANUS*

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Animals may exhibit aggressive behaviors for access to resources. Aggressive behaviors risk injury and death to the individual therefore, organisms may behave aggressively only when the value of the resource gained outweighs the potential costs. Female Drosophila melanogaster exhibit intrasexual aggression that increases after mating. However, in eight other species studied, aggression either does not change post-mating or decreases. Although the behavior of D. melanogaster is well-studied, the same cannot be said for other fruit flies, including Zaprionus indianus, a drosophilid and agricultural pest with a unique mating system. Male Z. indianus have extra-large sperm thus males do not produce many sperm and females need to remate often or they run out of sperm. Because sperm is a limited resource, females may fight over access to males. In our lab, females have been observed fighting in the presence of sperm depleted males, but aggression has not been quantified. To determine if females fight over a food resource and what aggressive behaviors females exhibit, we recorded starved female pairs of the same mating status (mated or unmated) in the presence of a food resource in a standard Drosophila aggression assay. Both fencing and headbutting were observed, two common behaviors seen in D. melanogaster and other species. Mated and unmated females did not differ significantly in mean percentage of time spent fencing (t-test, $P = 0.3629$), mean number of headbutts (t-test, $P = 0.2065$), or mean total aggressive encounters (incidents of fencing + number of headbutts; t-test, $P = 0.5184$). Overall, aggressive events were seldom observed. These findings suggest that, despite being starved for two hours prior to recording, food is either not a valuable resource or females are not aggressive, contradicting anecdotal observations in the lab. Our next experiments will be to score female aggressive behaviors in the presence of unmated and sperm deprived males to determine if females are aggressive for access to mates.

EFFECTS OF MANAGED HONEY BEES (*APIS MELLIFERA*) ON NATIVE BEES IN TALLGRASS PRAIRIES

Meghan Cashell, Oliver-Elias Hiszczynskyj, David Claridge, Meagan Fernandez, Jacob Spidell, Jae Horn, and Joanna Gress
School of Science and Mathematics, Emporia State University

Wild bees and other native pollinators are in serious decline worldwide. Among the top contributors to this decline are habitat loss and degradation, resulting in the loss of nesting and foraging resources. This issue may be exacerbated by the presence of managed honey bees competing for the same resources in native landscapes, including tallgrass prairie. Only 4% of the tallgrass prairie remains in the U.S.A., but it functions as a critical haven for native pollinators and plants. We seek to determine the compatibility of beekeeping with pollinator conservation in this habitat. Increased densities of managed honey bees may negatively affect wild bees via resource competition and changes in plant community, so understanding the interaction between managed hives and native bees can allow for the development of best management practices. We are analyzing native bee interactions using pollinator cup traps, field sweeps, and trail camera footage in the presence and absence of managed honeybee hives to determine how native bee abundance, species richness, and species diversity are impacted. This research will provide critical knowledge about whether managed bees kept on tallgrass prairie land have negative impacts on wild bees. Our findings will help inform management decisions concerning beekeeping and conservation efforts for tallgrass prairies for a wide range of organizations in Kansas and beyond.

INVESTIGATING THE ROLE OF PHYTOCANNABINOIDS IN ENHANCING HONEYBEE HIVE SURVIVAL

Jacob Spidell, Oliver-Elias Hiszczynskyj, Meghan Cashell, David Claridge, and Joanna Gress School of Science and mathematics, Emporia State University

Honey bee losses were 48% for managed hives in 2022-2023. While some variables are outside of beekeeper's control like external pesticide application, others can be regulated through management choice like bee baths. Beekeeper management can greatly influence colony survival. Neonicotinoid insecticides, including imidacloprid have received considerable attention as an important stress factor to bees. Exposure at sub-lethal levels can negatively impact honey bee olfactory memory and learning. Imidacloprid is also linked to gene regulation of many honey bee detoxification genes that metabolize toxic molecules or minimize their fatal effects. Industrial hemp, (*Cannabis sativa L*.), one of the earliest crops spun for fiber, is now used for a variety of commercial products derived from fiber or seeds and is used as a pollen source by bees. Hemp pollen contains several pharmacologically active phytocannabinoids including CBD, CBG, and CBN that can exert beneficial effects, including antioxidant and anti-inflammatory activity. These compounds can affect the production of ROS and combat the harmful effects of these neonicotinoids. We have been investigating if foraging on hemp pollen can protect against imidacloprid stress at a whole hive level and increase survivability. Hives were allowed to freely forage on hemp flowers either in the absence or presence of imidacloprid and foragers collected for qPCR analysis of the antioxidant pathway in the bee gut. In addition, hive sundries were collected to determine what phytocannabinoids were incorporated into the hive using GC-MS. These results may lead to an additional role for hemp pollen in IPM strategies for hive survival.

ABUNDANCE AND DIVERSITY OF TARDIGRADES IN CAMPUS WOODS

Marielena Banos[1], Alexis F. L. A. Powell[1], Stephen D. Fields[1], and William R. Miller[2]
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The low number of tardigrade species known from Kansas represents a unique opportunity for research, including description of new localities and species. Tardigrades, known as moss piglets or water bears,

are microscopic invertebrates that can be found in marine, freshwater, and limo-terrestrial environments. Currently, 1270 species have been found and described around the world. Tardigrades are mainly identified using morphological characteristics (cuticle, claws, and mouthparts). Work to describe tardigrades has increased considerably in recent years; however, many species are yet to be discovered. Also, few studies describe tardigrade habitats in detail, and rarely name the species of vegetation on which tardigrades were found. The diversity and abundances of tardigrade species in Kansas are poorly known; to date, only 20 surveys, limited to northeastern and northcentral counties, have been conducted. We have initiated the first study of tardigrades in Lyon County, starting with Campus Woods at Emporia State University, where the vegetation is representative of natural conditions. We aim to find and describe all tardigrade species and their habitats at that site.This research of the community composition and distribution of tardigrades within Campus Woods will contribute to broadening our understanding of one of the most enigmatic groups of invertebrates.

THE ASPERGILLUS NIDULANS SARB GENE ENCODES A PUTATIVE UDP-N-ACETYLGLUCOSAMINE TRANSPORTER INVOLVED IN AMINO ACID UTILIZATION

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Nutrient acquisition is an essential and controlled process. In In the model filamentous fungus *Aspergillus nidulans*, the transcription factor AreA regulates nitrogen utilization genes. The *areA102* pleiotropic altered function mutation confers increased growth on histidine as a nitrogen source. The suppressor of *areA102* mutants *sarA* and *sarB* suppress this strong growth on histidine.phenotype. The *sarA* gene (AN2350) is characterized and encodes an L-amino acid oxidase (LAAO)., but *sarB* was mapped to chromosome VII near *xprG*, but hhas remained unidentified. . *sarB* was mapped to chromosome VII, 0.26 cM from *xprG*. As 1 cM usually represents ~5-10 kbp in *A. nidulans, sarB* was expected to lie within 2.6 kbp of *xprG*. This project aims to identify the *sarB* gene and understand its role in nitrogen acquisition. Nine candidate *sarB* genes adjacent to *xprG* failed to complement the *sarB7* phenotype in transformation experiments, suggesting that *sarB* is physically further away from *xprG* than predicted. We therefore adopted aperformed Whole Genome Sequencing approach. The genomes to identify SNPs on chromosome VII unique toof the *sarB7* mutant relative toand its parent were sequenced and compared with the reference genome. The Three SNPs on chromosome VII were unique to the *sarB7* mutant. The closest SNP to *xprG* was ~118 kbp away in the uncharacterized gene AN8875. AN8875 and *xprG* are close to, but separated by, the centromere, consistent with the larger physical distance than expected. The SNP introduces a stop codon about one-third of the way through the uncharacterized gene AN8875gene, producing a truncated protein. To investigate if AN8875 is *sarB*, the wild-type AN8875 gene was transformed into the *areA102 sarB7* strain and transformants were obtained by direct selection for growth on histidine, indicating that AN8875 complemented the *sarB7* phenotype. To determine the phenotype of complete loss of AN8875, the gene was deleted. In a wild-type background, Tthe AN8875Δ mutation phenocopied *sarB7*, with mutants exhibiting weak growth on histidine in an *areA102* background. showed no phenotype on histidine, but in an *areA102* background, it phenocopied the *sarB7* mutation phenotype of weak growth on histidine. These experiments provide strong evidence that AN8875 is *sarB*. AN8875 encodes a putative UDP-N-acetylglucosamine (GlcNAc) transporter conserved in fungi. Its orthologs in *Saccharomyces cerevisiae* and *Hansenula polymorpha* are involved in cell wall chitin biosynthesis, and the *Kluyveromyces lactis* ortholog is involved in N-glycosylation. Because mutations in *sarA* and *sarB* produce the same phenotype, we hypothesize SarB is necessary for SarA LAAO function.

CASE STUDY- INHERITANCE OF SUPERNUMERARY TEETH IN A FAMILY WITH A SYSTEMIC

CONDITION

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Supernumerary teeth are a rare condition that is defined as additional dentition that occurs along with normal dentition. These extra teeth can form and erupt anywhere in the mouth. The aim of this case study was to evaluate the pattern of inheritance of supernumerary teeth within a family. The inheritance pattern was evaluated by obtaining the medical and dental history of two parents and their son who has the condition. This included creating a pedigree chart to map of where the condition prevalent in the generations. Evaluation of the information on the pedigree tree showed that this family seemed to show a Y-linked inheritance pattern. Despite the determination of Y-linked inheritance the research subject and his family, a multi factorial inheritance pattern along with systematic conditions are supported by other articles and should be supported.

THE EFFECTS OF COVID 19 ON LUNG CAPACITY IN COLLEGE STUDENTS

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COVID 19 is responsible for millions of deaths and continues to cause disease and death world-wide. In addition to acute illness, COVID 19 causes long-lasting effects (long COVID) on a variety of organ systems including the lungs as measured by breathing patterns and pulmonary function tests. The purpose of this study is to determine if COVID 19 compromises lung function in college-age students, and to determine if these effects are long-lasting. Vital capacity (VC) was measured in 75 volunteer students in the fall of 2022 and 77 volunteer students in the fall of 2023. The results of this study demonstrate significantly reduced VC among students reporting having COVID 19 compared with those reporting not having COVID 19 in 2022. Among those reporting having COVID 19 in 2022, there was no significant difference in VC between those who had it in 2022 and those that had it prior to 2022. The results of this study suggest COVID 19 can significantly impact lung function in college students, and these effects appear to resolve over time. The same comparisons were made again using data collected in 2023. No significance was found. This study will continue in 2024.

A NOVEL POPULATION OF ITALIAN WALL LIZARD (*PODARCIS SICULA*) IN WICHITA, KANSAS

Hunter Nelson, Elaina Jone, and Patrick Mathews
Friends University

Although it is not native to Kansas, the Italian Wall Lizard (Podarcis siculus) is a Lacertid lizard that has maintained an established population in Topeka, Kansas since the 1950's after pet store stock escaped. Although additional populations have since been reported in Lawrence and Hays, this is the first report of the species in South-Central Kansas. The population in Wichita appears to be self-sustaining and growing since its first appearance in the spring of 2023.

THE HERPETOLOGICAL FAUNA OF EOCENE BALKANATOLIA

Johan Knoff
The University of Kansas

During the Eocene (45-35mya), Balkanatolia was an island continent comprised of modern-day Turkey and the Balkans. During this time, Balkanatolia had been isolated from mainland Europe and Asia since the end of the Paleocene. As a result, the endemic fauna was unique, comprising of many lineages that

had gone extinct elsewhere. Past and ongoing research into the fossil record of Balkanatolia has shed light on the mammalian fauna of the time, however, the Herpetological fauna remains under-researched and undescribed. Here, we present specimens from the University of Kansas Vertebrate Paleontology collection, representing various lineages of reptiles and amphibians. These include crocodilian teeth, squamate vertebrae and dentulous jaw fragments, and assorted postcranial amphibian material. One particularly interesting specimen is comprised of two jaw fragments with several teeth remaining socketed in one of the fragments. We believe that this specimen may represent a choristodere (a group of enigmatic reptiles with a fossil record ranging from the middle Jurassic to the Miocene), bearing morphological similarities to the mainland European Lazarussuchus, albeit substantially larger. The description of this specimen along with the rest of the relevant KUVP material may have broad implications on the biogeography and evolution of Cenozoic non-avian reptiles and amphibians.

FACTORS INFLUENCING LOCATIONS OF WHITE-TAILED DEER (*ODOCOILEUS VIRGINANUS*) TRAILS IN KANSAS CROSS TIMBERS WOODLANDS

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White-tailed deer (Odocoileus virginanus) have been a topic of many recent studies due to their large potential impact on vegetation. In forests and woodlands, deer overabundance causes many problems including insufficient tree regeneration and changes in herbaceous understories. Intensity of white-tailed deer browsing can vary greatly across a landscape, yet often is most intense near deer trails. Relatively few studies have attempted to identify topographic and ecological characteristics describing where ungulate trails commonly occur. The objectives of this study are to determine if deer trails are associated with particular landscape, topographic, or vegetation features in the Cross Timbers woodlands of Kansas. Alternately, are deer trails randomly located across these woodlands? We sampled 500 m transects in three Cross Timbers woodland sites (Woodson Wildlife Area, Quivira Scout Ranch, and Fall River State Park). Along each transect at 25 m intervals we recorded GPS coordinates, slope steepness, and aspect. We used the point-quarter method to collect data on distance, dbh, and species of the four nearest trees / saplings. When a deer trail crossed the transect, we collected these same data at that point. After sampling at two of the three sites, we encountered 11 deer trail crossings across 1 km of transect. This provides a frequency of one crossing per 91 m. These preliminary results suggest a trend that deer trails are associated with less steep slopes. We also observed that the locations of deer trails are essentially random in regard to the surrounding vegetation density, height, and slope aspect.

CAUSES OF WHITE-TAILED DEER MOVEMENT IN SOUTHEAST KANSAS

Chase Nash and Ryan Calvert
Tabor College

Hunting provides essential funding for wildlife conservation, but deer hunting is becoming less popular in Kansas.[1] The decline in popularity may be a cause of technology, demographic changes, or more.[2] A lack of hunting means less funds for conserving Kansas wildlife species, and an overpopulation of white-tailed deer in Kansas, which may lead to crop damage, deer-vehicle collisions, etc.[3] Understanding motives of deer movement should lead to more hunters having successful harvests. We theorize that hunting will increase in popularity if more hunters have successful harvests. Deer movement is affected by many factors, but primarily: weather, hormones, sex ratios, predators, food, and light.[4] This research focused on the potential effects of food type on the appearance of deer within a specific area. Further, we looked for relationships with weather, season, and phases of the moon as possible compounding variables. This research aims to identify specific factors that might influence deer movement. It was found that white-tailed deer in Southeast Kansas tend to favor areas near corn and alfalfa significantly more than

areas near CRP (1253, 1262, and 422 respectively). Weather and the lunar schedule did not appear to significantly affect the number of white-tailed deer appearances at the different locations. These data can help hunters become more successful in deer harvests by focusing their hunts toward areas near corn or alfalfa fields. More successful harvests may lead to conservation funding, less crop damage, and a controlled white-tailed deer population in Southeast Kansas.

WISH FOR FISH: BRIEF ASSESSMENT OF THE FISH COMMUNITIES ON PRIVATE PROPERTY
Nicole Krieg
Emporia State University

Understanding the organisms that reside in our rivers, lakes, and streams is key to understanding the overall health of the ecosystem. Examining fish communities can provide insight into the health and functioning of stream environments. We were asked by private landowners to assess the aquatic biota on their property. Here, we report the fish community from the portion of McDowell Creek that runs through this property. We sampled one site on McDowell Creek in Geary County Kansas in Spring and Fall of 2023. We collected abiotic stream parameters and sampled fish using a seine in one pool and one riffle. Fish were identified in the field, and a photograph was taken of each unique species, or of difficult to identify individuals. We estimated that the pools would have more diversity than the riffles. We found 16 fish species in pools and 3 in riffles. Comparing Spring and Fall samples, we saw that some species were very prevalent in the spring, and almost completely absent in the fall.

EFFECTS OF *BACILLUS AMYLOLIQUEFACIENS* AF AND AW ON STEM-ROOT RATIO
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Bacillus amyloliquefaciens has been found in a variety of environments, especially in relation to plants, suggesting that it may play a role in plant growth. Two morphologically different strains isolated from the same soil sample were identified through 16S rRNA sequencing as *Bacillus amyloliquefaciens* in 2022. Previously, our preliminary results showed that the AF strain had better root growth compared to the control under minimal water conditions. Here, we aim to compare the effects of the AF and AW strains on tomato seedlings in wet bags. At 15 days, the ratio of stem to roots was 1:1.1 in the control group. However, both AF and AW significantly affected the ratio of stem to roots, with ratios of 1:2.4 in AF, 1:1.99 in AW, and 1:2.7 in a combination solution of AF and AW. A higher root-to-stem ratio may suggest a greater capacity for water and nutrient uptake, leading to improved plant growth and health. This may be particularly useful under conditions of limited water availability or nutrient deficiency in the soil. Furthermore, the germination rate of tomato seedlings at 15 days was slightly better in AF, AW, and the combination of the AF and AW strains than in the control.

BEE ALARMED: THE IMPACT ON NEONICOTINOIDS ON HONEY BEE (*APIS MELLIFERA*) LEARNING AND MEMORY
Meagan Fernandez, Oliver-Elias Hiszczyskyj, Meghan Cashell, David Claridge, Jacob Spidell, Jae Horn, and Joanna Gress
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Honeybees (*Apis mellifera*) are increasingly exposed to neonicotinoids, a comorbidity of colony collapse disorder, through insecticides such as imidacloprid. Low levels of neonicotinoids act as nicotinic acetylcholine receptor (nAChR) agonists and disrupt normal function of the neurons in the bee brain decreasing motor function, impairing visual learning and causing brain cell death. Olfactory learning is crucial because foragers learn to associate floral odors with rewarding nectar this enables foraging and

floral constancy, which is important for effective pollination. Industrial hemp (*Cannabis sativa L.*) contains several different phytocannabinoids including CDB, CBG and CBN, that can affect the redox balance of oxidants and antioxidants and that may offer a neuroprotective effect. Studies have shown that honeybees do incorporate cannabinoids into their in-hive pollen if foraging on male hemp flowers. In addition, access to crucial phytochemicals may improve survival and pesticide tolerance in honeybees. Honeybees have been reported to utilize hemp pollen as a protein source, which may improve survival and pesticide tolerance, but could impact foraging rates among hives. Male Hemp flowers were grown at the John C. Horticultural Center in Haysville, KS, through the Kansas State University Industrial Hemp Program. Hives were allowed to freely forage on hemp pollen in a wind tunnel with or without imidacloprid exposure. Learning and memory was assessed through forager counts. To further examine the protective effect of hemp pollen in the hive, we are conducting qPCR analysis of forager bee abdomens for each hive to look at expression of the antioxidant/detoxification pathway.

MULTIPLE MATING AND REPRODUCTIVE SUCCESS IN *ZAPRIONUS INDIANUS* FEMALES

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The fitness of an individual depends on reproduction. Mating multiply can increase reproductive capacity, but doing so may come with a cost. For females, mating multiply rarely increases progeny production and may incur a cost of harassment by males. Zaprionus indianus is an introduced Afrotropical drosophilid (fruit fly) that produces few, large sperm. Because sperm are limited, males do not transfer many sperm upon mating. We have demonstrated that females who mate multiply increase offspring production. Although females of many drosophilid species mate multiple times, most females do not increase their reproductive output with multiple matings. In this study, we tested variables that affect reproductive success, including length of exposure to males and access to multiple males. We also tested if exposure to multiple males simultaneously interfered with a female's ability to mate through harassment. Each female was exposed to one or more males for four days and then laid eggs for six days in isolation. None of the treatments differentially affected offspring production by the females. Some females never produced progeny, but the number failing to mate did not vary by treatment. Females exposed to four males for only 1 hour were less likely to mate within the first few days of exposure than females exposed to a single male continuously for 24 hours. To determine why a female exposed to multiple males may fail to mate, we plan to observe the interactions of males with a single female.

LARVAL AGGREGATION IN DROSOPHILA SPECIES

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Cooperative behavior may contribute to individual fitness for survival. Social behavior can have costs such as in group competition for the same resources or increased risks of predation. Larvae of Drosophila melanogaster cooperatively feed in aggregations. Aggregation allows the larvae to survive in liquid substrate, making air pockets that allow burrowing to solid substrates, thereby obtaining food without drowning. Communal burrowing behavior has not been tested in Drosophila species other than D. melanogaster but further testing may reveal similar behavior in other Drosophila species. To test this behavior, we will measure larval aggregation in multiple Drosophila species. We will measure closely related and distantly related species to D. melanogaster including species that are likely to encounter each other in nature. We developed an assay to measure the distribution of larvae on petri dishes filled with fly food. We will measure distance to the nearest neighbor using ImageJ. This experiment will lay the foundation for future experiments testing species recognition by larvae. Many species can be collected on

the same bait in the same location; thus, larvae are likely to encounter each other in nature. We will test the hypothesis that larvae preferentially aggregate with their own species.

REDUCED LESSER GRAIN BORER PROGENY PRODUCTION IN POLYPHENOL RICH SORGHUM VARIETIES

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Polyphenols, known antifeedants in plants, are present in varying concentrations across cereal grains and are known to have negative impacts on insects and their feeding behavior. We recently observed negative impacts on the reproductive capacity of the lesser grain borer (LGB) Rhyzopertha dominica when they were fed on sorghum grains that contained high levels of polyphenols (SC84) compared with those containing lower levels (Pi, Sumac, white). The purpose of this experiment was to confirm the levels of total phenols in the four sorghum varieties and measure total phenols in the control diet (wheat) that is typically used to rear these insects. Using a Folin-Denis assay, we found SC84 had the highest levels of total phenols of the four sorghum varieties and wheat had the lowest levels of total phenols overall. This finding is directly correlated with the results of our bioassay in which progeny production of LGB was highest on wheat and sorghum lines with low polyphenols and lowest on lines with high polyphenols. These findings suggest that sorghum polyphenols have the potential for grain protection against this destructive pest.

FOOD DRIVEN LONG-TERM FLIGHT PATTERNS OF INDIAN MEAL MOTHS

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Indian meal moth (IMM; Plodia interpunctella) is a common household and stored grain product pest. In conjunction with other stored product insects, IMMs are responsible for one-third of post-harvest grain damage throughout the world. IMM are short-lived as adults and often must fly long distances to successfully find mates, oviposition substrates, and suitable food sources for their offspring. Although these insects feed on a diverse range of commodities, they are common pests of wheat flour and flour mills in the Great Plains region. They use a combination of chemical cues (pheromone and food) as they traverse the landscape. Although we know that food cues impact IMM mating behavior, it is unclear how they influence flight activity. It is also unclear whether sex, age, or mating status has an impact on flight behavior as well. The purpose of this work was to measure flight activity in unmated IMM males and females in the presence of wheat flour over a five-day post-eclosion timespan. Both sexes were tested and replicated for a total of n=24 individuals per sex. This experiment helps us uncover the long-term flight patterns of IMM in the presence of wheat flour which impacts improvement opportunities for behavioral management methods by stored product pest managers.

FIRES BUGGING YOU?: THE EFFECTS OF CONTROLLED BURNS ON ARTHROPOD POPULATIONS

Tyler Mathews, Anthony Warnecker, and Patrick Mathews
Friends University

An industrial landfill site in Wichita, Kansas that is owned by Boeing is being managed to increase wildlife habitat. Management includes controlled burns in their grassland conservation regime, conducted in stages that leave burned and unburned sites immediately adjacent to each other. The purpose of this study was to understand how the use of these controlled burns affects the population parameters of arthropods at the landfill site. Burning clearly impacts arthropod populations but the impact appears to differ by season.

IDENTIFYING POTENTIAL CLIMATE-ADAPTED FUNCTIONAL TRAITS OF A DOMINANT PRAIRIE GRASS ACROSS PRECIPITATION AND TEMPERATURE GRADIENTS.

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Less than 5% of North America's once widespread tallgrass prairie remains intact, and what remains is threatened by increasing drought and temperatures. Big bluestem (Andropogon gerardi) is the dominant tallgrass species, is a major cattle forage, and is widely distributed across the US. Our goal is to characterize big bluestem's climate-adaptations to inform restoration efforts. In peak growing season 2023, we sampled 26 sites across broad climatic gradients: MN-TX (mean annual temperature 4-21°C) and CO-NC (mean annual precipitation 325-1400mm yr-1), including populations from the core (optimal environment) and margins (suboptimal environment). Marginal populations already experience extremes, so they are useful for predicting responses to climate change. We hypothesized that plants within the core would be most abundant and plants from its drier range margin would have lower photosynthetic and transpiration rates to conserve water, and a more negative water potential (associated with increased drought-tolerance), compared to its wetter range. We measured plant physiology (chlorophyll absorbance, photosynthetic rate, transpiration rate, and water potential), leaf C:N, and canopy cover. Big bluestem had highest canopy cover within its core. Populations from its drier range margin exhibited greater chlorophyll absorbance, higher photosynthetic rates, higher nitrogen content, more negative water potentials, and lower transpiration rates. Precipitation and aridity had the greatest effect on plant traits, while temperature alone had weak to no effect. This implies that drought will largely impact big bluestem. To mitigate the impacts of climate change, grassland restorations could plant western, drought-tolerant populations of big bluestem in areas where increasing drought is predicted.

THE INFLUENCE OF ABOVE GROUND RESOURCES VERSUS BELOW GROUND RESOURCES IN LIMITING POST OAK SAPLING GROWTH IN KANSAS CROSS TIMBERS WOODLANDS

Mason P. Moore and Leland Russell

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A deficiency in the regeneration of oak trees appears to be present across much of eastern North America. Canopy gaps are regarded as favorable settings for oak regeneration because they provide greater access to light. However, in xeric oak woodlands scarcity of water may hinder the capacity of oak saplings to fully utilize the plentiful sunlight in canopy gaps. Using surrogate measurements of light and soil resource availabilities, we examined the impact of above ground and below ground resources on height growth of Quercus stellata saplings in a dry Cross Timbers forest in southeast Kansas. These saplings occur in a long-term deer exclusion experiment and, hence, provide an opportunity to examine resource limitation with and without deer browsing. For both saplings exposed to and protected from deer, height growth had a strong positive relationship with canopy openness. However, there was no statistically significant relationship between sapling growth and either slope aspect, slope steepness, or soil rockiness. Further analyses are underway using a summed scalar index known as the Topographic

Relative Moisture Index (TRMI), which was specifically designed to compare potential soil moisture availability across locations in hilly or mountainous regions. Although data collection is ongoing to complete this investigation using the TRMI, initial analyses incorporating two out of the four TRMI index values, slope-aspect and slope-steepness, have not revealed any statistically significant relationship with sapling growth. Our results suggest that growth of Q. stellata saplings in these xeric oak woodlands primarily is limited by light availability, rather than water.

THE EFFECTS OF *BACILLUS AMYLOLIQUEFACIENS* (AF AND AW) AND *BACILLUS MOJAVENSIS* (BM) ON HUMAN BACTERIA

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Soil bacteria Bacillus amyloliquefaciens (AF and AW) and Bacillus mojavensis (BM) were identified from DNA of 16S RNA sequences. In order to test their microbe-microbe interactions, they were assessed against human bacteria Staphylococcus aureus (SA), Bacillus Proteus (BP), E. coli (K-12), Pseudomonas aeruginosa (PA), Proteus vulgaris (PV), and Klebsiella pneumoniae (KP) using the cross-streaking method. Inhibition zones were not observed when these six human bacteria were tested on the same LBA plate; they exhibited overgrowth of each other. However, when tested separately, 11 to 12 mm inhibition zones were clearly observed with both Bacillus amyloliquefaciens strains against the skin bacterium Staphylococcus aureus. A 2 to 4 mm inhibition zone was observed towards the E. coli K12 strain. Proteus vulgaris (PV), known for its intensive swarming growth, was shown to avoid both Bacillus amyloliquefaciens strains after 2-3 weeks; the plates were filled with PV, reaching the edge of the plate but not reaching the line of Bacillus amyloliquefaciens. Although none of the Bacillus strains showed any inhibition against Klebsiella pneumoniae (KP), Pseudomonas aeruginosa (PA), and Bacillus Proteus (BP), the growth of KP and PA was relatively restricted to their own areas rather than spreading to the sides. Bacillus Proteus (BP), however, was able to grow larger in size in the presence of AF, AW, and BM. The effects of microorganisms on each other can indeed be influenced or modified in the presence of other microorganisms.

DEVELOPMENT OF PROTOCOLS FOR TRANSCRIPT ANALYSIS OF COMBED OF PUBLICALLY AVAILABLE TRANSCRIPTOMIC DATA WITH THE GOAL OF IDENTIFYING NOVEL TARGET GENES IN EXTRA-NODAL NK T CELL LYMPHOMA (ENKTL): PROGRESS REPORT

Jerah Schmidt and Ryan Calvert
Tabor College

Extranodal Nk/T-Cell Nasal Type Lymphoma (ENKTL) is a rare aggressive malignancy, posing specific challenges to treatment (Dufva, 2018; de Mel, 2019). Despite efforts to understand its pathogenesis, limited therapeutic options exist, contributing to its poor prognosis (Dufva, 2018). Recent investigations into molecular markers have highlighted potential immunotherapeutic approaches, including PD-L1 inhibitors, yet the complexity of ENKTL necessitates further exploration of the progression and pathways involved in ENKTL development. Notably, the association of ENKTL with the Epstein Barr Virus (EBV) remains poorly understood, hindering advancements in treatment strategies. To address these challenges, comprehensive genomic and transcriptomic studies are essential. However, the scarcity of available data and the inherent limitations in sample size have restricted previous analyses. To maximize the utility of existing datasets, we have organized raw transcript data files for integrated analysis, aiming to enhance resolution and identify novel gene expressions specific to ENKTL. However, prior to integrating these studies, we will first develop a protocol for general microarray and RNA-seq analysis of a single dataset. These results will be compared to the original findings to ensure consistent results(using R and GEO2R when available). Then, all files from the mergeable dataset will be renamed and run

through the protocols. The resulting genes of interest (fold change >1.5) will be entered into DAVID for functional analysis. Current results indicate that our protocol for single dataset analysis is working and we are moving forward for the combined analysis.

DIETARY EFFECT ON MEAT TENDERNESS GENES CALPAIN AND CALPASTATIN (PROGRESS REPORT)

Laura Savage and Ryan Calvert
Tabor College

With increased consumer demand, individuals in the agricultural production industry are concerned with offering beef products with industry-high levels of tenderness. Though there are many determinants for meat tenderness, most are only possible post-slaughter. Therefore, there is a need for methods for detecting potential tenderness before slaughter allowing producers to alter feeding schedules to produce higher-quality products. One option may be to use genetic markers within specific muscles. Genes within the Calpain family are associated with meat quality, specifically tenderness characteristics (Sun et al., 2018). The objectives of this study were: (1) to assess the effect of dietary changes on the expression levels of μ-calpain and its inhibitor gene, calpastatin; and (2) to determine if a correlation exists between expression level and meat tenderness as shown through the Warner-Bratzler Shear Force Test (WBSF). Tenderness measurements and gene expression for twenty Black Angus steers were assessed utilizing WBSF and qPCR. Biopsies were collected before dietary changes leading up to slaughter and at slaughter. Overall, our animals produced very tender meat averaging 27.3N (Category 5 tenderness, based on the AMSA research guidelines). The Spinalis muscle was more tender than the Latissimus Dorsi (26.4 N, 27.7 N, p=0.03). WBSF data supports the continuation of genetic analysis of tenderness genes to determine the correlation between gene expression and tenderness. Currently, cDNA has been prepared from pre/post samples and is ready for qPCR analysis. The analysis is scheduled to be completed before the end of the Spring semester. AMSA (1995). Research guidelines for cookery, sensory evaluation and instrumental tenderness measurements of fresh meat. Chicago, Illinois: American Meat Science Association in cooperation with National Live Stock and Meat Board.

OBSERVING UPD GENE EXPRESSION IN *DROSOPHILA MELANOGASTER* AFTER SEPTIC INJURY

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Systemic Lupus Erythematosus (SLE) is a human autoimmune disease that occurs when the immune system loses self-tolerance and triggers a self-directed immune response. The JAK-STAT signaling pathway has been implicated in this disorder. In Drosophila melanogaster, three genes that encode cytokine-like proteins called unpaired (UPD) that activate the fly JAK-STAT pathway are found on the X-chromosome. UPD ligand proteins are induced locally in response to tissue damage. To investigate the expression of UPD3 in Drosophila, male flies were septically injured in their thorax with a bacteria dipped needle. RNA was extracted from the flies with an RNeasy kit, and the RNA was then amplified using RT-PCR for expression analysis.

ASSESSING THE PROTECTIVE EFFECTS OF PLANT-BASED ANTIOXIDANTS IN NEONICOTINOID TREATED APIS MELLIFERA

Oliver-Elias Hiszczynskyj, David Claridge, Meghan Cashell, Megan Fernandez, Jacob Spidell, and Joanna Gress
School of Science and Mathematics, Emporia State University

Over 130 commercial crops are pollinated by *Apis mellifera*, adding $15 billion to the U.S. economy each year. However, in 2023, beekeepers lost 48.2% of their hives due to a variety of stressors including pesticide exposure. Imidacloprid, a neonicotinoid pesticide, makes up ⅛ of the global insecticide market. This prevalence in both agricultural and private environments leads to high levels of exposure to forager honey bees. Exposure to this pesticide causes elevated levels of oxidative stress, which reduces the ability to break down toxins resulting in cell damage and death in the gut. This class of pesticides is also linked to gene regulation of many *A. mellifera* detoxification genes that metabolize toxic molecules or minimize their effects. Antioxidant compounds that are naturally present in many plant species may be able to counteract the harmful effects of this pesticide exposure by increasing the expression of the detoxification pathway. We looked at 5 classes of antioxidants from commonly pollinated plants including epigallocatechin-3-O-gallate, rosmaric acid, anthocyanins, proanthocyanins, and mint essential oils. To assess if these plant-based antioxidants contain a protective effect for neonicotinoid ROS stress in the gut, feeding trials were performed with forager bees. Each antioxidant trial consisted of feeding 20 foragers and then exposing them to imidacloprid. After 48 hours their abdomens were collected to extract RNA and to perform qPCR analysis to view the expression of the 10 detoxification pathway's genes.

EFFECT OF LIGHT WAVELENGTH ON EXPRESSION OF TOC1 IN *ARABIDOPSIS THALIANA*
Maggie Stadler and Erin R. Morris
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Many aspects of plant growth and development are regulated by the circadian clock. This internal clock utilizes many environmental cues, photoperiod being one of the most influential. The clock sets regular circadian rhythms by expressing daytime genes and nighttime genes at distinct times during the day. Timing of CAB expression 1 (TOC1) encodes a transcription factor that is a repressor of daytime genes. In this study, Arabidopsis thaliana plants were grown under red, blue, and white lights to see how different wavelengths affected TOC1 mRNA expression. Arabidopis plants were grown on plates for a total of 10 days. The seeds were germinated and grown under 24-hour white light for the first 3 days. The next 7 days the plants were grown in an 8hour dark/16-hour light treatment (white, red, and blue). mRNA was collected for RT-PCR to investigate if TOC1 expression is affected by different wavelengths of light.

EFFECT OF SALT CONCENTRATION ON EXPRESSION OF GPDH-1 IN *C. ELEGANS*
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Caenorhabditis elegans, a soil nematode, is a model organism used in developmental biology studies. NaCl is a common environmental stressor that induces a stress response in C. elegans, including the expression of the stress response gene glycerol-3-phosphate dehydrogenase (gpdh-1) in epithelial cells. Expression of gpdh-1 can be up- or down-regulated based on environmental factors such as osmotic stress. NaCl is necessary for organisms to survive, but in excess, can negatively impact metabolic pathways and growth and development. In C. elegans specifically, a hypertonic stress response (HTSR) pathway is activated when exposed to elevated levels of hypertonicity, which protects cells from volume loss in these environments. In this study, C. elegans were grown on plates with four different NaCl concentrations:15μM, 50μM, 150μM, and 250μM. RNA was extracted and will be analyzed with an RT-PCR kit to determine if salt concentration affects the expression of gpdh-1.

USING THE DEREG KNOCK-IN MOUSE MODEL TO INVESTIGATE THE ROLE OF THE T-REGULATORY CELL IN VACCINE EFFICACY
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T-regulatory (T-reg) cells are responsible for suppressing the immune response by regulating effector T-helper cells activated by antigen. Therefore, T-reg cell activity may limit immune response to vaccines and reduce their overall efficacy. The DEREG mouse model allows manipulation of T-reg activity because it, contains a transgene to direct expression of the diphtheria toxin receptor in T-reg cells allowing the T-reg cells to be depleted with a peritoneal diphtheria toxin (DTx) injection. In this study DEREG and wild-type mice will be injected with DTx three days before immunization with bovine serum albumin (BSA). We hypothesize the depletion of T-reg cells will allow a greater immune response that can be measured by the concentration of antigen specific antibodies in serum. Antibody levels are assessed using Enzyme-linked Immunosorbent Assay (ELISA). Initial experiments have shown wild-type mice have a robust immune response to BSA immunization and the ELISA can be improved by using non-acetylated BSA to coat the plates. Soon, eight DEREG and wild type mice will be injected with diphtheria toxin and immunized. Fourteen days post-immunization, the serum will be collected, and antibody levels determined using the ELISA test

EFFECT OF HALIDE IN AMMONIUM SALTS IN THE ADDITION OF BENZOIC ACID TO STYRENE OXIDE

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Nucleophilic additions to epoxides are an important class of reactions in organic chemistry which have found use in material science, as intermediates, and in the synthesis of biologically important compounds. Many nucleophiles add to epoxides via a SN2 mechanism at the least substituted carbon. However, under acidic conditions addition is at the most substituted carbon via a SN1 mechanism. Included within this class of reactions is the addition of carboxylic acids to epoxides using tetrabutylammonium bromide as the catalyst. These reactions are straight forward and give high yields of the product. However, previous work in our lab using phthalimide as the nucleophile showed a faster reaction rate with tetrabutylammonium fluoride. Due to this result, we were interested in studying the effect of halide on the addition of benzoic acid to styrene oxide. To better understand this reaction and the role of the catalyst, the halide of the ammonium salt was varied (F-, Cl-. Br-, and I-). Reaction times were determined by IR spectroscopy and the product ratio was determined using proton NMR spectroscopy. The results, reaction times and ratio of products, of these studies will be reported.

EFFECT OF ALKYL LENGTH IN AMMONIUM SALTS IN THE ADDITION OF BENZOIC ACID TO STYRENE OXIDE

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Epoxides are an important class of reagents in organic chemistry which react with a variety of nucleophiles. Strong nucleophiles add to epoxides at the least substituted carbon via a SN2 mechanism. However, under acidic conditions nucleophilic addition is at the most substituted carbon via a SN1 mechanism. Included within this class of reactions is the addition of carboxylic acids to epoxides using tetrabutylammonium bromide as the catalyst. These reactions are straight forward and give high yields of the product. However, previous work in our lab using phthalimide as the nucleophile showed a faster reaction rate with tetrabutylammonium fluoride. Due to this result, we were interested in studying the effect of alkyl length on the addition of benzoic acid to styrene oxide. To better understand this reaction and the role of the catalyst, the length of the alkyl group of the ammonium salt was varied (butyl, propyl, ethyl, and methyl). Reaction times were determined by IR spectroscopy and the product ratio was

determined using proton NMR spectroscopy. The results, reaction times and ratio of products, of these studies will be reported.

TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: ROBOTIC ASSISTED DISSECTING MICROSCOPE STAGE FOR MAKING RESEARCH SLIDES

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When conducting a biodiversity survey for microscopic animals such as tardigrades (water bears), it is necessary to make a research grade slide of each specimen. Specimens are found in a petri dish under a 25X dissecting microscope and placed into a drop of mounting media on a 25x75 mm glass slide, then a cover slip is applied. This simple process takes about 2 minutes per specimen (not counting the time searching for the specimen). Because some tardigrades turn transparent when inserted into the media, time is limited and the location must be marked immediately with a felt pen. We developed a robotically assisted dissecting scope stage that allows us to insert three specimens into the same drop of media. The stage saves 2/3s of the material cost of making three slides, reduces the time to make three slides by 1/3, and improves location accuracy by using a laptop, an Arduino controller, two servos, with a joystick and a few buttons to run the XY stage. This is a customizable, low-cost Do-It-Yourself project, built from readily available parts. We provide files for 3D printed parts, instructions for assembly, and Arduino code for operation. This robotic tool can be the center piece for process improvement that teaches cross discipline integration, saves operation cost, and makes the researcher is more productive

STUDENT PERSPECTIVES ON VIRTUAL REALITY AS AN ALTERNATIVE TO PHYSICAL MODELS IN A COLLEGE ANATOMY COURSE

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Undergraduate anatomy courses are often perceived as a right of passage for students pursuing a career in the medical or biological fields. This is largely due to the necessity of memorizing substantial information within a limited timeframe. While the integration of models and hands-on activities (active learning) proves beneficial for comprehending this knowledge, challenges arise due to the expense and limited availability of 3D physical models, particularly in smaller educational institutions. Furthermore, the scarcity and inherent limitations of 3D physical models create a bottleneck effect that underscores the need for an alternative method of learning and studying for specific systems. Additionally, some anatomical systems are difficult to display as complete models (lymphatic, endocrine, nervous). One promising solution is the use of virtual reality which allows students to each have a model they can learn from. Beyond availability, VR offers several views and options that transcend the capabilities of traditional methods (slides or physical models) thus expanding students' depth of understanding. Our goal was to assess student perception of VR use compared to the available physical models in our anatomy course. We found that overall students were supportive of VR use and generally favored the VR models over the physical models. This data demonstrates that VR is a viable option for smaller schools to provide a greater number of models and experiences for students in the Anatomy classroom.