

Joint Meeting of
Kansas Academy of Science
(155th Annual)
&
Kansas Entomological Society
(99th Annual)

McPherson College
April 14-15, 2023



Program & Abstracts



Welcome to McPherson College!

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

Dr. Dustin Wilgers
Dr. Allan van Asselt
Dr. Amanda Yamasaki

General Meeting Information

Friday Field Trips

McPherson Museum – 3:30-5:00 pm

Meet @ McPherson Museum, 1111 E. Kansas Ave., McPherson, KS 67460

Field Trip Leader: Brett Whiteneck

Land Institute – 2:30-5:00 pm

Meet @ McPherson College, Melhorn Hall Front Entry (building 15 on map)

Will Carpool and Caravan to Land Institute

Field Trip Leader: Dustin Wilgers

Parking

You can park in any of the parking lots available on campus. You may have the most success finding parking in the following lots: west of athletic center (building 2 on map), south of the student union (building 10 on the map), east of Melhorn Science Hall (building 15 on map), and along Lehmer St. east of the practice football and soccer fields.

Registration/Check-in

The check-in table will be on the first floor of Melhorn Science Hall. Enter the building on the west side and signs will point you to the proper location. Registration will be open on Friday from 5-7:15pm and Saturday from 7-10am.

Food & Banquets

Breakfast, drinks, and afternoon snacks are all covered in your registration fee. These will all be served in Mingenback theatre at the specified times in the schedule below. In order to attend the Friday evening and Saturday noon banquets, you must have purchased tickets before the meeting. Stickers on the back of your nametag will be your ticket. If you did not, please go enjoy some of the other dining options that McPherson has to offer (see brochure included in your meeting bag).

WiFi

Network Name: MacWifi or MacWifi2.4

Password: bulldogs4life

Presenter Information

Oral Presentations

The computers in the classrooms are Windows based PCs with the Microsoft Office Suite loaded on them. Please load your talk file (.ppt or .pptx) on the computers in the room for your session before your session begins. The room and time of your talk is written on the backside of your nametag. There will be a folder on the desktop for each of the sessions. Please place your talk in the appropriate session. Talks are allotted 15 minutes for the presentation and 5 minutes for questions.

Poster Presentations

Posters will be displayed on the 2nd Floor of Melhorn Hall. Please have your poster hung no later than 10:00 am. Your poster # is found on the back of your nametag, you can find the location of your poster by looking at the poster map in the meeting program. Binder clips to help you hang your poster are at your poster station. If needed, additional mounting wall tacks will be on the tables upstairs at each end of the building. Please stand by your poster for questions and discussion of your poster during the entire poster session. After the poster session is over, I encourage you to leave your poster hanging until you leave the meeting.



McPherson

COLLEGE



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

Oral and Poster Paper Presentations: Melhorn Hall – Building 15

-Oral Presentations will occur in classrooms on the 1st floor

-Poster Presentations will occur in the hallways of the 2nd floor

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

2023 Meeting Schedule Overview

Friday, April 14

2:30 p.m.	Leave for Land Institute	Melhorn Hall (West Entry)
3:30 p.m.	McPherson Museum Tour	McPherson Museum Entrance
5:00 – 7:15 p.m.	Registration	Melhorn Hall (1 st floor)
6:00 – 7:15 p.m.	Dinner Banquet	Mingenback Theatre
7:30 – 8:30 p.m.	Nininger Keynote Lecture: Dr. Gregory McDonald	Mingenback Theatre
8:45 – 9:45 p.m.	KAS Executive Council Meeting	Melhorn Hall (Rm 101)

Saturday, April 15

7:00 – 10:00 a.m.	Registration	Melhorn Hall (1 st Floor)
7:00 – 8:30 a.m.	Breakfast	Mingenback Theatre
8:00 – 8:20 a.m.	Welcome	Mingenback Theatre
8:30 – 10:10 a.m.	Oral Paper Session 1	Melhorn Hall
10:10 – 10:50 a.m.	Poster Session 1 (Odd #s)	Melhorn Hall (2 nd Floor)
10:50 – 11:20 a.m.	Morning Break	
11:20 – 12:00 p.m.	Poster Session 2 (Even #s)	Melhorn Hall
12:00 – 1:00 p.m.	Lunch Banquet / KAS Business Meeting	Mingenback Theatre
1:00 – 2:00 p.m.	Keynote: Dr. Lee DeHaan	Mingenback Theatre
2:10 – 3:50 p.m.	Oral Paper Session 2	Melhorn Hall
3:50 – 4:15 p.m.	Afternoon Break / Snacks	Mingenback Theatre
4:15 p.m.	Award Presentations	Mingenback Theatre
4:30 – 5:30 p.m.	KES Business Meeting	Melhorn Hall (Rm 112)

Keynote Talks

Friday Evening: 7:30 – 8:30 pm

Nininger Keynote Lecture



Dr. Greg McDonald

From Jefferson to Jayhawkers and South America to the Sunflower State: Sloth in Kansas

*Funding for this lecture provided in honor of Professor Harvey Nininger, MC Class of 2014

Saturday Afternoon: 1:00 – 2:00pm



Dr. Lee DeHaan

Land Institute

Director of Crop Improvement

Lead Scientist, Kernza Domestication

The Genomics Revolution for a Sustainable Future

Oral Presentation Sessions Location & Schedule

(Presenting Author in *Italics*)

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

Concurrent Paper Session 1 (Saturday 8:30-10:10 AM)

Physics & Chemistry (Moderator: Allan van Asselt) – Melhorn 111

- 8:30 ***Alcerro, L. (3)***. The University of Kansas.
RECREATING THE VERY FIRST INSTANTS OF THE UNIVERSE WITH RELATIVISTIC HEAVY ION COLLISIONS.
- 8:50 ***Saray Arteaga E. (3)***. Physics and Astronomy Department, The University of Kansas.
THE STRUCTURE OF THE PROTON.
- 9:10 ***Kampshoff, M. (3)***. Department of Physics and Astronomy, University of Kansas.
COMPOSITE PARTICLES: QUANTUM CHROMODYNAMICS & HADRON COLLIDERS.
- 9:30 ***Bhatta, M. (1), Davies, B., and Adem, S.*** Department of Chemistry, Washburn University.
DEVELOPMENT AND CHARACTERIZATION OF MALONIC ACID MODIFIED GOLD NANOPARTICLES FOR COLORIMETRIC ANALYSIS OF LEAD IONS (Pb²⁺).
- 9:50 ***Dhimal, A.¹ (1), and Nguyen, H. L.²*** 1. Department of Biology, Washburn University, and 2. Department of Chemistry, Washburn University.
GRAPHENE-BASED QUANTUM DOT SYNTHESIS FOR BIOMOLECULAR IMAGING.

Ecology & Organismal Biology: Entomology (Moderator: Mary Liz Jameson) – Melhorn 112

- 8:30 ***Bryant, M. J. (1), and Gleason, J. M.*** Department of Ecology and Evolutionary Biology, University of Kansas, Lawrence, Kansas.
BEEPING FLIES AND THE REPRODUCTIVE COSTS OF STRESS IN *DROSOPHILA STURTEVANTI*.
- 8:50 ***Harriman, C.L. (1)***. Department of Biology and Chemistry, Baker University.
INCREASED POLLINATOR DIVERSITY ON GOLF COURSES AS A RESULT OF THE CONVERSION OF “OUT OF PLAY” AREAS INTO POLLINATOR HABITAT.
- 9:10 ***Maille, J. M.¹(3), Brabec, D.², Zhu, K. Y¹, Morrison III, W. R.², and Scully, E. D.², 1.*** Department of Entomology, Kansas State University, and 2. USDA – ARS Center for Grain and Animal Health Research.
NON-DESTRUCTIVE ELECTRONIC NOSE TECHNOLOGY FOR EARLY DETECTION OF STORED PRODUCT PESTS.
- 9:30 ***Proctor, M. R.¹ (2), Luhring, T. M. ¹, Jeyasingh P. D.², and Jameson, M. L.¹.*** 1. Department of Biological Sciences, Wichita State University and 2. Department of Integrative Biology, Oklahoma State University, Oklahoma.
FROM DUNG TO ORNAMENTS: USING ELEMENTS AND TEMPERATURE TO EXPLORE PHENOTYPIC PLASTICITY IN DUNG BEETLE HORNS.
- 9:50 ***Schaefer, P. A.¹(1), and Gleason, J. M.²*** Department of Ecological, Evolutionary and Organismal Biology, University of Kansas.
WHAT COMPONENTS OF COURTSHIP ARE NECESSARY FOR SUCCESSFUL MATING IN *DROSOPHILA HYDEI*.

Health & Molecular Biology (Moderator: Amanda Yamasaki) – Melhorn 113

- 8:30 **Parr, S. K.¹, Scheuermann, B. C.¹, Kunkel, O. N.¹, Hammond, S. T.¹, and Ade C. J.^{1,2,3}** 1. Department of Kinesiology, Kansas State University, 2. Department of Physician Assistant Studies, Kansas State University, and 3. Johnson Cancer Research Center.
MICRORNA-92A EXPRESSION IS INCREASED IN ENDOTHELIAL CELLS TREATED WITH THE COMMON CHEMOTHERAPEUTIC DOXORUBICIN.
- 8:50 **Rorstrom, C. J. (1), and Ayella, A. K.** Department of Chemistry, Washburn University.
SOX2 AND HDAC1 PROTEIN DOCKING.
- 9:10 **Saffer, N. A. (1), and Weesner, A. M.** Department of Natural Sciences, McPherson College.
USING INFECTIOUS DISEASE SIR MODELS TO ANALYZE COVID-19 IN TWO NEIGHBORING US STATES.
- 9:30 **Smith, O. (1).** Department of Natural Sciences, McPherson College.
GENOMIC EXPLORATION OF THE ROLE OF LIPID METABOLISM IN INTRAPERSONAL CHANGES IN THE HUMAN SKIN MICROBIOME.
- 9:50 **Apple, A. (1).** Department of Natural Sciences, McPherson College.
USABILITY OF *VITIS VINIFERA* 'CHAMBOURCIN' GRAPE EXTRACT AS A PH INDICATOR.

Concurrent Paper Session 2 (Saturday 2:10 PM – 3:50 PM)

Geology / Science Education (Moderator: Debbie Rogers) – Melhorn 111

- 2:10 **Schrock, J. R.** Department of Biological Sciences, Emporia State University, KS and Northwest Agriculture & Forestry University, Yangling, China.
WHY CHINA ADVANCES IN SCIENCE.
- 2:30 **Clay, M. A.** Department of Teacher Education, Fort Hays State University.
EARLY EXPLORATIONS IN USING 360 VIDEO TO TEACH ENVIRONMENTAL SCIENCE.
- 2:50 **Peterson, A. E.** Kansas Geological Survey, The University of Kansas, Lawrence, Kansas 66047.
AN UNMAPPED LATE HOLOCENE NORMAL FAULT IN THE SARATOGA VALLEY, CARBON COUNTY, WYOMING.
- 3:10 **Hoffman, B. L., and Gunther, S. G.** Department of Natural and Physical Sciences, Park University, Parkville, Missouri.
COMPARISON OF MOLARIFORM AND CUSPIDATE TEETH OF WHIPTAIL STINGRAYS FROM THE PUNGO RIVER FORMATION (MIOCENE) OF NORTH CAROLINA.

Ecology & Organismal Biology (Moderator: Jacqueline Maille) – Melhorn 112

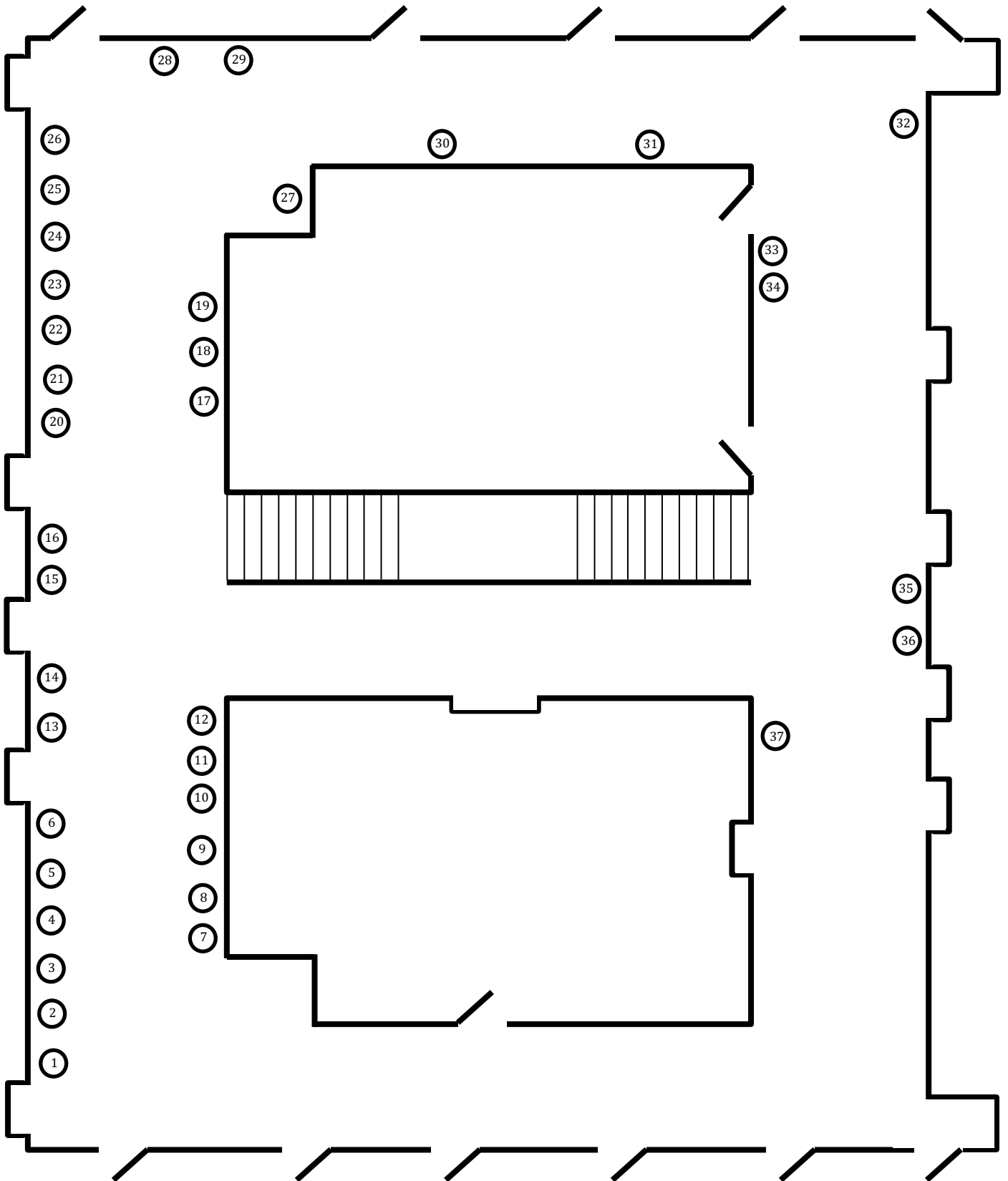
- 2:10 **Hartung, E.¹ (2), Sarkar, S.^{1,2}, Fogarty, K.¹, Kazarina, A.¹, Systma, J.¹, Jumpponen, A.¹, Lee, S.¹, and Johnson, L.¹** 1. Division of Biology, Kansas State University, and 2. Center for Fundamental and Applied Microbiomics, Biodesign Institute, Arizona State University.
DO WET AND DRY ECOTYPES OF A DOMINANT GRASS GROW BETTER WITH THEIR NATIVE SOIL MICROBES?

- 2:30 **Horton, S. (1), and Russell L.** Department of Biology, Wichita State University.
QUANTIFYING ARTHROPOD HERBIVORY ON LONICERA MAACKII IN SOUTH
CENTRAL KANSAS.
- 2:50 **Huffman, J. R. (1), Russell, F. L., and Houseman G. R.** Department of Biological Sciences,
Wichita State University.
INSECT HERBIVORY, NOT SOIL FERTILIZATION, AFFECTS TALL THISTLE (*CIRSIMUM*
ALTISSIMUM) REPRODUCTIVE PHENOLOGY.
- 3:10 **Sytsma, J.¹ (3), Galliard, M.², Heffley, T.⁵, Baer, S. G.³, Bishop, N.¹, Winters, H.¹, Hartung, E.¹,
Gibson, D.⁴, and Johnson, L.¹** 1. Department of Biology, Kansas State University, 2. Department
of Biological Sciences, Fort Hays State University, 3. Ecology and Evolutionary Biology,
University of Kansas, 4. School of Biological Sciences, Southern Illinois University Carbondale, 5.
Statistics, Kansas State University. LOCAL ADAPTATION AND TRAIT VARIATION OF THE
DOMINANT PRAIRIE GRASS ACROSS THE RAINFALL GRADIENT OF THE MIDWEST
AND IN RESPONSE TO DROUGHT.
- 3:30 **Franta, B. C.¹ (2), Powell, A. F. L. A.¹, and Wiggam, S.²** 1. Department of Biological Sciences,
Emporia State University, and 2. The Nature Conservancy.
DO MIGRATING SHOREBIRDS USE OLD BISON WALLOWS AND OTHER MICRO-
DEPRESSIONS AS EPHEMERAL WETLANDS?

Ecology & Organismal Biology (Moderator: Bao Nhu To) – Melhorn 113

- 2:10 **Altohol, B. H. and Schneegurt, M. A.** Department of Biological Sciences, Wichita State
University, Wichita, Kansas.
THE ABUNDANCE OF AIRBORNE HALOTOLERANT MICROBES.
- 2:30 **Atha, M. (1), Isom, N., Hodge, S., and Hong, W.-F.** Department of Biology, Sterling College.
STUDIES OF TWO STRAINS OF *BACILLUS AMYLOLIQUEFACIENS*.
- 2:50 **Hodge, S. (1), Atha, M., Isom, N., and Hong, W-F.** Department of Natural Sciences and
Mathematics, Sterling College.
ASSESSMENT OF BACILLUS MOJAVENSIS BM1 FOUND IN KANSAS AS A CANDIDATE
FOR BIO-FERTILIZER AND MICROBIAL PESTICIDE.
- 3:10 **Kimball, S. A.¹, Miller, W. R.¹, Schukei, R.² and Spenko, M.³** 1. Department of Biology and
Chemistry, Baker University, 2. Department of Mathematics, Physics, and Computer Science,
Baker University, and 3. Illinois Institute of Technology.
TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: UPDATING A 100+ YEAR OLD
PROCESS.
- 3:30 **Reh, M. G., and Stark, W. J.** Department of Biological Sciences, Fort Hays State University.
PRELIMINARY RESULTS AND HABITAT MODELING OF CHIHUAHUAN GREEN TOADS,
ANAXYRUS DEBILIS, IN WESTERN KANSAS RANGE.

Poster Presentation Locations



Poster Presentations

(Presenting Author in *Italics*)

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

1. ***Aber, J. S.***,¹ ***Aber, S. E. W.***², and ***Everhart, M. J.***³ 1. Emporia State University, Emporia, 2. San José State University, California, 3. Sternberg Museum of Natural History, Hays.
ROADSIDE GEOLOGY OF KANSAS, MOUNTAIN PRESS (2023).
2. ***Avery, A.***¹ (1), ***Kessler, E. M.***¹, ***Kimball, S. A.***², and ***Miller, W. R.***², 1. BioScience, Blue Valley Center for Advanced Professional Studies, and 2. Baker University.
TARDIGRADES OF KANSAS: THE INFLUENCE OF pH ON HABITAT SUITABILITY.
3. ***Bishop, N.*** (1)¹, ***Systema, J.***¹, ***Galliart, M.***², ***Heffley, T.***⁵, ***Baer, S. G.***³, ***Winters, H.***¹, ***Hartung, E.***¹, ***Gibson, D.***⁴, and ***Johnson, L.***¹ 1. Department of Biology, Kansas State University; 2. Department of Biological Sciences, Fort Hays State University; 3. Ecology and Evolutionary Biology, University of Kansas; 4. School of Biological Sciences, Southern Illinois University Carbondale, 5. Statistics, Kansas State University.
EFFECTS OF DROUGHT ON REGIONALLY ADAPTED PRAIRIE GRASS.
4. ***Clemens, S.***, ***Bjerke, S.***, and ***O'Neill, H.*** Washburn University.
CORAL PHARMACEUTICALS: A POSSIBLE SOLUTION TO DISEASE THREATENING THE CONSERVATION OF CORAL REEFS.
5. ***Cloyd, R. A.***, and ***Herrick, N. J.*** Department of Entomology: Kansas State University, Manhattan, KS.
PROTECTION OF CONTAINER-GROWN NURSERY PLANTS FROM DAMAGE CAUSED BY THE REDHEADED FLEA BEETLE, *SYSTEMA FRONTALIS* (COLEOPTERA: CHRYSOMELIDAE) USING SYSTEMIC INSECTICIDES
6. ***Cox, D.***¹ (1), ***Spenko, M.***², ***Kimball, S. A.***³, ***Schukei, R.***³, and ***Miller, W. R.***³, 1. Kansas State University, 2. Illinois Institute of Technology, and 3. Baker University.
TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: MICROSCOPE SLIDE HANDLING WITH TABLETOP ROBOTS.
7. ***Davis, M. J.*** (1), and ***Conard, J. M.*** Natural Science Department, Sterling College.
DEER VIGILANCE AND DIRECT CONTACT RATES: EXPLORING POTENTIAL FOR CWD TRANSMISSION.
8. ***Gale, A.***, ***Fernandez, K.***, and ***Eschliman, K.*** Department of Science, Technology, Engineering and Mathematics, Friends University.
SYNTHESIS OF NOVEL NNSN DERIVATIVES WITH EDARAVONE.
9. ***Fogarty, K.***¹(1), ***Hartung, E.***¹, ***Sarkar, S.***^{1,2}, ***Kazarina, A.***¹, ***Systema, J.***¹, ***Jumpponen, A.***¹, ***Lee, S.***¹, ***Johnson, L.***¹ 1. Division of Biology, Kansas State University and 2. Center for Fundamental and Applied Microbiomics, Biodesign Institute, Arizona State University.
DO ECOTYPES OF BIG BLUESTEM GRASS GROW BETTER WITH THEIR LOCAL MICROBES?

10. **Franta, B. C. (2), Powell, A. F. L. A., and Ramey, B.** Department of Biological Sciences, Emporia State University.
ASSESSING BREEDING BIRD DIVERSITY, DISTRIBUTIONS, AND ABUNDANCES WITHIN IOWAY TRIBAL NATIONAL PARK.
11. **Fryer, E. J. (1), Ayella, A. K.** Department of Chemistry, Washburn University, Topeka, Kansas.
SINGLE AMINO ACID SUBSTITUTION OF LACTATE DEHYDROGENASE STABILIZES ITS STRUCTURAL STABILITY.
12. **Funk, M. (1), Unger, I. M.** Department of Biology and Chemistry, Baker University.
THE EFFECTS OF PASTURED POULTRY GRAZING AND BREED ON SOIL MICROBIAL COMMUNITY COMPOSITION AND ACTIVITY.
13. **Havner, K. A. (1), Williams, D. R.** Department of Biological Sciences, University of Saint Mary.
HEALED BONE INJURIES IN VIRGINIA OPOSSUM (*DIDELPHIS VIRGINIANA*).
14. **James, A.¹(1), Ranabhat, S.¹, Morrison III, W. R.²** 1. Department of Entomology, Kansas State University, 2. USDA-ARS Center for Grain and Animal Health Research.
EFFICACY OF INSECTICIDE NETTING WITH DIFFERENT ACTIVE INGREDIENTS AGAINST FOUR MAJOR STORED PRODUCT BEETLES.
15. **Denning, R. (1), Nelson H. (1), Schofer, E. (1), Swartwood, E. (1), Jurcak-Detter, A.** Friends University.
A CRAY-ZY INVASION: A SURVEY OF INVASIVE CRAYFISH PRESENCE IN THE WICHITA KS AREA.
16. **Kimball, S. A.¹, Miller, W. R.¹, Schukei, R.²** 1. Department of Biology and Chemistry, Baker University, and 2. Department of Mathematics, Physics, and Computer Science, Baker University.
TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: PRELIMINARY DATA FROM A STATEWIDE SURVEY OF TARDIGRADES (PHYLUM: TARDIGRADA).
17. **McCready, C. R., and Gleason, J. M.** University of Kansas.
ZAPRIONUS INDIANUS: AN INVASIVE DROSOPHILA IN KANSAS.
18. **Mecke, M. M. (1) and Henry, C. B. S.** Department of Biology and Chemistry, Baker University.
FIBROBLAST GROWTH FACTOR SIGNALING IS REQUIRED FOR NEW SEGMENT REGENERATION IN *LUMBRICULUS VARIEGATUS*.
19. **Miller, W. R.¹, Schukei, R.¹, Kimball, S. A.¹, and Spenko, M.²** 1. Baker University, 2. Illinois Institute of Technology.
TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: ANNOTATED COMPUTER KEY FOR IDENTIFICATION.
20. **Monroe, B. (2), Price, H., Paynter, A., George, A., and Ghosh, A.** Biology Department, Pittsburg State University, Pittsburg, KS.
CHARACTERIZATION OF CULTURABLE BACTERIAL ISOLATES OBTAINED FROM GUANO OF GRAY BATS IN SOUTHEAST KANSAS FOLLOWING BIOCHEMICAL AND GENOMIC APPROACHES.

21. **Munsell, K. B. (1), Brighton, K., and Reed, B.** Department of Biology, Washburn University, and 2. Department of Biology, University of Nebraska Lincoln.
EXAMINING THE REPRODUCTIVE ECOLOGY OF *TERRAPENE ORNATA* IN WESTERN NEBRASKA.
22. **Norton, A. E.¹(1), Whitworth, R. J.¹, Ewing, R.², and Cohnstaedt, L. W.²** 1. Department of Entomology, Kansas State University, and 2. National Bio and Agro Defense-USDA, Manhattan, Kansas.
FATAL FOOD! SILVER COATED GRAIN PARTICLES DISPLAY LARVICIDAL ACTIVITY IN *CULEX QUINQUEFASCIATUS*.
23. **Paudyal, G. (1), and Nguyen, H.** Department of Chemistry, Washburn University, Topeka, KS 66621, USA.
MICRO FABRY-PEROT CAVITY FOR CHEMICAL CHARACTERIZATION OF NANOSCALE PARTICLES.
24. **Peterson, A. E.** Kansas Geological Survey, The University of Kansas, Lawrence, Kansas 66047.
A LIDAR DERIVED STRUCTURAL CONTOUR MAP OF THE BARNESTON LIMESTONE, MORRIS COUNTY, KANSAS.
25. **Pfeiffer, K.^{1,2} (1), Cooper, A.¹, Mitzel, D.³, and Silver, K.¹,** 1. Department of Entomology, Kansas State University, 2. Department of Animal Sciences and Industry, Kansas State University, and 3. National Bio and Agro-Defense Facility, US Department of Agriculture.
EFFECTS OF ELECTRICITY ON THE BEHAVIOR OF BITING MIDGES DURING ELECTROPENETROGRAPHY.
26. **Renfro, A. (1), Simpson, J., Steffen, E., Bushek, R., and Schukei, R.** Department of Mathematics, Computer Science & Physics, Baker University.
TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: FIELD COLLECTION APP.
27. **Simpson, J. (1), Renfro, A., Kosanke, K., Wright, A., Martinez, F., and Schukei, R.,** Department of Mathematics, Computer Science & Physics, Baker University.
TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: ADMINISTRATIVE SUITE.
28. **Singh, R.^{1,4}(3), Peterson, J.^{2,3}, Santana, A. L. D.^{2,3}, Zhu, K. Y.¹, Siliveru, K.², Smolensky, D.³, Scully, E.^{1,4}** 1. Department of Entomology, Kansas State University, 2. Department of Grain Science and Industry, 3. Grain Quality and Structure Research, USDA ARS, Manhattan, 4. Stored Product Insect and Engineering Research, USDA ARS, Manhattan.
INVESTIGATING THE ROLE OF SORGHUM POLYPHENOLICS IN MEDIATING RESISTANCE TO STORED PRODUCT INSECT INFESTATION.
29. **Slabaugh, G.¹ (1), Preston, B.¹, Edmonds, A. B.¹, Schultz, H.¹, and Dr. Zhang, Q.¹** 1. Department of Physical Sciences, Emporia State University.
VARIATION IN CONCENTRATION OF HEAVY METALS IDENTIFIED IN SOIL SAMPLES COLLECTED UP AND DOWN STREAM ALONG THE NEOSHO RIVER TO TAR CREEK

30. **Stucky, K. (1), and Conard, J.** Department of Science and Mathematics, Sterling College.
AGE-RELATED TOOTH WEAR AND SEXUAL DIMORPHISM IN WHITE-TAILED DEER
(*ODOCOILEUS VIRGINIANUS*) JAWS FROM QUIVIRA NATIONAL WILDLIFE REFUGE,
KANSAS.
31. **To, B. N. (1) and Schneegurt, M. A.** Department of Biological Sciences, Wichita State
University, Wichita, Kansas.
MICROBIAL SURVIVAL AND DISTRIBUTION IN LAYERED ICE TERRACES RELEVANT
TO MARS.
32. **Todwong, S. (1), Berger, A. (1), Burghart, J. (1), and Herbig, A.** Department of Biology,
Washburn University.
EFFECT OF SIMULATED GASTRIC JUICE ON PROBIOTIC COUNTS IN DAIRY VS.
DAIRY-FREE YOGURT.
33. **Verma, V. (2), Halabi, M. E., VandeVelde, C. W., Strong, S., and Gleason, J. M.** University of
Kansas.
DOES AGGRESSION LEVEL CO-VARY BETWEEN MALE AND FEMALE *DROSOPHILA*
MELANOGASTER?
34. **Weikert, C. (1), and Rogers, D.** Department of Natural Sciences, Sterling College, Sterling,
Kansas.
IMPACT OF LOW TO MODERATE HUMIDITY ON PO₂ AND HEART RATE IN
ATHLETES.
35. **Winters, H.¹ (1), Sytsma, J.¹, Bishop, N.¹, Hartung, E.¹, Galliard, M.², Baer, S. G.³, Gibson,
D.⁴, Barfknecht, D.⁴, Johnson, L.¹.** 1. Division of Biology, Kansas State University; 2.
Department of Biological Sciences, Fort Hays State University; 3. Center for Ecological Research,
University of Kansas; 4. School of Biological Sciences, Southern Illinois University.
DECADAL STUDY OF ADAPTATION OF THE DOMINANT PRAIRIE GRASS BIG
BLUESTEM ACROSS THE RAINFALL GRADIENT OF THE MIDWEST.
36. **Wood, J. Q.¹ (1), and Jameson, M. L.² 1.** Cohen Honors College, Wichita State University, and
2. Department of Biological Sciences, Wichita State University.
DO YOU SEE WHAT I SEE? COLOR VISION DEFICIENCIES IN KANSAS.
37. **Wright, C. (2), Rindom, K., and Bailey, M. M.** Department of Biological Sciences – MSFS
Program, Emporia State University.
THE EFFECTS OF SIMPLE GREEN EXTREME ON THE MICROSCOPIC EXAMINATION
OF CARTRIDGE CASES.

Abstracts

Organized Alphabetically

Aber, J. S.,¹ Aber, S. E. W.,² and Everhart, M. J.³ 1. Emporia State University, Emporia, 2. San José State University, California, 3. Sternberg Museum of Natural History, Hays.

ROADSIDE GEOLOGY OF KANSAS, MOUNTAIN PRESS (2023). *Roadside geology of Kansas* (RGK) is scheduled for publication by Mountain Press late in 2023. The book represents a successor and complement to *Roadside Kansas* (Buchanan and McCauley 2010). Three years in preparation, RGK covers mostly non-interstate US highways including US 24, 50, 69, 81, and 281 plus state routes 4, 27, and 99. In addition, and for the first time in the Roadside Geology series, the book contains all 12 state and national scenic and historic byways. Examples include the Flint Hills National Scenic Byway, Post Rock Scenic Byway, Glacial Hills Scenic Byway, Western Vistas Historic Byway, and Route 66 Historic Byway. Together, the selected highways and byways cover all sectors of the state and geologic features. Emphasis in RGK is given to surficial geology, fossils, landscape regions, and geologic resources. The latter include fossil fuels, native stones, evaporite minerals, groundwater, wind energy, and the Tri-state Mining District. The state geologic symbols are elaborated for marine fossil (*Tylosaurus*), flying fossil (*Pteranodon*), mineral (galena), rock (Greenhorn Limestone), and gemstone (amber, var. jelenite). The book is richly illustrated with maps, as well as color images of specimens, rock exposures, and kite aerial photographs.

Alcerro, L (3). The University of Kansas. RECREATING THE VERY FIRST INSTANTS OF THE UNIVERSE WITH RELATIVISTIC HEAVY ION COLLISIONS. Tiny droplets of a very special substance called Quark and Gluon Plasma (QGP) are copiously produced after the collision of heavy ions at high energies. The QGP is characterized by its extremely high temperature and energy density, similar to the conditions prevailing just after the Big Bang. In order to perform detailed studies of the QGP, sophisticated infrastructures have been built in which beams of particles are accelerated at relativistic energies and collide, producing sprays of new particles whose information is recorded and then analyzed. One of such experiments is the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN). In this talk a general overview on how the LHC data is being used to answer some of the most fundamental questions on nuclear physics is discussed.

Altohol, B.H. and Schneegurt, M.A. Department of Biological Sciences, Wichita State University, Wichita, Kansas. THE ABUNDANCE OF AIRBORNE HALOTOLERANT MICROBES. Microbes transported by the wind can cross oceans and continents without the biogeographic limitations of larger organisms. While everything is potentially everywhere, the environment must select for endemic species since all microbes are not cosmopolitan. Halotolerant microbes in common soils appear to be autochthonous (native) members of the community rather than allochthonous (transients). In the current study, we measured the abundance of halotolerant airborne bacteria in areas near Wichita, Kansas, with no nearby hypersaline environments. Active microbial air sampling at 1 m above the ground was used to enumerate halotolerant bacteria by forcing air through a cone for 15 min at 100 L min⁻¹ onto triplicate R2A agar plates supplemented with fungicide and either 1% or 10% NaCl. Resulting colonies were counted and the percentage of airborne halotolerant microbes was calculated. Five sampling events in a campus area of managed turf yielded a mean of 34 ± 10 CFU m⁻³ of air on medium with 10% NaCl, approximately 10% of the counts on low-salt medium. This is a substantially higher percentage than observed for oligosaline soils in similar locations. Measurements in natural prairie environments yielded lower counts of halotolerant microbes, which represented less than 1% of the counts on low-salt medium, but still a higher percentage than from equivalent soils. Some isolates grew at 20% NaCl. Airborne microbes may be associated with salty dusts and include bacterial endospores. Airborne microbes may be

halotolerant, not halophilic, and therefore able to grow when deposited on oligosaline soils. Supported by NASA and K-INBRE.

Apple, A (1). Department of Natural Science, McPherson College. USABILITY OF *VITIS VINIFERA* 'CHAMBOURCIN' GRAPE EXTRACT AS A PH INDICATOR. The present assay is the experimental study of an American-European hybrid grape known as "Chambourcin" and its ability to be used as a natural acid-base indicator. The rationale for choosing this grape is supported by multiple data analysis's proving the skin of the grape has a high anthocyanin count. Anthocyanins are responsible for the red, blue, and purple pigments in plants and after extraction, can be used as natural indicators for acid base titrations to identify the endpoint. In testing this theory, data supported that Chambourcin grape extract can be used as a pH identifier in favorable conditions, but not as an acid base titration indicator due the amount of extract required to see potent color changes in large volumes of analyte.

Atha, M. (1), Isom, N., Hodge, S., and Hong, W.-F. Department of Biology, Sterling College. STUDIES OF TWO STRAINS OF *BACILLUS AMYLOLIQUEFACIENS*. *Bacillus amyloliquefaciens* and its close relative *B. subtilis* have been found in various niches, including soil, plant rhizospheres, fermented vegetables, animal feces, human food, and aquatic environments. This implies a wide range of genomic and physiological properties that allow them to adapt to different environments (Earl *et al.*, 2008; Zhang *et al.*, 2016). Studies have proposed that *B. amyloliquefaciens* comprises two subspecies: plant-associated *B. amyloliquefaciens* subsp. *plantarum* and non-plant-associated *B. amyloliquefaciens* subsp. *amyloliquefaciens* (Borriss *et al.*, 2011). In our research, two types of *Bacillus amyloliquefaciens* were isolated from the same soil sample. Both were identified as *Bacillus amyloliquefaciens* by 16S rRNA sequencing. They are both Gram-positive, aerobic, endospore-forming, but have different morphological appearances on 10% salt on NA media. Our studies showed that both strains did not promote wheat germination in a 15ml bacterial solution wet bag compared to the control with water only. However, our preliminary data showed that when tomato seeds were soaked with the AF strain under minimum water conditions, the newly grown root length on the 10th day was 5 times longer compared with the control without bacterial inoculation. When the plants were transferred to pots with garden soil without additional bacterial inoculum, the average stem height was 1.3 times higher than the control after 2 weeks. Both strains also showed antifungal properties against *Fusarium* sp, which was isolated from dry rot disease in potato.

Avery, A.¹ (1), Kessler, E. M.¹, Kimball, S.A.², and Miller, W.R.², 1. BioScience, Blue Valley Center for Advanced Professional Studies, and 2. Baker University. TARDIGRADES OF KANSAS: THE INFLUENCE OF pH ON HABITAT SUITABILITY. First report of 2022 Kansas Academy of Science Undergraduate grant award to test the hypothesis that different species of tardigrades react differently to the pH of their habitat (moss and lichens) with the extremes expressed as presence or absence while concentrations within suitable ranges determine the diversity and density of tardigrades found within those habitats. The behavioral response of moving toward or away from different pH concentrations was tested with tardigrades from four different genera *Echiniscus*, *Milnesium*, *Ramazzottius*, and *Paramacrotbiotus*. Different concentrations of pH were introduced at one end of a 12 x 25 mm chamber with 10 tardigrades at the center. The animal's movement was digitally recorded at 15 second intervals for 20 minutes and the movement from the starting point calculated for each animal. The average directions and distances were compared for the species and pH concentration.

Bhatta, M. (1), Davies, B., and Adem, S. Department of Chemistry, Washburn University. DEVELOPMENT AND CHARACTERIZATION OF MALONIC ACID MODIFIED GOLD NANOPARTICLES FOR COLORIMETRIC ANALYSIS OF LEAD IONS (Pb²⁺). Heavy metal ions are generally toxic, deleteriously affecting human health and welfare. Lead ions are major environmental pollutants and long-term exposure may cause adverse health effects even at low concentrations. Thus, a

simple, rapid, sensitive, easy-to-use, inexpensive, and on-site applicability detection method is much needed for monitoring the level of lead ions in environmental samples such as drinking water. Gold nanoparticles (GNPs) play a crucial role in developing highly sensitive and selective method to detect toxic contaminants due to their high surface-to-volume ratio and unique optical properties. In this experiment, we work on developing malonic acid (MA) functionalized GNPs for colorimetric detection of Pb^{2+} ions in drinking water. The stability and selectivity of GNPs are studied and characterized by UV-vis spectroscopy. In these preliminary experiments, the malonic acid functionalized gold nanoparticles are able to detect lead ions in the micromolar range. The color of AuNPs changed from wine red to purple in the presence of lead ions. There was a linear correlation between the response of the probe and the concentration of lead ions in the range of 10.0 – 80.0 μM ($R^2 = 0.9536$). A limit of detection (LOD) of 20.7 μM was also obtained. We are working in optimizing experimental conditions to improve the detection limit down to the nanomolar range and the selectivity of the probe.

Bishop, N. (1)¹, Systma, J.¹, Gallart, M.², Heffley, T.⁵, Baer, S.G.³, Winters, H.¹, Hartung, E.¹, Gibson, D.⁴, and Johnson, L.¹ 1. Department of Biology, Kansas State University; 2. Department of Biological Sciences, Fort Hays State University; 3. Ecology and Evolutionary Biology, University of Kansas; 4. School of Biological Sciences, Southern Illinois University Carbondale, 5. Statistics, Kansas State University. EFFECTS OF DROUGHT ON REGIONEALLY ADAPTED PRAIRIE GRASS. Droughts are expected to increase in frequency and severity within the Midwest, however our understanding of its impacts on dominant plants is not fully known. Big bluestem (*Andropogon gerardii*), is a dominant prairie grass, and serves in both native prairie conservation, as well as cattle forage. Through the Midwest rainfall gradient (500-1200mm/yr.), different climate-adapted ecotypes of *A. gerardii* have arisen. Reciprocal gardens were established in 2009 containing wet, mesic, and dry *A. gerardii* ecotypes across the gradient (driest to wettest: Colby, Hays, Manhattan, KS to Carbondale IL) and measured for over a decade for various traits. Rainfall was reduced with rainout shelters, and plants were monitored for biomass, photosynthetic rates, and flowering time. The objectives were to characterize local adaptations across the natural gradient, and measure plant responses to drought. We hypothesized that local ecotypes would perform better than non-local ecotypes at their home sites, and that plants in drought conditions would reduce flowering and timing flower than those in ambient conditions. Local ecotypes had higher biomass than non-local ecotypes at their home locations. Flowering time was consistently sooner in dry ecotype than mesic and wet ecotype. Photosynthetic rates were also often highest in dry ecotypes regardless of their location and drought conditions. These findings show important and significant differences between ecotypes and their ability to perform in differing rainfall conditions. This knowledge could be used in the future to prepare prairies and grazing pastures for harsher conditions while still maintaining a staple tallgrass.

Bryant, M. J. (1), and Gleason, J. M. Department of Ecology and Evolutionary Biology, University of Kansas, Lawrence, Kansas. BEEPING FLIES AND THE REPRODUCTIVE COSTS OF STRESS IN *DROSOPHILA STURTEVANTI*. An organism's condition and energy reserves are limited and may be sapped by stress; therefore, stress may limit an individual's ability to perform courtship. *Drosophila* courtship consists of multimodal signals, including vision, touch, and sound. Males in the *Drosophila saltans* species group produce courtship song to stimulate females to mate. Most courtship songs in the *saltans* group have two types of pulse song, which are discrete pulses produced in bursts. In addition, *Drosophila sturtevanti* has a novel, tonal auditory song, a 'beep'. To understand beeps, we investigated how stress influences song and determined which song parameters associated with mating success. Because song is energetically costly, we predict that starved individuals will not perform song as well as control individuals. We also predict a difference in mating success between stressed and unstressed flies. Lastly, we hypothesize that song parameters differ between the courtship songs of successfully mating males compared to unsuccessful males. To test the hypotheses, we analyzed the courtship song of fed and starved males. A greater proportion of fed males mated than starved males, though there was no

difference in the proportion of males who courted in each treatment. Fed and starved males differed in song characteristics. Duty cycle was greater in mating flies than non-mating flies, and mating flies were more likely to have beeped than non-mating flies. Our findings imply that some song characteristics are costly, though starvation does not inhibit song altogether. Beeping does not guarantee mating, but beeping appears to facilitate mating success.

Clay, M.A. Department of Teacher Education, Fort Hays State University. EARLY EXPLORATIONS IN USING 360 VIDEO TO TEACH ENVIRONMENTAL SCIENCE. In many educational settings, teaching in field-based settings encounters logistical and financial barriers. However, 360 video has the potential to address these barriers and allow field-based teaching techniques to be utilized in the environmental science classroom. This session will discuss early field work in capturing 360 video, survey results of teachers' perceptions of the potential for this technology, as well as the instructional potential for this technology to create equitable opportunities for science students to experience field-based teaching. Furthermore, this work will explore the potential to provide greater conceptual clarity to complex topics such as climate change by allowing students to observe, interpret evidence, and build their own understanding. Examples will be shared of using this technology with K-12 students, undergraduate students, and with the general public. Furthermore, there will be a discussion of how science educators can incorporate this technology in their own work.

Clemens, S., Bjerke, S., and O'Neill, H. Washburn University. CORAL PHARMACEUTICALS: A POSSIBLE SOLUTION TO DISEASE THREATENING THE CONSERVATION OF CORAL REEFS. Between 2009 and 2018 nearly one sixth of coral reefs were eradicated. Current projections estimate that more than fifty percent of coral reefs could be damaged by 2035. With the looming threat of climate change fast approaching, one hope remaining for the conservation of coral lies in aquaculture – the practice of farming aquatic organisms. Rapid tissue loss represents one of the largest threats to captive corals. Countless corals affected by this illness have been analyzed and *all* contain a unique pathogen that infects the corals symbiotic algae. Because this pathogen infects the algae within coral and not the coral itself, it can infect any species of coral. Due to this organism's general mode of infection, it has the capacity to wipe out entire aquaculture facilities. This organism has been associated with more than seven distinct diseases in wild coral, but its presence is relatively unreported in captivity. No commercial treatments are known to treat this infection. In this study a new treatment has been created to eradicate the pathogen. Additionally, work has started to identify the active ingredient of the top commercial coral "dips". After identification, an experiment is conducted on each of the compounds to determine their ability to fight the organism. By the end of the study, we hope to isolate the pathogen and successfully infect healthy coral to prove they are responsible for the infection and assess if current market treatments work as advertised.

Cloyd, R. A., and Herrick, N. J. Department of Entomology: Kansas State University, Manhattan, KS. PROTECTION OF CONTAINER-GROWN NURSERY PLANTS FROM DAMAGE CAUSED BY THE REDHEADED FLEA BEETLE, *SYSTEMA FRONTALIS* (COLEOPTERA: CHRYSOMELIDAE) USING SYSTEMIC INSECTICIDES. *Systema frontalis*, commonly known as the redheaded flea beetle, is an insect pest of plants grown in nursery production systems. Adults feed on plant leaves, which reduces plant aesthetic quality and salability. Control methods using foliar insecticides are costly and labor intensive. Systemic insecticides applied to the growing medium may protect plants from *S. frontalis* adult feeding. In 2021 and 2022, two greenhouse experiments were conducted to determine if systemic insecticides reduce feeding by field-collected populations of *S. frontalis* adults. *Itea virginica* 'Little Henry' plants treated with systemic insecticides were placed into plastic observation cages. Eight *S. frontalis* adults were released into each cage. The systemic insecticides thiamethoxam, dinotefuran, and acephate protected plants from *S. frontalis* adult feeding over the 15-day exposure period tested. Our

results indicate that systemic insecticides can mitigate feeding damage caused by *S. frontalis* adults on container-grown nursery plants.

Cox, D.¹ (1), Spenko, M.², Kimball, S.A.³, Schukei, R.³, and Miller, W.R.³, 1. Kansas State University, 2. Illinois Institute of Technology, and 3. Baker University. TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: MICROSCOPE SLIDE HANDLING WITH TABLETOP ROBOTS. For 50 years the procedure to catch, process and identify tardigrades has remained the same. As a result, Baker University and the National Science Foundation has undertaken a project to improve the process by reducing the time and cost of gathering the basic diversity, density, and distribution data for the taxa. Tardigrade specimens are mounted on microscope slides which entails a lot of handling processes in order to identify the species. We have identified steps in the process that can be done off line in a batch mode such as affixing a bar coded label to the slide, engraving codes into the glass of the slides, sealing the cover slip, and loading slides into and out of storage boxes. In addition, robotic in-process aids are being developed such as an automated dissecting microscope stage with media and cover slip application. We are also developing automated imaging to support image analysis specimen identification. The machines are run by Arduino and Raspberry PI microcomputers controlled by a Python app that communicates with the slides by bar codes and with the project web site back bone. The machines are intended to be used and fully tested in the summer of 2023 during Baker's statewide Survey of Kansas Tardigrades. The program is designed to be adaptable to different geographic regions and different taxa with simple text-based CSV/spreadsheets. The designs, construction details, and code are anticipated to be available next year.

Davis, M. J. (1), and Conard, J. M. Natural Science Department, Sterling College. DEER VIGILANCE AND DIRECT CONTACT RATES: EXPLORING POTENTIAL FOR CWD TRANSMISSION. Chronic Wasting Disease (CWD) is a fatal neurological disease of deer and other ungulates. CWD is transmitted from animal-to-animal by direct contact as well as through fecal matter and saliva. We investigated factors that may affect direct contact rates including group size, composition, location, vigilance, season, and time of day. During the study, we conducted surveys at Quivira National Wildlife Refuge on six separate days in the fall (2022) and the spring (2023). Three surveys were conducted in the morning (AM) and evening (PM) during each season. We observed groups for five-minute increments and recorded time feeding or moving, vigilance, and direct contact. The direct contact rates for fall and spring were quite similar. However, the direct contact observations made in the fall involved more female-to-female contact while the spring involved more male-to-female contact. The group size averaged 2.75 deer per group in the fall with an average moving time of 2:42. The average time spent alert for groups in the fall was 1:23. For the spring, the average group size was 3.1 deer per group and the average time spent feeding or moving was 3:58. The average time spent alert in the spring was 41 seconds. Deer were less vigilant in the spring and the average group size was larger as well. This may result in the potential for seasonal differences in the rates of CWD transmission.

Denning, R. (1), Nelson H. (1), Schofer, E. (1), Swartwood, E. (1), Jurcak-Detter, A. Friends University. A CRAY-ZY INVASION: A SURVEY OF INVASIVE CRAYFISH PRESENCE IN THE WICHITA KS AREA. Invasive crayfish are known to jeopardize many organisms within local ecosystems, especially native crayfish species, and are a large threat to biodiversity globally. Two particularly invasive crayfish are the rusty crayfish (*Faxonius rusticus*) and the red swamp crayfish (*Procambarus clarkii*). In 2019, the red swamp crayfish was discovered in a private pond in Butler County, Kansas. In 2021, the rusty crayfish was discovered in McPherson State Fishing Lake. The purpose of this study was to understand the invasive crayfish species population in the greater Wichita area. Seven sites were sampled from late August to mid October. Sites included 5 CFAP fishing ponds, a protected wetland, and two sites on Cowskin Creek in Wichita, KS. Methods for collection utilized both physical trapping (minnow traps, D nets, kick seines) as well as environmental DNA (eDNA). All

crayfish were native to Kansas and represented one species. eDNA results will help to elucidate if any other species, both native and invasive, were present in the aquatic habitats, that were not collected. Future studies are needed to understand the current native and invasive crayfish populations currently in Kansas.

Dhimal, A.¹ (1), Nguyen, H. L.². 1. Department of Biology, Washburn University, and 2. Department of Chemistry, Washburn University. GRAPHENE-BASED QUANTUM DOT SYNTHESIS FOR BIOMOLECULAR IMAGING. Quantum dots (QDs) are semi-conductor nanoparticles with unique optical and electronic properties dependent on their physical size. Their small size and versatile characteristics have allowed applications to various fields over the years, including biological research, targeted drug delivery, engineering, etc. However, their biocompatibility and toxicity are still a major concern for biological application. We follow a bottom-up strategy to synthesize graphene-based quantum dots (GQDs) using pyrene as a precursor. These graphene-based nanoparticles have many advantages including good solubility, stable fluorescence, high surface area, adjustable band gap, and lower cytotoxicity compared to their heavy-metal-based counterparts. GQDs are expected to be suitable for applications in bio-imaging, tracking, and sensing inside a cell. Our synthesized GQDs display a blue fluorescence under the ultra-violet excitation. We are currently working on characterizing the optical properties of our synthesized GQDs and will later introduce them inside living cells to quantify their cytotoxicity. Next, we will work on fine-tuning our synthesis protocol to adjust the bandgap of our GQDs.

Fogarty, K.¹(1), Hartung, E.¹, Sarkar, S.^{1,2}, Kazarina, A.¹, Systma, J.¹, Jumpponen, A.¹, Lee, S.¹, Johnson, L.¹ 1. Division of Biology, Kansas State University, and 2. Center for Fundamental and Applied Microbiomics, Biodesign Institute, Arizona State University. DO ECOTYPES OF BIG BLUESTEM GRASS GROW BETTER WITH THEIR LOCAL MICROBES? Big bluestem (*Andropogon gerardii*) is a dominant forage grass of prairies and is distributed across a steep rainfall gradient in the Great Plains. This gradient has given rise to locally adapted wet and dry ecotypes. Soil microbes likely vary along this precipitation gradient as well and play a role in nutrient availability for big bluestem. We investigated how local soil microbes affect Big Bluestem growth and whether plant ecotypes are matched to their local soil microbes. We predicted that each ecotype would grow better when grown with its native microbes. We collected seed and soils from six native Big Bluestem populations from western KS and IL. Plants were grown in greenhouse in garden soil. Microbes isolated from our field collections were reciprocally injected into the garden soils weekly for 12 weeks. Measurements were taken on these plants weekly. Ecotype differences affected many results like leaf area, height, and leaf width. Microbe origin (wet vs dry) was also important in affecting some of the characters we measured. Total plant biomass showed that ecotypes produced more biomass when grown with their local microbes. Furthermore, chlorophyll absorbance (proxy for photosynthesis) was also enhanced when ecotypes grew with their local microbes, suggesting effects of microbe-mediated nutrient availability. These results provided insight into how plants interact with their native microbes. Local microbes can have a large impact on the growth of plants. These results will help to inform range managers to optimize forage and restoration through use of and matching with beneficial microbes.

Franta, B. C. (2), Powell, A. F. L. A., and Ramey, B. Department of Biological Sciences, Emporia State University. ASSESSING BREEDING BIRD DIVERSITY, DISTRIBUTIONS, AND ABUNDANCES WITHIN IOWAY TRIBAL NATIONAL PARK. Ioway Tribal National Park (ITNP) is located in what is now commonly called Nebraska and Kansas (in their southeastern and northeastern corners, respectively). The land consists of rolling bluffs with areas of upland and lowland prairie, together with oak-hickory forest tracts, along the Missouri River valley. Conservation projects are being considered; therefore, baseline data are needed to help anticipate effects of potential stewardship alternatives. From 27 May to 27 July 2022, we conducted surveys of breeding birds and woody vegetation

to describe their compositions and distributions in ITNP. Spot-mapping along 19 transects was used to record the geographic locations of birds, which were detected via auditory or visual cues at unlimited distance. Tree and shrub species were identified, counted, and their diameter at breast height (DBH) measured. In total, 58 bird and 32 woody species were identified, including seven bird Species of Greatest Conservation Need in Nebraska as well as seven in Kansas. Future data collection and analyses will include mapping more distributions in 2023 and then measuring strengths of associations between bird locations and woody vegetation parameters such as species diversity, species abundance, tree density and height, and canopy cover, in addition to elevation and slope.

Franta, B. C.¹ (2), Powell, A. F. L. A.¹, and Wiggam, S.² 1. Department of Biological Sciences, Emporia State University, and 2. The Nature Conservancy. DO MIGRATING SHOREBIRDS USE OLD BISON WALLOWES AND OTHER MICRO-DEPRESSIONS AS EPHEMERAL WETLANDS? American Bison (*Bos bison*), which once numbered in the tens of millions in North America, were nearly exterminated in the 1800s, but millions of their 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). From 9 April – 12 May 2022, we measured the extent to which migrating shorebirds 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 322 detected micro-depressions was assigned to a wetland and emergent vegetation cover class in each survey. We found four shorebird species and four other bird species present within micro-depressions. Several bird species appeared to be attracted to recently burned grassland rather than to micro-depressions per se. Following more surveys in 2023, we aim to have a better idea of landscape and habitat variables that are attractive to migrating shorebirds.

Fryer, E. J. (1), Ayella, A. K. Department of Chemistry, Washburn University, Topeka, Kansas. SINGLE AMINO ACID SUBSTITUTION OF LACTATE DEHYDROGENASE STABILIZES ITS STRUCTURAL STABILITY. Lactate dehydrogenase (LDH) is an enzyme that is used in all living organisms in a reversible conversion of lactate to pyruvate in a dehydrogenation reaction. Studies show increased expression of the LDH enzyme in cancer cells due to the Warburg effect. Therefore, decreasing the amount of functional LDH in a cancerous cell would be beneficial. One way to limit genomic expression of LDH is to stabilize its structure. Therefore, in this research, we hypothesized that the mutation of a glycine to lysine on the 68th position of LDH will increase the thermal stability of the LDH protein, and hence make it more stable. This change from a non-polar to a polar amino acid will cause an increase in non-covalent interactions and therefore, increase stability. The experiment was done by conducting a transformation then, purifying his-tagged proteins by using nickel column chromatography. We determined enzyme activity of our mutant samples and found them to be comparable to wild type LDH protein. Circular dichroism experiments showed an increase in stability of the mutant protein as observed by increased melting point of the LDH protein. These results could lead to further investigation on the role single amino acids substitutions play in the stability of the LDH protein structure. This stability could indicate a reduced genomic expression of the LDH protein in cancer cells.

Funk, M. (1), Unger, I.M. Department of Biology and Chemistry, Baker University. THE EFFECTS OF PASTURED POULTRY GRAZING AND BREED ON SOIL MICROBIAL COMMUNITY COMPOSITION AND ACTIVITY. The soil microbial community plays a crucial role in terrestrial ecosystem functioning. There is a back-and-forth interaction taking place between below-ground and above-ground biological activity. In the agricultural context, rotationally grazing poultry on pasture introduces forces that may shape the soil community, including manure input, soil surface scratching, and herbivory. Pasturing poultry is a burgeoning field in sustainable livestock management. It is important to

evaluate how different management methods and poultry breeds impact the soil microbial community so that the impacts on the ecosystem can be determined. Before grazing and after grazing soil microbial community profiling using Biolog EcoPlates was conducted at a Northeast Kansas family farm. With my testing, no significant results were found that the grazing of chickens, *Gallus domesticus*, nor the type of chicken breed (Cornish cross, ISA Brown) alters the diversity and abundance of soil microbes. Future studies should continue to investigate poultry impacts on soil organisms and nutrient cycling to guide the development of best practices for this important sector of sustainable agriculture.

Gale, A., Fernandez, K, and Eschliman, K. Department of Science, Technology, Engineering and Mathematics, Friends University. SYNTHESIS OF NOVEL NNSN DERIVATIVES WITH EDARAVONE. The steady rise of multi-drug resistant bacteria is a worldwide issue that needs immediate attention. NNSN molecules are a novel, patented class of drugs that have been proven effective against bacterial infections such as *Staphylococcus aureus*, *Escherichia Coli*, *Mycobacterium tuberculosis*, *Corynebacterium diphtheriae*, *Streptococcus agalactiae*, *Shigella Flexneri*, and *Enterococcus faecalis*. They are called NNSN's due to an extended thiourea motif that is synthesized by coupling a phenyl isothiocyanate with a pyrazole ring. Novel derivatives are being produced through the coupling of various phenyl isothiocyanates with Edaravone, an established drug with a pyrazole ring that is used in the treatment of strokes and amyotrophic lateral sclerosis (ALS). Testing of these derivatives will be sought to determine effectiveness toward various bacterial infections and potentially ALS and/or stroke prevention and treatment.

Harriman, C.L. (1). Department of Biology and Chemistry, Baker University. INCREASED POLLINATOR DIVERSITY ON GOLF COURSES AS A RESULT OF THE CONVERSION OF "OUT OF PLAY" AREAS INTO POLLINATOR HABITAT. Golf courses are intensively managed green spaces which often include suitable pollinator habitat within a highly fragmented landscape. Given the decline in pollinator populations, due in part to habitat fragmentation, golf courses are ideal targets for conservation efforts. I investigated pollinator diversity on golf courses, comparing grass-dominated, "out-of-play" areas (control sites) to areas dominated by wildflowers (pollinator-enhanced treatment sites). I visited five golf courses in eastern Kansas and central Missouri and sampled both plant and pollinator diversity. Transect surveys confirmed that the wildflower areas were more diverse than the control sites. Pollinators were sampled by counting individuals using circular quadrats. Mean pollinator diversity was 43.8% higher in the sites with more diverse flora. Similarly, pollinator richness was 158.9% higher and abundance was 270.2% higher in the wildflower areas than in the control sites. These data suggest that conversion of grassy areas into wildflower habitat can increase pollinator diversity and could be used as a tool of to provide pollinator habitat in an already fractured landscape.

Hartung, E.¹ (2), Sarkar, S.^{1,2}, Fogarty, K.¹, Kazarina, A.¹, Systma, J.¹, Jumpponen, A.¹, Lee, S.¹, and Johnson, L.¹ 1. Division of Biology, Kansas State University and 2. Center for Fundamental and Applied Microbiomics, Biodesign Institute, Arizona State University. DO WET AND DRY ECOTYPES OF A DOMINANT GRASS GROW BETTER WITH THEIR NATIVE SOIL MICROBES? Big bluestem (*Andropogon gerardii*) is a dominant grass of the Midwest that accounts for roughly 70% of the biomass of tallgrass prairies. Its distribution across a steep rainfall gradient in the Midwest has given rise to locally adapted wet and dry ecotypes. Abiotic factors driving ecotype formation have been well-studied. However, the role of soil microbes in local adaptation is less clear. We investigated how local soil microbes affect *A. gerardii* growth and whether ecotypes are matched to local soil microbes. We predicted that each ecotype would grow better when grown with its native microbes. We collected seed and soil from six *A. gerardii* populations from western KS (500 mm rainfall) and Illinois (1200 mm rainfall). We isolated microbes from roots and soil, cultured them in R2A agar broth, and reciprocally inoculated wet and dry microbes (plus mock control) weekly into garden soil where plants were grown for 12 weeks with 6 replicates per treatment. Plant form and function were measured weekly. Preliminary

results showed that ecotypes are genetically distinct and that inocula harbor distinct microbial communities. For ecotype effects, wet ecotypes produced more biomass, greater leaf area, and were taller than dry ecotypes. For inoculation effects, chlorophyll absorbance, a photosynthesis proxy, was enhanced when ecotypes grew with their local microbes. Even more notable, the dry ecotype produced ~30% more biomass when matched with its local microbiome. Taken together, these results suggest ecotype specific microbe-mediated effects on productivity and interactions with soil microbe may be harnessed to increase plant growth.

Havner, K. A. (1), Williams, D. R. Department of Biological Sciences, University of Saint Mary. HEALED BONE INJURIES IN VIRGINIA OPOSSUM (*DIDELPHIS VIRGINIANA*). We initiated a student-led research project in 2018 to collect roadkill Virginia Opossums (*Didelphis virginiana*) in Leavenworth County, KS, and analyze the skeletons for the distribution of healed skeletal injuries. Dog attacks, falls from trees, and automobile collisions are some of the previously proposed causes of these skeletal injuries. Our own early collections added one new potential cause for bone injuries, intraspecies aggression. We predicted dog attacks to cause a bilateral injury localized to the neck and cranial thorax. To date we have collected and analyzed 22 specimens. Eight individuals compared well with our predicted dog attack distribution. The majority of the remainder did not have healed injuries. The minority compared well with predicted injuries from our other three causes. Our ongoing research has implications for the further study of opossum ecology, particularly population demographics. If opossum-dog interactions are common throughout the species' distribution, then our work could have public health implications, as opossums are a reservoir for several communicable diseases.

Hodge, S.(1), Atha, M., Isom, N., and Hong, W-F., Department of Natural Sciences and Mathematics, Sterling College. ASSESSMENT OF BACILLUS MOJAVENSIS BM1 FOUND IN KANSAS AS A CANDIDATE FOR BIO-FERTILIZER AND MICROBIAL PESTICIDE. *Bacillus Mojavensis* (Bm1), isolated from red worm compost in Sterling, Kansas, is a good candidate for promoting plant growth under Midwest conditions, requiring less fertilizer and can be used as a bio-pesticide. This bacterium appears as a creamy white circular colony with wrinkles on LB agar. It was identified through 16S rRNA sequence analysis and confirmed as a Gram-positive, rod-shaped, motile, endospore-forming aerobic bacterium. The growth curve of Bm1 was carried out for three days in 0%, 5%, and 10% salt in LB medium. All of them showed growth in these conditions; however, Bm1 had a longer lag phase in 5% and 10% salt than the 0% control. Compared with other *Bacillus* species on wheat seed germination in high humidity conditions, Bm1 is slightly better than the control. Mycelium growth from *Fusarium* species isolated from dry rot of potato disease was significantly inhibited by Bm1. Currently, we are working on the second trial on tomato plant growth aiming to confirm the positive plant growth effect.

Hoffman, B. L. and Gunther, S. G. Department of Natural and Physical Sciences, Park University, Parkville, Missouri. COMPARISON OF MOLARIFORM AND CUSPIDATE TEETH OF WHIPTAIL STINGRAYS FROM THE PUNGO RIVER FORMATION (MIOCENE) OF NORTH CAROLINA. The Pungo River Formation sediments excavated at the Nutrien Phosphate Aurora Mine at Aurora, Beaufort County, North Carolina preserves a rich marine fauna from the Miocene epoch. Fossil remains of fish at this site include the teeth of whiptail stingrays that are similar in appearance to those of the extant dasyatid ray *Hypanus say*. Two morphotypes of these teeth are present, including a molariform tooth type typical of females, juveniles, and potentially non-breeding phase males, as well cuspidate teeth typical of breeding phase males. Scanning electron imaging of sectioned teeth show that the enameloid structure of teeth of these two forms are virtually identical, showing that differences in overall shape do not require a restructuring of enameloid crystallite orientation. Our bulk sampling of Pungo River Formation material from mine tailings available from the Aurora Fossil Museum has yielded 597 dasyatid teeth. Of these, 478

are molariform and 119 are cuspidate. This 4:1 ratio of molariform: cuspidate teeth compares favorably with an adult population ratio of 2.5 females: 1 male in extant *Hypanus say* from Florida.

Horton, S. (1), and Russell L. Department of Biology, Wichita State University. QUANTIFYING ARTHROPOD HERBIVORY ON LONICERA MAACKII IN SOUTH CENTRAL KANSAS. The enemy release hypothesis suggests that invasive plants that have been introduced from their native habitats into new habitats will lack their specialist herbivores and, hence, will be released from an important population-regulating pressure. The exotic shrub *Lonicera maackii* has spread rapidly across much of the Eastern United States and is widely considered to be invasive. By analyzing damage to 2,520 leaves from *L. maackii* shrubs across six sites in South Central Kansas, we quantify the level of arthropod herbivory on this invasive plant at the western range edge of its introduced range. Sites were chosen based on their urbanization levels, rural and urban (3 urban and 3 rural), and by occurrence of both woodland interior and woodland edge habitat types. For each leaf sampled, we recorded its damage type and estimated its area lost. The average leaf area lost to arthropods was 2.30%, with significant variation among sites in mean leaf loss. The most prevalent damage type by area lost was chewing (53.34%) followed by scraping (20.03%), with the most rare damage type being rolling (0.53%). Habitat type (woodland edge vs. interior) had no significant effect on the mean leaf area lost however, shrubs at woodland edges had a significantly higher proportion of damaged leaves. The low rate of mean leaf loss found across the sites indicates a lack of arthropod herbivory, likely contributing to *L. maackii*'s rapid success in Kansas.

Huffman, J. R. (1), Russell, F. L., and Houseman G. R. Department of Biological Sciences, Wichita State University. INSECT HERBIVORY, NOT SOIL FERTILIZATION, AFFECTS TALL THISTLE (*CIRSIIUM ALTISSIMUM*) REPRODUCTIVE PHENOLOGY. Plant reproductive phenology, the timing of reproductive events, can determine the strength and outcomes of plant-pollinator and plant-florivore interactions. Reproductive phenology of thistles (genus *Cirsium*) is of particular interest due to their broad flower heads that are accessible to many insects and, hence, their high pollinator visitation rates. Our study species, Tall thistle (*Cirsium altissimum*), is a short-lived perennial, monocarpic plant that is present in the eastern half of the United States. In a Kansas restored tallgrass grassland, long-term experimental manipulations of soil fertilization, insect herbivore exclusion and mammal herbivore exclusion were tested to assess their effects on tall thistle reproductive phenology. Plant height and counts of flower heads in different developmental stages were obtained bi-weekly over summer 2022 and twice, end of August and start of October, each summer 2018-2022. In both the 2022 data set and the multi-year data set, taller plants had earlier phenology for all stages of flower head development. In both data sets, insect herbivory delayed phenology due to apical meristem mining by insect larvae, causing the plant to divert growth to secondary branches. Excluding mammals did not affect reproductive phenology. Soil fertilization did not directly affect thistle reproductive phenology. In the multi-year data set, 2019 and 2020 had delayed reproductive development, but this was not correlated with climatic variables or prescribed fire. Our results highlight the importance of environmental context in influencing plant reproductive phenology, which affects the success of current and future generations.

James, A.¹(1), Ranabhat, S.¹, Morrison III, W. R.² 1. Department of Entomology, Kansas State University, 123 Waters Hall, 1603 Old Claflin Place, Manhattan, KS 66506; 2. USDA-ARS Center for Grain and Animal Health Research, 1515 College Ave., Manhattan, KS 66502. EFFICACY OF INSECTICIDE NETTING WITH DIFFERENT ACTIVE INGREDIENTS AGAINST FOUR MAJOR STORED PRODUCT BEETLES. There has been a push to diversify integrated pest management (IPM) programs at food facilities after harvest. One challenge to these programs is the immigration of stored product insects from the landscape. A novel IPM tactic to intercept immigrating insects is through the use of long-lasting insecticide-incorporated netting (LLIN), which has shown promise against stored product insects. In this study, we evaluated three different kinds of insecticide netting with different active

ingredients, including those with: 0.4% deltamethrin (Vestergaard, Inc), 0.34% alpha-cypermethrin (BASF AG), and 8% etofenprox (AgBio, Inc.) compared to untreated netting. In particular, we exposed *Rhyzopertha dominica*, *Tribolium castaneum*, *Sitophilus oryzae*, *Oryzaephilus surinamensis* for 5, 60, or 120 min, then assessed recovery immediately after or after 24, 72, or 168 h. Afterwards, conditions of adults were recorded as alive (e.g., moving normally), affected (abnormal, drunken movements or twitching), or dead (e.g., completely immobile). Regardless of LLIN, there was strong immediate knockdown of adults, but with etofenprox LLIN, there was vigorous recovery. The effects for BASF LLIN were somewhat delayed from that of Vestergaard, but could still be considered highly effective. Our results demonstrate that other active ingredients may be useful in diversifying those that can be used in insecticide netting to improve resistance management for stored product insects.

Kampshoff, M (3). Department of Physics and Astronomy, University of Kansas. COMPOSITE PARTICLES: QUANTUM CHROMODYNAMICS & HADRON COLLIDERS. 99% of visible matter in the universe are composite particles called hadrons. The mechanism that binds these hadrons together is provided by the theory of the strong force, Quantum Chromodynamics (QCD). Yet the nature of this force makes observations of hadron constituents very challenging. Two particular features of QCD are called asymptotic freedom and confinement. These two mainly facilitate the widespread use of large colliders for hadrons. In this talk, we will give an outline of characteristic features of QCD and how it is studied today at the Large Hadron Collider (LHC).

Kimball, S. A.¹, Miller, W. R.¹, Schukei, R.², 1. Department of Biology and Chemistry, Baker University, and 2. Department of Mathematics, Physics, and Computer Science, Baker University. TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: PRELIMINARY DATA FROM A STATEWIDE SURVEY OF TARDIGRADES (PHYLUM: TARDIGRADA). Members of the Phylum Tardigrada are widespread across the globe, inhabiting a variety of terrestrial, freshwater, and marine systems, but the basic diversity and distribution of the group is poorly described in the state of Kansas. Only 13 counties in Kansas currently have tardigrade records, nearly all of which come from the northeastern corner of the state. As part of a larger effort to increase our fundamental knowledge of Tardigrade biology, our group has initiated a comprehensive survey of Kansas to better understand the ecological constraints on the distribution and diversity of tardigrades that occur in the state. Here we describe our project goals and present the preliminary results of the first two of three sampling seasons, wherein we collected samples of tardigrade habitat (mosses, lichens, and aquatic algae) from 62 of the 105 counties in Kansas. After our final field season in 2023 we will have collected tardigrades from every county, ecoregion, and major watershed in the state, generating a data set that will allow us to identify the important physical and biotic attributes of the landscape that contribute to the distribution and diversity of the tardigrade community in Kansas.

Kimball, S. A.¹, Miller, W. R.¹, Schukei, R.² and Spenko, M.³ 1. Department of Biology and Chemistry, Baker University, 2. Department of Mathematics, Physics, and Computer Science, Baker University, and 3. Illinois Institute of Technology. TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: UPDATING A 100+ YEAR OLD PROCESS. The process for collecting, processing, and identifying tardigrades has changed little over the last 100+ years. We train students exactly as we were trained 50 years ago. The number of species has grown from 250 to 1,400+, compounding our disability to assign a specimen to a species. To understand the evolution and ecology of tardigrades, we need to know which species are found where (diversity) and where each species is found (distribution). Tardigrades live for years, survive absolute zero, tolerate great pressure or extreme vacuum and exposure to outer space. The phylum is dispersed by winds, animal, currents and tides and has a pivotal place in the evolution of the ecdysozoa. It may have been the first legged organism to crawl out of the ocean. Tardigrades are easy to work with up to the point of identification. Their classification is based on the subtlety of relatively few observable morphological characteristics which is why we are proposing the use

of modern tools to generate species/place data. By employing cell phone apps, drones, table top robotics, automated imaging, and artificial intelligence image analysis, we are reducing process time and cost while increasing accuracy in the identification of a specimen. This project is based on surveying the tardigrades of the state of Kansas and experimenting with new tools and techniques to save labor and cost and publishing the improvements such that they may be adapted by other labs, schools, students, and citizen scientists.

Maille, J. M.¹⁽³⁾, Brabec, D.², Zhu, K. Y¹, Morrison III, W.R.², and Scully, E.D.², 1. Department of Entomology, Kansas State University, and 2. USDA – ARS Center for Grain and Animal Health Research. NON-DESTRUCTIVE ELECTRONIC NOSE TECHNOLOGY FOR EARLY DETECTION OF STORED PRODUCT PESTS. Early detection of stored product pest infestations is crucial for post-harvest management. However, detecting pests, like *Rhyzopertha dominica* (Coleoptera: Bostrichidae), *Sitophilus zeamais* (Coleoptera: Curculionidae), *Tribolium castaneum* (Coleoptera: Tenebrionidae) and *Plodia interpunctella* (Lepidoptera: Pyralidae) are often challenging to locate the source of infestation within vast storage spaces. Without early detection and treatment, stored product pests contribute to the global postharvest economic loss of 1.3 billion tons of food. The electronic nose is a multivariate sensor array advantageously uses machine learning and pattern recognition software to identify the odors associated with specific insects, grain, and infestations cues. Here, we investigated the state-of-the-art electronic nose, MSEM-160 (Sensigent, Baldwin Park, U.S.A.), and its ability to detect four stored product pests in wheat. All pests were reared on hard red winter wheat tempered to 13%. One-hundred-gram wheat samples of clean and infested grain were tested with supervised and unsupervised machine learning to differentiate the infested to clean wheat samples. We found that the electronic nose reliably discriminated between clean and infested wheat from the four species. This work has clear implications in reducing post-harvest loss throughout the supply chain by detecting cryptic infestations of stored product pests in stored wheat. In the future, additional stored product pests and additional commodities should be evaluated for early detectability.

McCready, C. R., and Gleason, J. M. University of Kansas. *ZAPRIONUS INDIANUS*: AN INVASIVE DROSOPHILA IN KANSAS. *Zaprionus indianus* is a drosophilid (fruit fly), despite having a different genus name than *Drosophila*. They are an invasive species that originated in Africa and first found their way to the US around 2005, arriving in Kansas around 2012. Unlike most *Drosophila*, they are an agricultural pest, especially in Brazil, where they are responsible for a 50% yield loss in fig crops. *Zaprionus indianus* have unique mating characteristics. Males have large sperm, approximately 5mm in length. Females have fifteen ovarioles per ovary and have unique mating behavior. After a single mating, females run out of sperm within five days, implying that males do not transfer many sperm. Males decrease mating attempts if they have unlimited access to females, implying they become sperm limited. We plan to study female reproductive success.

Mecke, M. M. (1) and Henry, C. B. S. Department of Biology and Chemistry, Baker University. FIBROBLAST GROWTH FACTOR SIGNALING IS REQUIRED FOR NEW SEGMENT REGENERATION IN *LUMBRICULUS VARIEGATUS*. Fibroblast growth factor signaling has been shown to play a prominent role in cellular migration and proliferation during tissue regeneration. This phenomenon has been observed in many organisms, but FGF activity is not well understood in *Lumbriculus variegatus* which is a model organism for tissue regeneration. I hypothesized that FGF signaling is required for tissue regeneration in *L. variegatus*. I predicted that treatment with SU5402, a FGF signaling inhibitor, will have more drastic impacts when administered to worms earlier in the tissue regeneration timeline. My results suggest that FGF signaling is required for tissue regeneration in *L. variegatus*. Findings also suggest that FGF signaling is more prominent earlier in the tissue regeneration timeline, as early inhibition of the FGF signaling pathway appears to severely delay, or even stop, the tissue regeneration process in *L. variegatus*. In general, worms that were treated with SU5402 earlier in

the tissue regeneration timeline exhibited fewer regenerated segments than those treated later. In addition, worms that were treated with SU5402 at the beginning of the tissue regeneration timeline and left to regenerate for 2 weeks exhibited growth patterns characteristic of only 2 days, suggesting that early treatment with SU5402 stopped the tissue regeneration process at an early stage. This study establishes *L. variegatus* as a model organism for FGF pathway exploration and highlights interesting avenues for future FGF signaling studies.

Miller, W. R.¹, Schukei, R.¹, Kimball, S. A.¹, and Spenko, M.². 1. Baker University, 2. Illinois Institute of Technology. TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: ANNOTATED COMPUTER KEY FOR IDENTIFICATION. The procedure to catch, process and identify tardigrades has remained the same for 50 years. As a result, Baker University and the National Science Foundation has undertaken to improve the process by reducing the time and cost of gathering the basic diversity, density, and distribution data of what species lives where and where each species lives. The identification of a specimen to species is difficult due to the lack of specific characteristics and the availability of current and accurate KEYS. Incorporating the capability of laptop and tablet computers we have developed an annotated Application Key with images and current descriptions for the comparison of specimens and decision making that can be used with a mouse alongside the microscope. The App is written in Python and uses simple CSV file structure for the data. The program is intended to be used during the imaging step of the process and will be fully tested in the summer of 2023 during Baker's statewide Survey of Kansas Tardigrades. The program is designed to be adaptable to different geographic regions and different taxa by changing the text-based CSV/spreadsheets. The App is anticipated to be available next year.

Monroe, B. (2), Price, H., Paynter, A., George, A., and Ghosh, A. Biology Department, Pittsburg State University, Pittsburg, KS. CHARACTERIZATION OF CULTURABLE BACTERIAL ISOLATES OBTAINED FROM GUANO OF GRAY BATS IN SOUTHEAST KANSAS FOLLOWING BIOCHEMICAL AND GENOMIC APPROACHES. Humans have historically had an ambivalent relationship with bats. Bats perform important services by reducing populations of insect pests. They also act as reservoirs of diseases, as highlighted by the recent Coronavirus pandemic. This study aims to characterize the bacterial diversity associated with the Gray Bat (*Myotis grisescens*) in Southeast Kansas. A total of 32 bacterial isolates with different colony morphology were recovered from guano samples on tryptic soy agar media after enrichment. The majority (21/32, 65%) of isolates were Gram positive. All isolates were tested for growth on selective and differential media. Sugar fermentation profiles showed that 78% (25/32) fermented all four sugars, 9% (3/32) fermented three sugars, another 9% (3/32) fermented two sugars, and one isolate (3%) fermented only one sugar. Urea was hydrolyzed by seven (21%) isolates while one isolate (3%) was positive for indole production. Pooled isolates were sequenced using an Illumina miniSequencer. A total of 2,909,555 reads were completed. The most common genus being *Serratia* (26.36%) followed by *Achromobacter* (20.17%), *Lysinibacillus* (19.93%), and *Bacillus* (17.01%). Currently, sequencing experiments are underway to determine the microbiota of male and female bats GI tract. Identification of known and novel bacteria/fungi in bats is important for prevention of disease spread and long-term preservation of bat populations.

Munsell, K. B. (1), Brighton, K., and Reed, B. Department of Biology, Washburn University, and 2. Department of Biology, University of Nebraska Lincoln. EXAMINING THE REPRODUCTIVE ECOLOGY OF *TERRAPENE ORNATA* IN WESTERN NEBRASKA.

Understanding the reproductive ecology of any species is vital for determining intraspecific variation in individual fitness, modeling population growth or persistence potential, and developing effective conservation strategies. The reproductive ecology of many species has been extensively studied (particularly in mammals); however, other taxonomic groups including many ectotherms has not been well documented. One such ectotherm is the ornate box turtle (*Terrapene ornata*), which, to our

knowledge, has never had its reproductive ecology extensively examined, especially in the field. In this study, we examined the reproductive ecology of ornate box turtles over a six-week period in a mixed shortgrass prairie in Western Nebraska. To do this, we used a field rated portable ultrasound (IBEX EVO II) to determine egg bearing status of 24 female ornate box turtles during what we presumed was their egg bearing period. Our results enabled us to describe the egg bearing cycle of ornate box turtles in relation to individual mass and movement fluctuations. These data can be useful in understanding individual variation in reproductive output, fitness, and ultimately aid in targeted conservation plans.

Norton, A. E.¹(1), Whitworth, R. J.¹, Ewing, R.², and Cohnstaedt, L. W.², 1. Department of Entomology, Kansas State University, and 2. National Bio and Agro Defense-USDA, Manhattan, Kansas. FATAL FOOD! SILVER COATED GRAIN PARTICLES DISPLAY LARVICIDAL ACTIVITY IN *CULEX QUINQUEFASCIATUS*. Nanotechnology is defined as creating and manipulation materials at the nanoscale 1 to 100 nm. The development of nanotechnology has led to the expansion of new technology, which has impacted various fields such as chemistry, medicine, material science, and entomology. One barrier to expand the commercial use of nanomaterials is the ability to mass produce the particles. Here we report particle synthesis that has the potential for mass production. These particles also have implication as a mosquito larvicide. The nanoparticle reported here was designed using zein as the core and silver as the AI. The particle shows mortality rates at 1 ppm, more surprising, adult mosquito emergence was prevented at rates of 0.1 ppm.

Parr, S. K.¹, Scheuermann, B. C.¹, Kunkel, O. N.¹, Hammond, S. T. ¹, Ade C. J.^{1,2,3} 1. Department of Kinesiology, Kansas State University, 2. Department of Physician Assistant Studies, Kansas State University, and 3. Johnson Cancer Research Center. MICRORNA-92A EXPRESSION IS INCREASED IN ENDOTHELIAL CELLS TREATED WITH THE COMMON CHEMOTHERAPEUTIC DOXORUBICIN. Doxorubicin (DOX) is a staple chemotherapy used to treat breast cancer and is associated with the development of large artery stiffness (LAS). Mechanisms contributing to LAS after DOX treatment have been investigated including structural changes in collagen and elastin; however, mechanisms of cell-to-cell communication (i.e. microRNAs) have yet to be investigated. Increases in endothelial-derived microRNA-92a (miRNA-92a) has been associated with reduced NO signaling in endothelial cells and phenotypic changes to underlying vascular smooth muscle which promotes LAS. The preliminary step of this study was to determine if endothelial cells exposed to a physiological dose of DOX would have increased expression of miR-92a when compared to control cells. Human coronary artery endothelial cells (HCEACs) were cultured and treated with a single physiological dose of DOX (n=4) (0.08265mM) or saline (n=4) for 4 hours. After treatment, cells were harvested and prepared for two-step real-time polymerase chain reaction (RT-PCR) using TaqMan microRNA assays. Data were analyzed using the comparative threshold ($\Delta\Delta C_t$) method. A Mann-Whitney test was used to determine if differences exist between groups. Data are presented as mean \pm SEM with significance set at $P < 0.05$. HCAECs treated with DOX had higher expression of miR-92 when compared to control cells treated with saline (101.2 \pm 51.86 vs. 4.82 \pm 4.34, $P=0.02$). Our findings suggest miR-92a is upregulated in endothelial cells following a physiological dose of DOX. We aim to expand our sample size and determine if miR-92a is mediating endothelial dysfunction following DOX treatment.

Paudyal, G. (1), and Nguyen, H. Department of Chemistry, Washburn University, Topeka, KS 66621, USA. MICRO FABRY-PEROT CAVITY FOR CHEMICAL CHARACTERIZATION OF NANOSCALE PARTICLES. A micro Fabry-Perot cavity is an optical device capable of amplifying optical signal from nanoparticles for chemical characterization. This optical device consists of two high-reflectivity mirrors positioned micrometers apart. The resonance condition of the cavity is finely tuned by fixing one mirror and moving the other one precisely using a shear piezo. The on-resonant optical signal emitted by the nanoscale particles inside the cavity will be enhanced and then detected by a spectrometer to identify the chemical compositions. This method is non-destructive and thus can be used to study a

variety of nanoscale particles, from quantum dots to molecular assemblies. We are expecting of a 100-time enhancement for infrared emission with our current setup. As we have observed preliminary signal from the cavity, we are working on a revised set up to introduce liquid base sample into the cavity.

Peterson, A. E. Kansas Geological Survey, The University of Kansas, Lawrence, Kansas 66047. A LIDAR DERIVED STRUCTURAL CONTOUR MAP OF THE BARNESTON LIMESTONE, MORRIS COUNTY, KANSAS. A detailed digital surficial geology of Morris County was completed as recently as 2016. Bedrock geology in the county is exclusively lower Permian. The Barneston Limestone Formation is the most prominent bench-former in the county. A structural contour map of the Barneston Limestone top was created using elevation from LiDAR, and surface elevations of bedrock outcrops were extracted from LiDAR. Elevation was added or subtracted to strata above and below the surface of the Barneston Formation to bring them into plane with the Barneston where they are not visible in outcrops. WWC5 water well drillers logs, oil and gas geological reports, KDOT drillers logs, and NG911 imagery were used to fill in areas where stratigraphic boundaries were not visible, or where structural complexity warranted increased data density. The resulting map details the trace of the Humboldt fault and other structural features in the county.

Peterson, A. E. Kansas Geological Survey, The University of Kansas, Lawrence, Kansas 66047. AN UNMAPPED LATE HOLOCENE NORMAL FAULT IN THE SARATOGA VALLEY, CARBON COUNTY, WYOMING. A fault with a vertical offset of ~2 meters was mapped in Cow Creek Valley northwest of the town of Encampment, Wyoming. LiDAR, aerial imagery and small format unmanned aircraft systems reconnaissance enabled the mapping of this fault. The Holocene T₁ alluvial terrace is offset by ~2 meters. The knick point in the active floodplain created by the fault has migrated approximately 180 meters upstream. Knick point migration rates for alpine drainages in the Rocky Mountains suggest that this fault displacement occurred less than approximately 1,800 years ago. Knick point migration rates for flashflood-dominated creeks suggest a more recent fault displacement. The Miocene Browns Park Formation in the uplands is offset by the same amount as the T₁ terrace within the alluvial valley. This evidence suggests a low recurrence interval for displacement along this fault.

Pfeiffer, K.^{1,2} (1), Cooper, A.¹, Mitzel, D.³, and Silver, K.¹, 1. Department of Entomology, Kansas State University, 2. Department of Animal Sciences and Industry, Kansas State University, and 3. National Bio and Agro-Defense Facility, US Department of Agriculture. EFFECTS OF ELECTRICITY ON THE BEHAVIOR OF BITING MIDGES DURING ELECTROPENETROGRAPHY. *Culicoides sonorensis* biting midges are vectors of epizootic hemorrhagic disease virus and bluetongue virus, which adversely affect animal welfare and production in ruminant livestock operations. A better understanding of midge feeding behavior will allow for greater control of these insects and diseases. Electropenetography (EPG) is a tool for quantifying probing and ingestion behaviors that has recently been applied to blood-feeding arthropods, including *C. sonorensis*. Previous studies have shown that the electricity applied during EPG can negatively affect larger insects, such as the plant-feeding bug *Lygus lineolaris*. However, few studies have directly investigated the effects of applied electricity on small insects, such as *C. sonorensis*. Therefore, EPG was performed on 242 *C. sonorensis* using two current types: alternating (AC) and direct (DC). The average number of probes from *C. sonorensis* was significantly less with AC compared to DC. However, when ten probing and non-probing behaviors were analyzed in 14 video recordings of *C. sonorensis* that engorged during EPG, no significant differences in the duration and counts of the ten behaviors were found between current types. The lack of significant differences in the video analysis may be due to the small sample size. Furthermore, video analysis was only conducted on individuals that probed and engorged. Individuals that fed normally may not be sensitive to applied electricity, regardless of the current type. Therefore, differences may be detected when videos of individuals that did not probe are analyzed. Investigation of the effects of applied electricity on *C. sonorensis* during EPG is ongoing.

Proctor, M.R.¹ (2), Luhring, T.M.¹, Jeyasingh P.D.², and Jameson, M.L.¹. 1. Department of Biological Sciences, Wichita State University and 2. Department of Integrative Biology, Oklahoma State University, Oklahoma. FROM DUNG TO ORNAMENTS: USING ELEMENTS AND TEMPERATURE TO EXPLORE PHENOTYPIC PLASTICITY IN DUNG BEETLE HORNS. In many organisms, environmental conditions during development induce morphological changes (phenotypic plasticity). A common mechanism of plasticity is nutrition-responsive development. In some taxa, nutritionally-induced differences between genetically similar individuals can be so divergent that discrete phenotypes result. Dung beetles are one such example; males that develop in nutrient-poor conditions emerge as small males with minute or absent horns, while those that develop in nutrient-rich conditions are large and sport substantial horns. Previous studies indicate that the type of dung and temperature affects mass-specific horn size (e.g., small males expressing larger horns for their size). However, the elements in dung associated with phenotypic differences and the interactive effects of nutrients and temperature on beetle phenotypes are unknown. I will examine phenotypic regulation in the polyphenic dung beetle *Digitonthophagus gazella* from two dung types (*Bos taurus* and *Bison bison*) that are known to differ in their elemental contents, and at a range of temperatures. I will quantify the elemental composition of dung using methods in ionomics. To our knowledge, this is the first study to use ionomics tools to investigate which elements in dung are associated with horn phenotypes in dung beetles. Environmentally induced phenotypes are subject to selection and contribute to extreme morphological diversity in dung beetles. Determining how heterogeneous environments impact plasticity can help us understand how the environment and development interact to drive evolutionary diversification. Elemental effects on phenotypic evolution are likely to amplify as the cycles of the ~25 biogenic elements rapidly change in the Anthropocene.

Reh, M. G, and Stark, W. J. Department of Biological Sciences, Fort Hays State University. PRELIMINARY RESULTS AND HABITAT MODELING OF CHIHUAHUAN GREEN TOADS, *ANAXYRUS DEBILIS*, IN WESTERN KANSAS RANGE. The Chihuahuan Green Toad (CGT) is a small arid-adapted toad native to extreme western Kansas. Since its listing as a Kansas Threatened Species in 1987, there has been a lack of focused research on the extent and health of the population within its Kansas range. The objective of my research has been to locate and track CGT in western Kansas in an effort to create a comprehensive life history account within the state. ARDs and manual surveys were conducted from the end of May 2022 to the end of July 2022. Due to severe drought in Logan and Wallace counties during the summer research season, few CGT were observed with little insight gained into their behaviors and movement. Preliminary analysis of observation records from my research season may elucidate behavioral trends for similar arid-adapted anurans. This presentation will cover the methods, materials, preliminary results, future planning, and implications from my research.

Renfro, A. (1), Simpson, J., Steffen, E., Bushek, R., and Schukei, R., Department of Mathematics, Computer Science & Physics, Baker University. TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: FIELD COLLECTION APP. The expanding efforts of tardigrade research have resulted in a need for a more modern approach to logging and monitoring field entries. Traditionally, this data has been hand-recorded on-site and then entered into a spreadsheet in the lab. A grant from the National Science Foundation has allowed students at Baker University to explore whether a mobile-based application (App) could ease the process and save valuable research time. The first stage was determining the required information that was being logged for every tardigrade sample. Using the information gathered, an app and database were created. The app allows users to enter vital information about a sample, such as collection site, habitat, and substrate. Additionally, users with administrative status may create new collection sites, substrates, and habitats. The app is written in Flutter and Java, allowing builds for both iOS and Android systems. An administrative website works alongside this app and allows users to edit and review entries. The app and website utilize an SQL database to store and modify all sample

and user information. The results of this exploration have proven to be a success and will be fully tested in the summer of 2023 during Baker's statewide Survey of Kansas Tardigrades. The App is anticipated to be available next year.

Rorstrom, C.J. (1), and Ayella, A. K. Department of Chemistry, Washburn University. SOX2 AND HDAC1 PROTEIN DOCKING. SOX2 is a transcription factor protein that is a powerful regulator of cell pluripotency and epigenetic regulation in *homo sapiens*. SOX2 has been shown to associate with many different proteins such as HDAC1 (histone deacetylase 1) to produce its large-scale genomic changes. These genomic changes could cause developmental diseases, and cancers. Therefore, our hypothesis seeks to further understand how SOX2 binds with HDAC1 to aid in its full function. To do this, we used the InterEvDock3 program to predict the docking site of the SOX2 HMG region with a known structure of the HDAC1 protein. The results showed a predicted docking site within the 325-343 turn region (TR) for the HDAC1 protein with the SOX2 HMG region. With these predicted regions of association, three different oligopeptides of the SOX2 123-180 destabilized loop region (DLR) and 1 oligopeptide of the HDAC1 TR will be run together on native tris-tricine-page gel electrophoresis to determine if the regions associate. If any of the 3 Sox2 oligopeptides are found to dock with the HDAC1 oligopeptide, then it may be presumed that the predicted site of the HDAC1 protein has an inhibitory binding effect on the SOX2 DLR region due to the inhibitory binding of the SOX2 HMG region with the HDAC1 protein. Taken together, these results would suggest that HDAC1 has regulatory effect on pluripotency induced by SOX2 binding via histone deacetylation.

Saffer, N. A. (1), and Weesner, A. M. Department of Natural Science, McPherson College. USING INFECTIOUS DISEASE SIR MODELS TO ANALYZE COVID-19 IN TWO NEIGHBORING US STATES. In the wake of the 2019 novel coronavirus outbreak, epidemiological modeling shifted to the forefront of this pandemic. It served as a tool, helping scientists predict what may happen and what they could do to stop the spread of the virus. Of the thousands of variants of Covid-19, three became variants of concern: Alpha, Delta, and Omicron. SIR models were created for two states, Kansas and Colorado, and graphed the model's predicted new case infections for each population relative to each of the three variants. By adjusting the model's parameters, its output was fitted to actual new infection data from the CDC. These model parameters and deviances of the CDC'S data from the model's prediction highlight the significance of different public health mandates and of vaccinations on the spread of the Covid-19 virus.

Saray Arteaga E (3). Physics and Astronomy department, The University of Kansas. THE STRUCTURE OF THE PROTON. Protons are the most important parts of the building blocks of the visible matter in the universe. Since its discovery in 1917 many unresolved questions remain about its properties. In this talk we will discuss about the constituents of the proton where particle accelerators become the key to study and zoom in on the fundamental structure of matter. We will talk about some of the current results from different LHC collaborations, as well as open questions about this mysterious particle, the proton.

Simpson, J. (1), Renfro, A., Kosanke, K., Wright, A., Martinez, F., and Schukei, R., Department of Mathematics, Computer Science & Physics, Baker University. TARDIGRADES OF KANSAS: PROCESS IMPROVEMENT: ADMINISTRATIVE SUITE. The expanding efforts of tardigrade research have resulted in a need for a more modern approach to logging and monitoring field entries. Traditionally, this data has been hand-recorded on-site and then entered into a spreadsheet in the lab. A grant from the National Science Foundation has allowed students at Baker University to create an administrative website to work alongside a mobile-based application (app) to increase the efficiency of the process of Tardigrade research.

The beginning stage was determining the required information that was being logged for every tardigrade sample, which resulted in the creation of an app. Initial field tests warranted the creation of an administrative website. This website serves as a way to review and edit existing entries, such as removing grammatical errors and invalid data. Additionally, the website allows users to change personal information such as name and password and allows for users with administrative permission to change user access. The website is coded using HTML, Java, and JavaScript. Like the app, it relies on an SQL database to store and modify any information concerning a sample or user. The website is now fully functional and will be utilized by Baker's statewide Survey of Kansas Tardigrades this coming summer (2023) alongside the newest version of the mobile app.

Schaefer, P. A.¹(1), and Gleason, J. M.² Department of Ecological, Evolutionary and Organismal Biology, University of Kansas. WHAT COMPONENTS OF COURTSHIP ARE NECESSARY FOR SUCCESSFUL MATING IN *DROSOPHILA HYDEI*. Courtship is dependent on signals and reception and may be influenced by how often individuals mate. *Drosophila hydei* males produce giant sperm and transfer a small amount of sperm during copulation, thus females mate often, and they may be indiscriminate in choosing mates. During courtship *D. hydei* males perform a variety of behaviors and produce courtship song using their wings. These behaviors and songs have been described, but their contribution to successful mating have not been tested. The goal of this project was to evaluate the courtship song and behaviors of *D. hydei* to determine if song is necessary for successful mating and what components of song and behaviors lead to successful mating. The need for courtship song was assessed by analyzing the courtship of winged and wingless males. Courtship duration, latency, and index were calculated. To determine the behaviors that lead to copulation, courtship behaviors for the videos of winged males were used to generate an ethogram. To determine the components of song that lead to successful mating, the audio of 218 courting pairs of males and females was recorded and courtship song characteristics were measured. We found an undescribed pulse song that may have been missed in earlier studies because it has a low amplitude. The presence of wings has no impact on courtship success indicating courtship song is not necessary for successful mating. These findings only apply to virgin females. Females may be less indiscriminate after multiple matings.

Schrock, J. R. Department of Biological Sciences, Emporia State University, KS and Northwest Agriculture & Forestry University, Yangling, China. WHY CHINA ADVANCES IN SCIENCE. Additional major reports provide insight into China's continual advancement, surpassing the U.S. in number of STEM graduates (2007), science papers (2017), science patents (2019), authors in top one percent cited papers (2022), and increased international collaboration.

Major factors include: 1) greater population size and affluence, 2) greater cultural valuing of science and math leading to half of their college enrolment, 3) adoption of English as second language beginning in grade 3, 4) political leadership at national and provincial levels are nearly all science majors, 5) K-12 teachers are trained in content departments, 6) massive expansion of higher education, 7) cultural value for education (success frame), 8) designation of research centers and elite schools, 9) ample funding for science publication, 10) fair examination (meritocracy), and 11) recruitment. China's one drawback remains teaching-to-the-test.

Singh, R.^{1,4}(3), Peterson, J.^{2,3}, Santana, A. L. D.^{2,3}, Zhu, K. Y.¹, Siliveru, K.², Smolensky, D.³, Scully, E.^{1,4} 1. Department of Entomology, Kansas State University, 2. Department of Grain Science and Industry, 3. Grain Quality and Structure Research, USDA ARS, Manhattan, 4. Stored Product Insect and Engineering Research, USDA ARS, Manhattan. INVESTIGATING THE ROLE OF SORGHUM POLYPHENOLICS IN MEDIATING RESISTANCE TO STORED PRODUCT INSECT INFESTATION. Polyphenols are a group of plant secondary metabolites that are widely distributed. They play diverse functional roles in plant such as chemical defenses against herbivory including providing grain resilience against stored product infestation. For example, in maize kernels, polyphenolic

concentrations have been found to have a strong negative correlation with infestation by *Prostephanus truncatus* and *Sitophilus zeamais*, two prominent, cosmopolitan stored product insect species. Sorghum grain is known for its rich diversity of phenolic acids and polyphenolic compounds; however, our understanding of the role that these compounds play in resistance to stored product insect is limited. Sorghum production is increasing in United States for human consumption due in large part to its drought tolerance, its gluten-free nature, and its richness in antioxidants and polyphenols, which are beneficial for human health. Numerous pest management approaches exist for controlling stored product pests, including the use of fumigations, but many stored product species have developed resistance to these tactics, and they can be ineffective in some environments. Therefore, identifying properties of grain that reduce its susceptibility to stored product pest infestation would diversify pest management strategies and reduce post-harvest losses. The current study investigated the resistance of sorghum grains with varying polyphenolic compositions and concentrations to 4 different stored product insect species, including *Trogoderma variabile*, (Warehouse Beetle, WB), *Tribolium castaneum* (Red flour beetle, RFB), *Rhyzopertha dominica* (Lesser grain borer, LSB), *Plodia interpunctella* (Indianmeal Moth, IMM). Bioassays showed a negative correlation between polyphenolic concentration levels and emergence of adult insects in WB and IMM.

Slabaugh, G.¹ (1), Preston, B.¹, Edmonds, A. B.¹, Schultz, H.¹, and Dr. Zhang, Q.¹ 1. Department of Physical Sciences, Emporia State University VARIATION IN CONCENTRATION OF HEAVY METALS IDENTIFIED IN SOIL SAMPLES COLLECTED UP AND DOWN STREAM ALONG THE NEOSHO RIVER TO TAR CREEK. The Tri-State Mining District (TSMD) was once one of the major mining areas in the world, producing over 45 percent of all lead, and 50 percent of all zinc, used in World War I (Everett, 2022). The mining of these ores also produced massive amounts of waste, approximately over 500 million tons (EPA, 2007). Piles of chat that contain harmful heavy metals scar the territory. Other remains of the mining activity are visible within the abandoned mines that have flooded, sudden sinkholes forming, an increase lead concentration in children, and a loss in the ecosystem. Approximately 40 million tons of chat and mine waste remain on the surface. Allowing for Zinc, cadmium, and lead to be above levels deemed safe. Within this project, multiple soil samples were taken upstream and downstream from the mining district to determine the heavy metals present and the variation in concentration. Soil samples were transported to the lab and prepared using EPA 3050b procedure before analysis by ICP-AES. Using average data, samples collected show a 50x increase in lead concentration lead in the contaminated area on average.

Smith, O. (1) Department of Natural Sciences, McPherson College. GENOMIC EXPLORATION OF THE ROLE OF LIPID METABOLISM IN INTRAPERSONAL CHANGES IN THE HUMAN SKIN MICROBIOME. The composition of the skin's microbiome varies widely with the chemical and physical environments on different regions of skin. For instance, human sebum is rich in lipids and sebaceous regions like the forehead are likely to experience overgrowth of lipid-metabolizing bacteria, especially if left uncleaned. In this study, we had a single human subject avoid skin cleansing for a 30-day period, before and after which bacterial samples were collected from the subject's forehead. The samples then underwent 16S rRNA sequencing by CD Genomics, allowing for identification of unspecified bacterial species from 13 genera (nine in the sample taken before treatment, four in the one obtained after) which were present on the skin. Common species were selected from each genus and their genomes were compared via Unix programming to establish a metabolic baseline for each. The baselines for the genera in the first sample were compared to one another, and the same was done with those from the second, to obtain a profile of all common protein-coding sequences present in each sample. These lists of protein-coding sequences were then analyzed against one another to identify 27 protein-coding sequences present in bacteria on the subject's uncleaned skin that were not present in the bacteria on the subject's cleansed skin. Of these protein-coding sequences, four were identified that have been linked to lipid metabolism, likely conferring certain bacteria a metabolic advantage in lipid-rich environments.

Stucky, K. (1), and Conard, J. Department of Science and Mathematics, Sterling College, 125 Cooper Ave, Sterling, KS 67579. AGE-RELATED TOOTH WEAR AND SEXUAL DIMORPHISM IN WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) JAWS FROM QUIVIRA NATIONAL WILDLIFE REFUGE, KANSAS. White-tailed deer (*Odocoileus virginianus*) graze on woody stems for their main source of nutrients. As they age, there is noticeable wear to all of their teeth, but the third premolar (P3) may exhibit the greatest amount of tooth wear. Age may influence tooth wear, with older deer having higher rates of wear. Tooth wear patterns may differ for male and female deer due to variations in diet, habitat use, and body size. We measured the maximum height, enamel wear, and dentine width on the anterior and posterior cusps of the buccal and lingual sides of white-tailed deer jaws (n=12) collected from Quivira National Wildlife Refuge, Kansas. Known ages for deer jaws were determined by analyzing cementum annuli from the 4th incisor (Matson's Lab). We compared known ages to tooth wear rates to assess relationships between age and tooth wear for male and female deer. Male deer had a slightly longer average mandible length when compared to female deer which could indicate a larger average body size for males. There was a slight negative relationship between age and the height of the anterior buccal cusp for both male ($R^2 = 0.56$) and female deer ($R^2 = 0.46$). The slope of the regression line was slightly more negative for female deer, indicating slightly more rapid rates of tooth wear. Our results agree with other studies that tooth wear increases with age in white-tailed deer populations and that there may be differences in tooth wear between male and female deer.

Sytsma, J.¹ (3), Galliard, M.², Heffley, T.⁵, Baer, S. G.³, Bishop, N.¹, Winters, H.¹, Hartung, E.¹, Gibson, D.⁴, Johnson, L.¹ 1. Department of Biology, Kansas State University, 2. Department of Biological Sciences, Fort Hays State University, 3. Ecology and Evolutionary Biology, University of Kansas, 4. School of Biological Sciences, Southern Illinois University Carbondale, 5. Statistics, Kansas State University. LOCAL ADAPTATION AND TRAIT VARIATION OF THE DOMINANT PRAIRIE GRASS ACROSS THE RAINFALL GRADIENT OF THE MIDWEST AND IN RESPONSE TO DROUGHT. Frequent droughts are predicted to impact grasslands but intraspecific variation in response to drought is not well-known. Big bluestem (*Andropogon gerardii*) is a grass distributed across the Midwest rainfall gradient (MAP500-1200mm/yr) giving rise to climate-adapted ecotypes. This grass is important for forage and conservation. Reciprocal gardens were established in 2009 in ecological communities (driest to wettest: Colby, Hays, Manhattan, KS to Carbondale IL) and measured for over a decade. Rainfall was reduced using rainout shelters in three sites. Cover and biomass were monitored in plots over time, and height, width, photosynthetic rate, SPAD (chlorophyll concentration), and reproductive phenology were measured on single plants. Objectives were to 1) characterize functional traits across the natural gradient, 2) measure trait response to drought and 3) determine the impact of ecotypes on the community. We hypothesized drought tolerant traits would be more prevalent in the dry ecotype, drought would delay reproduction, and that the local ecotype would be competitively dominant over the surrounding community. The dry ecotype showed higher photosynthetic rates and SPAD, narrower blade width, and reduced height than the wet ecotype. Drought delayed reproduction and decreased biomass and cover. Wet and dry ecotypes had highest performance in their home site, demonstrating local adaptation. The dry ecotype in the wet site had higher performance under the rainouts, demonstrating adaption to reduced rainfall. The locally adapted ecotype became competitive dominance over the surrounding plant community. These results indicate the prominent role of ecotypes and that restoration should use climate-adapted ecotypes in anticipation of droughts.

To, B. N. (1) and Schneegurt, M. A. Department of Biological Sciences, Wichita State University, Wichita, Kansas. MICROBIAL SURVIVAL AND DISTRIBUTION IN LAYERED ICE TERRACES RELEVANT TO MARS. Mars may accumulate layered ice terraces through the deposition of frost, aeolian dust, and the infiltration of brine. As conditions warm, frozen brines melt before pure ice layers, due to freezing point depression, creating liquid layers or lenses trapped in icy deposits. We have created

laboratory analogs of layered ices with pure water and 15% NaCl brine, which were first frozen at $-40\text{ }^{\circ}\text{C}$ and then warmed to $-12\text{ }^{\circ}\text{C}$ to melt the brine layer. Cultures of halotolerant bacteria such as *Oceanobacillus* sp. str. SAF16 or *Halomonas* sp. str. BLE7 grown in R2A medium supplemented with 15% NaCl acted as the brine layer. After this brine melted at $-12\text{ }^{\circ}\text{C}$, pure water frazil ice froze out, leaving a denser brine below. Using standard plate counts, we followed the survival of bacteria in this system and the partitioning of cells between the frazil, brine, and ice layers. Exposing cells to a freeze-thaw cycle reduced their viability as expected, but by less than a log decrease. The frazil layer often had a greater volume than the brine layer but did not typically retain a greater number of cells. The concentration of viable cells in the frazil was consistently lower than in the brine. Assays with a tetrazolium dye (XTT) demonstrated that cells respired at $-12\text{ }^{\circ}\text{C}$. Media supplemented with NaClO_3 allows for lower melt temperatures and better mimic Mars salts. Studies of layered ices have relevance beyond Mars, to the ocean worlds of the outer solar system. Supported by NASA and K-INBRE.

Todwong, S. (1), Berger, A. (1), Burghart, J. (1), and Herbig, A. Department of Biology, Washburn University. EFFECT OF SIMULATED GASTRIC JUICE ON PROBIOTIC COUNTS IN DAIRY VS. DAIRY-FREE YOGURT. The increasing popularity of dietary dairy alternatives has led to the proliferation of dairy-free yogurt products. Yogurt is known to contain a variety of probiotic bacteria that are active and are thought to provide a variety of health benefits especially in the gut. However, upon ingestion, these probiotic bacteria must first traverse the hostile gastric environment. This has led us to compare the number of probiotic bacterial cells in dairy vs. dairy-free yogurt following exposure to simulated gastric juice. We hypothesize that dairy-based yogurt will contain a greater number of CFU/mL than the non-dairy alternative. Therefore, yogurt containing greater numbers of probiotic bacteria is most likely the better option for dietary benefits. We compared an almond milk-based yogurt (dairy-free) to a milk-based Greek yogurt (dairy) to allow us to determine which contains the most probiotics following a gastric juice simulation. Preliminary results indicate that exposure to simulated gastric juice reduces the number of CFU/mL in dairy-free yogurt compared to the control. These results reveal implications for probiotics on the dietary benefits of dairy-free yogurt.

Verma, V. (2), Halabi, M. E., VandeVelde, C. W., Strong, S., and Gleason, J. M. University of Kansas. DOES AGGRESSION LEVEL CO-VARY BETWEEN MALE AND FEMALE *DROSOPHILA MELANOGASTER*? The display of aggression can benefit organisms that compete for resources. Males use aggression to defend territory and mates while females use aggression when fighting for resources linked to offspring production. In general, males are more aggressive than females. *Drosophila melanogaster* is a model organism for studying the genetics of aggressive behavior. Previous work on the Drosophila Genetics Reference Panel (DGRP) identified variation in male aggression, but little research has been done on female aggression. Genetics plays a role in agonistic behavior. We hypothesized that the genetic basis of aggression is same for both male and female *D. melanogaster*. A prediction of the hypothesis is that the least aggressive lines of DGRP for males will also have least aggressive females and the lines with most aggressive males will have the most aggressive females. We measured male and female aggression in nine lines that had the extreme male aggression levels. The most common aggressive behaviors observed in males included boxing, kicking, chases, and wing threats whereas females engaged in head butt and fencing. In general, females were less aggressive than males. Preliminary analysis indicates that male and female aggression is correlating suggesting a shared genetic basis for aggression.

Weikert, C. (1), and Rogers, D. Department of Natural Sciences, Sterling College, Sterling, Kansas. IMPACT OF LOW TO MODERATE HUMIDITY ON PO₂ AND HEART RATE IN ATHLETES. Though an athlete may train for many years, there are factors beyond their control that may influence their performance. One factor is environmental humidity. Humidity is the amount of water vapor in the air. During exercise heat is generated from muscle activity, the body produces sweat that evaporates cooling the body to maintain proper internal temperature. In humid environments, the extra water vapor in the air

decreases the evaporation of sweat, causing the internal body temperature to increase. With an increase in body temperature, blood is shunted away from active muscles to the skin to help dissipate the internal heat. Muscles will suffer due to receiving less blood oxygen. Respiration is increased to intake more oxygen to support the oxygen demands. Stronger exhalation of warm air helps alleviate some of the extra internal heat too. Though high humidity and exercise correlations have been well documented, low to moderate humidity levels have not been investigated. This preliminary study was designed to examine physiological responses to low or moderate humidity levels during routine athletic training. Using a fingertip pulse oximeter, pO₂ and heart rate were monitored before and after 30 yard sprints in a 10-30% or 40-50% humid environment. ANOVA analysis revealed statistically significant differences in pO₂ and heart rate between the 10-30% and 40-50% humidity levels (pO₂ p<0.0001, F value 21.0, Heart rate p=0.0018, F value = 10.5). These results indicate that proper precautions may need to be initiated at moderate humidity levels to prevent heat injury to an athlete.

Winters, H.¹ (1), Sytsma, J.¹, Bishop, N.¹, Hartung, E.¹, Galliard, M.², Baer, S. G.³, Gibson, D.⁴, Barfknecht, D.⁴, Johnson, L.¹. 1. Division of Biology, Kansas State University; 2. Department of Biological Sciences, Fort Hays State University; 3. Center for Ecological Research, University of Kansas; 4. School of Biological Sciences, Southern Illinois University. DECADEAL STUDY OF ADAPTATION OF THE DOMINANT PRAIRIE GRASS BIG BLUESTEM ACROSS THE RAINFALL GRADIENT OF THE MIDWEST. Big bluestem, *Andropogon gerardii*, is a perennial prairie grass that makes up 70% of the aboveground biomass in the Great Plains. It is broadly distributed across the U.S., is a major forage for cattle, and is widely used in grassland restoration. However, this grass is at risk due to projected increased drought. To predict its response to drought, we tested whether dry, mesic, and wet ecotypes of *A. gerardii* demonstrate local adaptation (home-site advantage) to precipitation. Our goal was to characterize local adaptation to rainfall in a decade long study. Since *A. gerardii* is a long-lived perennial, long-term studies are vital to understand adaptation and responses to annual rainfall differences. In 2009, these ecotypes were cross-transplanted across a rainfall gradient (500-1200 mm/year) to garden sites located in Colby (driest), Hays, and Manhattan, KS; and Carbondale, IL (wettest). Rainout shelters were established to experimentally reduce precipitation. Aboveground biomass and canopy cover were collected in 2022, over a decade after establishment. The dry ecotype had the highest biomass and cover at the dry sites, and the wet ecotype had the least. The reverse was found at the wet site in Carbondale. Rainouts reduced biomass and cover, except the dry ecotype at the wet site, whose biomass and cover increased under rainouts. These findings demonstrate how *A. gerardii* exhibits strong local adaptation to precipitation. Therefore, Kansas can improve its drought resilience by using drought-tolerant ecotypes of *A. gerardii* to restore grasslands, protecting both our native ecosystem and extensive cattle industry.

Wood, J. Q.¹ (1), and Jameson, M. L.² 1. Cohen Honors College, Wichita State University, and 2. Department of Biological Sciences, Wichita State University. DO YOU SEE WHAT I SEE? COLOR VISION DEFICIENCIES IN KANSAS. Color vision deficiencies are due to the modified or functional loss of one or more cone cells in the retina. Individuals with color vision deficiencies may face challenges related to color perception in everyday life. Various tests screen for and diagnose color vision deficiencies, and the Ishihara plate test is a common screening test for red/green color vision deficiencies. My research examined the visual transduction pathway and the genetics of color vision deficiencies. Additionally, I implemented a digital color vision survey to compare the frequency of color vision deficient adults in Kansas to the average global frequency. An Ishihara plate test was utilized to screen for dichromatic color vision deficiencies in a sample of adults in the state of Kansas. Subjects were presented with eleven digital plates from the official Ishihara plate test, and then they were asked to identify the figure on each plate. Of the 271 survey participants, 3.0% of female participants (n=199), 8.2% of male participants (n=61), and 0.0% of other gendered participants (n=11) demonstrated having a color vision deficiency. This is significant because, while the percentage of potentially color vision

deficient males aligned with the global frequency of 8.0%, the percentage of potentially color vision deficient females was much higher than the global frequency of 0.5%. Although the sample size was a small fraction of the adults in Kansas, these results may indicate that color vision deficiencies are more prevalent in Kansas compared to the global frequency.

Wright, C. (2), Rindom, K., and Bailey, M. M. Department of Biological Sciences – MSFS Program, Emporia State University. THE EFFECTS OF SIMPLE GREEN EXTREME ON THE MICROSCOPIC EXAMINATION OF CARTRIDGE CASES. Examination of microscopic striations on bullets or cartridge cases imparted during firing is the cornerstone of firearms identification. Often, bullets and cartridge cases found at fire scenes are contaminated with foreign materials that have been “baked” onto the metal, which can obscure microscopic striations used for comparison. To date, most research conducted on cleaning methods focuses on preserving usable DNA evidence. No published research has focused specifically on removing fire debris from cartridge cases while preserving the striations. This experiment investigates the effects of Simple Green Extreme™ with or without gentle brushing on the striations on fired cartridge cases that were either exposed to a simulated car fire or left unburned. Ultramax™, Winchester Silvertip™, CCI Blazer™, TulAmmo, and Sellier & Bellot cartridge cases fired from either a Taurus PT709 Slim or a Taurus G2S. Cases were soaked and brushed (if applicable) in one of four dilutions of Simple Green Extreme™ 1:3, 1:13, 1:30, and 1:127 for a maximum of 7 days at either room temperature or 43°C were photographed before and after each treatment, and compared to the untreated control case and previous photographs. The results indicate that all striations are visible and comparable on unburned cases after soaking and brushing with no damage to the striations at any of the concentrations of Simple Green Extreme™ tested. Discoloration of brass cases was observed at the 1:3 and 1:13 dilutions in cases soaked for more than two days at 43°C. Research on debris removal from the burned cases is ongoing.