

PRESENTATION ABSTRACTS
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AGRICULTURE SECTION
ORAL PRESENTATIONS

S. Funk, A. Rogers and A. Giri, Department of Biology and Agriculture, University of Central Missouri. **REVISITING THE DUST BOWL.** In the American agricultural system, the Dust Bowl was arguably one of the most prolonged and devastating events of the century. Extreme weather events had and do still occur which disrupts agricultural production; however, none have been as severe as the Dust Bowl. In this paper, we research the primary reasons that contributed to the Dust Bowl. Furthermore, we do an extensive literature review to list the economic damages associated with the event, and finally present many initiatives that were adopted in the aftermath, so the event does not occur again. Even though the repeat of a large-scale Dust bowl is very unlikely, in the recent past smaller dust bowls have been observed across the country. We will investigate the rise of small dustbowls across the Midwest. Our preliminary results show that the more than 220 million trees planted in the Great Plains have been cut at an increasing rate in the recent past. Increase in commodity prices, improvement in irrigation technology, and precision agriculture has allowed producers to bring marginal land into agricultural production. All of the above-mentioned factors have contributed to small scale Dust Bowls. It is evident that if we do not take appropriate actions we could very well end up with a large-scale Dust Bowl again.

M. Bashyal, C. Ferguson, N. Hoilett, and O. Hernandez, Northwest Missouri State University. **IS CEREAL RYE AND HAIRY VETCH A FEASIBLE COVER CROP OPTION FOR CORN GROWERS IN NORTHWEST MISSOURI?** A study was conducted in 2016 to determine the effect of cereal rye and hairy vetch as cover crops on pest suppression, soil health, and corn yield in Northwest Missouri. The experiments consisted of six treatments corresponding to cereal rye (*Secale cereale*) and hairy vetch (*vicia villosa*) combinations, plus a control. The corn treatments included conventional corn and transgenic corn. Each plot was assessed for weed suppression, rating of corn earworm (*Helicoverpa zea*) damage on ears, rating of fungal ear rots, mineralization of nitrogen over a growing season, soil bulk density, and estimation of corn yield. Cereal rye and hairy vetch treatments included no cover crops, 100% cereal rye, 66% rye:33% vetch, 50%rye: 50% vetch, 33% rye: 66% vetch and 100% vetch. Harvested ears were assessed in the laboratory for rating on corn earworm damage and fungal diseases. Similarly, corn yield was measured across the treatments on randomly selected ears. In general, there was no significant difference among the cereal rye-hairy vetch treatments for weed

score, insect or fungal disease ratings, mineralization rate of nitrogen, or soil bulk density. Mowing hairy vetch with delayed termination with atrazine was not a viable option, as hairy vetch continued to grow and prompted poor corn growth resulting in higher true armyworm (*Mythimna unipuncta*) infestation along with abundant presence of yellow fox tail (*Setaria pumila*). *Penicillium* ear rot was confirmed in most of the treatments. The results of this study suggest that the benefits of including cereal rye-hairy vetch in corn are a function of cover crop termination timing. Also, the results suggest that there is an increased risk of armyworm and corn earworm damage in subsequent corn under these cover crop systems.

C. Henderson and S. Nikaido, Department of Biology and Agriculture, University of Central Missouri, and O. Pérez-Hernández, School of Agricultural Sciences, Northwest Missouri State University. **IDENTIFYING AND CONTROLLING A SYMBIOTIC FUNGUS**

ASSOCIATED WITH TALL FESCUE. Grasses often form symbiotic relationships with certain fungi. The fungus *Neotyphodium coenophialum* forms a symbiotic relationship with tall fescue (*Festuca arundinacea*) conferring the grass tolerance to heat and the fungus the nutrients from fescue tissue. However, this fungus can harm livestock that graze on heavily infected fescue forage. Application of a foliar fertilizer that has no effect at one concentration but inhibits fungal growth at a higher concentration may be a strategy to suppress fungal growth early in the growing season, when fungal symbiosis is less beneficial, yet allow fungal growth later in the season when symbiosis is more needed. Fulltec-brand fertilizers contain various heavy metal cations (i.e. copper 2+) that, aside from being essential plant nutrients, are known to inhibit fungal growth. Several fungi were isolated from tall fescue leaf blades collected from a farm north of Warrensburg, Johnson County, MO Cultured fungal species were identified through ribosomal RNA gene sequence (internally transcribed spacers). An immunoblot assay suggested that one of the fungi was *Neotyphodium*. Three formulations at varying concentrations (0%-1.2%) were tested to determine inhibition of fungal growth in potato dextrose agar. In a preliminary experiment, concentrations as low as 0.12% completely inhibited fungal growth.

AGRICULTURE SECTION POSTER PRESENTATIONS

W. Doggett, F. Eivazi and M. Dolan-Timpe, Department of Agriculture and Environmental Sciences, Lincoln University in Missouri. **MEASUREMENT OF HEAVY METALS AND ENZYME ACTIVITIES IN THE WETLANDS OF THE MOREAU RIVER.** Research has indicated that the use of animal manure as fertilizer is a significant point source of pollution to the environment. Heavy metals can be found in and from items such as cigarettes, construction sites, mining areas, and some over-the-counter medications. The use of these items can cause serious health effects on humans and the environment. Through surface runoff, the heavy metals are transported to the wetlands causing pollution. The objectives of this study are: 1) to measure the activities of β -Glucosidase, Arylsulfatase, Acid Phosphatase, and β -Glucosaminadase in the

soil of Moreau River wetlands; 2) to measure the concentration of heavy metals in soil samples taken from Moreau River wetlands. The sensitivity of enzymes to the environmental pollution, the ease of assay, and their role in soil biological functions makes them useful tool as indicator of soil quality.

M. Hill, A. Giri and K.W. Lovercamp, Department of Biology and Agriculture, Agriculture program, University of Central Missouri. **EFFECT OF ROTATING BOAR SEMEN POST-COLLECTION ON SPERM QUALITY.** Gravity causes gradual sedimentation of live and dead sperm cells in stored liquid semen. It has generally been assumed that this close contact of live and dead sperm cells could create a toxic micro-environment within the extended semen dose. Prior research had suggested that extended semen should be rotated once per day to re-suspend the sperm cells in solution to prevent this toxic environment. However, newer research indicates rotation may not be needed. The purpose of this study was to determine if once per day rotation (control) or no rotation (treatment) of extended semen would affect the quality of sperm cells. Ejaculates (n = 6) from two sexually mature Berkshire x Duroc crossbred boars were collected once per week for three consecutive weeks. Following collection and processing, the semen was extended to 37.5×10^6 sperm/mL and stored for 6 days post collection in a semen cooler at 17°C in 15 mL conical tubes. During storage the tubes were laid flat. Once per day from day 0 to day 6 the control group of semen samples were rotated by gently inverting the tube one full 360-degree revolution to re-suspend the sperm cells into solution. Motility and morphology of sperm cells was evaluated on day 0 (day of collection) and day 6 each week. The day x treatment interaction was not significant ($P > 0.05$) for motility or morphology. No statistical differences ($P > 0.05$) were found between the treatment and control for total sperm motility (84.2 vs. 84.1%), progressive sperm motility (59.2 vs. 61.3%) and normal sperm morphology (92.1 vs 91.5%). These results indicate that rotation of sperm cells once per day is not needed to maintain sperm quality over a six-day storage period. Therefore, not having to rotate semen once per day could alleviate time and labor costs for boar stud operations.

K.W. Lovercamp, M. Hill and A. Giri, Department of Biology and Agriculture, Agriculture program, University of Central Missouri. **DETERMINATION OF OPTIMUM TIME FOR SPERM MOTILITY ANALYSIS FOLLOWING SEMEN EXTENSION POST-COLLECTION AND SEMEN STORAGE.** Determining the optimum time to evaluate sperm motility is essential since a semen sample may be rejected for use in an artificial insemination program if the sperm motility is less than 70 to 80%. Therefore, the purpose of this research was to determine the optimum time for sperm motility analysis following semen extension post-collection and at day six of semen storage. Ejaculates (n = 12) from three sexually mature Berkshire x Duroc crossbred boars were collected once per week for four consecutive weeks. Following collection and processing, the semen was extended to 37.5×10^6 sperm/mL and stored for 6 days post collection in a semen cooler at 17°C in 15 mL conical tubes. Motility was evaluated on day 0 (day of collection) and day 6 each week. For each day of analysis, 1 mL

aliquots were placed into a warming well on a heating stage kept at 39°C. The semen was then evaluated every 15 minutes from time 0 to 75 minutes after semen extension on day 0 or after removal from the semen cooler on day 6. Results showed on both day 0 and day 6, time point 0 had lower motility and progressive motility ($P < 0.05$) compared to the other five-time points (i.e. 15, 30, 45, 60 and 75 minutes after time point 0). In general, the numerically highest percentage of motile and progressively motile sperm was seen at time points 15, 30 and 45. Although not statistically different from time points 15 and 45, time point 30 had the highest percentage of sperm cells showing motility (day 0: 84.3%; day 6: 76.0%) and progressive motility (day 0: 75.4%; day 6: 63.6%). Overall, these results suggest that motility analysis of boar sperm cells should be performed 30 minutes after semen extension on the day of collection (day 0). Similarly, stored extended semen should also be analyzed 30 minutes after being removed from the semen cooler. Finally, these results imply that sperm cell motility analysis should not be performed immediately after semen extension or removal of extended semen from the semen cooler (i.e. time point 0).

M. Adreon, N. Hoilett, A. Coy, O. Perez-Hernandez, and K. Mallikarjunrao, Northwest Missouri State University. **INFLUENCE OF OAK AND CORN BIOCHAR ON SOIL HEALTH: AN INCUBATION STUDY.** Adaptation of soil health practices such as no-till, cover cropping, and diversification of crop rotation is being promoting within farming systems. Perceived benefits of soil health include improved water infiltration, increased soil organic matter, and soil microbial activity. Biochar is showing promise to enhance soil physical and biological properties under different management systems. However, the effect of biochar on soil properties is reliant on the type of biomass used to produce the biochar; and by the pyrolysis temperature at which the biochar is produced. Our premise is that the influence of plant biomass on the biochar properties needs to be further investigated relative to its impact on soil health. We hypothesize that differences in biochar properties based on the biomass material used to produce the biochar will influence soil health. Our objective is to determine the effect of biochar types on soil physical and chemical properties such as water infiltration, soil water holding capacity, total organic carbon & nitrogen, and potential mineralizable nitrogen. The expected outcomes of the total project are to develop the ecological mechanisms that use biochar management to enhance agricultural production and improve soil health.

A. Coy, N. Hoilett, O. Perez-Hernandez, M. Adreon. Northwest Missouri State University. **CAN THE INCLUSION OF LIVESTOCK GRAZING INCREASE THE ADAPTATION OF COVER CROPS IN FARMING SYSTEMS?** Current specialized cropping systems e.g. monoculture, although highly economically viable tend to degrade soil health and negatively affect the environment by repressing nutrient cycling or promoting nutrient loss. Cover crops have been proposed as a viable technique to mitigate nutrient leaching, reduce runoff, retard erosion and soil degradation, ultimately improving soil health. The adaption of cover crop in Missouri is hindered by the perception that including cover crop in farming system increases

overall cost of farm operations due to additional management and delayed spring planting. This misconception stems from a lack of information on cover crop management techniques and ambiguity of the economic benefits of cover crops. One suggestion to add value to the use of cover crop is to use the crop as winter grazing for ruminant livestock. Grazing cover crops reduces the need for a spring kill, reduces the hay requirement for feeding livestock over the winter, and retains soil nitrogen. The overall objective of this project is to demonstrate the soil health, livestock production, and economic benefits of including cover crop and grazing in corn-soybean cropping systems in Northwest Missouri. The results from this project will provide valuable data to assist producers with an interest in cover crops in deciding for or against introducing cover crops in their farming system.

I.S. Braden, E. Smothers, R. Lepski, R. Millburg, and B. Tremain. Department of Agriculture, Southeast Missouri State University. **EVALUATION OF AN ESTABLISHED RIPARIAN MANAGEMENT ZONE.** Several conservation practices are recommended for producers to help reduce soil erosion. Riparian management zones provide plant cover, wildlife habitat, soil conservation, and streambank stability along water sources. A riparian management zone was established along Williams Creek at the David M. Barton Agriculture Research Center, in Gordonville, MO. The four-acre riparian zone consisted of native trees and shrubs and a vegetative filter strip of native grasses and forbs. In 2017, the riparian zone was evaluated to determine species survival. Of the five tree species and four shrub species that were planted, all of the tree species and three of the shrub species were present. In addition, to the flora of the riparian area, diversity of fauna that were observed indicated potential improvements to wildlife habitat. Due to flooding events to the riparian area, long-term assessment of the area will be needed to provide data to researchers and producers of species persistence.

C. Olewunne, O. Pérez-Hernández, and N. Hoilett, Northwest Missouri State University. **BEHAVIOR AND MORTALITY OF JUVENILES OF *Heterodera glycines* AT DIFFERENT pH IN VITRO.** The soybean cyst nematode (SCN; *Heterodera glycines*) is considered the most economically important pathogen of soybean in the Midwest. Recently, an SCN modeling study determined that during corn rotation, for every unit increase in soil pH, the SCN mortality is expected to increase by 10%, thus potentially determining SCN population densities during the soybean cropping cycle. This finding confirmed the hypothesis that soil pH affects SCN, yet little is known about the exact effect of pH on the behavior, activity and mortality of second-stage juveniles, the infective stage of the pathogen. The objective of the present study is to determine the effect of pH on SCN juvenile activity and mortality *in vitro*. Juveniles will be obtained from fresh cysts and placed in Syracuse dishes at pH 6.0, 6.5, 7.0, 7.5 and 8.0. The dishes will be incubated at 25°C and the activity and survival of the juveniles monitored at regular time intervals. The results of the study will enhance understanding of the influence of pH on SCN and will serve as important basis for management of the pathogen in field conditions.

S.E. Svenson, Charles Nemanick Alternative Agriculture Garden, Department of Agriculture, Southeast Missouri State University. **NATIVE PERENNIALS FOR BUTTERFLY AND POLLINATOR GARDENS: THIRD YEAR PERFORMANCE IN SOUTHEAST MISSOURI.** Perennials native to Missouri were evaluated for survival, growth, and flowering from twenty-seven to thirty-nine months after planting into a compost-amended urban soil in Cape Girardeau, MO. Twenty-eight container-grown plants of each species were planted in late August 2014 in a butterfly-shaped garden under full sun growing conditions. Two plots per species were planted in each wing of the garden, providing four replicated plots of seven plants of each species for analysis. During the third full year after establishment, the following species had 100% survival, excellent growth, and 100% flowering: *Penstemon digitalis*, *Rudbeckia fulgida* var. *umbrosa*, *Rudbeckia missouriensis*, *Symphyotrichum oblongifolium*, and *Veronicastrum virginicum*. Species having 75% to 86% survival, good growth, and 100% flowering during the third growing season included: *Echinacea purpurea*, *Eryngium yuccifolium*, *Eutrochium purpureum*, and *Zizia aurea*. *Echinacea pallida*, *Echinacea paradoxa*, *Asclepias tuberosa* and *Glandularia canadensis* had less than 50% survival, poor growth, and 100% flowering of surviving plants. *Amorpha canescens* had less than 50% survival, but living plants had good growth and flowering. *Rudbeckia fulgida* var. *umbrosa* and *Rudbeckia missouriensis* have seed propagated at the location, populating additional area in and around the experimental plots. Less than 75% of the original *Coreopsis lanceolata* specimens remained alive in the third growing season, but the species has aggressively populated near-by growing beds. Species planted in near-by secondary plots had 75% to 86% survival, excellent growth, 100% flowering, including: *Asclepias incarnata*, and *Liatris spicata*. The data will help guide the selection of plant species used for urban or suburban butterfly and pollinator gardens in southeast Missouri.

O. Babalola, Department of Agriculture and Environmental Science, Lincoln University. **PURIFICATION OF NUTRIENT POLLUTANTS IN DRINKING WATER (NITRATES AND PHOSPHATES) FOR SUSTAINABLE CLEAN WATER PROVISION USING NANOFILTRATION.** The problem of water eutrophication has become a global environmental menace in recent years. It is caused by the high concentration of nutrients in water, mainly nitrates and phosphates, which is due to the fertilizer runoff from agricultural areas, as well as poor disposal of industrial and domestic wastewater into the environments. The consumption of high concentrations of these pollutants from drinking water can lead to health problems such as Methemoglobinemia, also known as blue-baby syndrome. Considering the negative influence that these nutrient pollutants manifest in our health and environment, numerous studies has been conducted to efficiently remove nutrient pollutants from water, such as chemical methods (Electrocoagulation, MAP, chemical precipitation technique), Physio-chemical methods (Crystallization, Polymer hydrogels technique), and Bio-electrochemical denitrification methods. It was discovered that the electrocoagulation technique was the best method applied for the removal of nitrate and phosphate, however it had its downsides such as

high electricity usage and high cost of operation. For this reason, this research plans to investigate the possibility of application of nanofiltration in the removal of nitrate and phosphate in drinking water.

N. Al-Awwal, M. El-Dweik, M. Dolan-Timpe and M. Alalem, Cooperative Research, Center of Nanotechnology, Lincoln University. **COMPARATIVE EFFICIENCY OF**

COLORIMETRY AND ION CHROMATOGRAPHY IN DETECTION AND DETERMINATION OF OTHROPHOSPHATE IN RUNOFF WATER.

Detection as a method for determining the presence of a chemical or biological agent, is a vital function within the domain of environmental monitoring and remediation. Nutrient pollutants (NPs), mainly nitrites, nitrates and phosphates that are applied commonly as fertilizers throughout American Midwest agricultural zones, have added to the problems of eutrophication of streams and other bodies of water. In this present work, a colorimetry and an ion-chromatographic method are employed for detection and determining the presence of orthophosphate from Grays Creek in Jefferson City, Missouri, seeking to introduce a sensitive and less expensive method. The absorbance was taken at 610nm, the concentration ranged from 0.3-13.93ppm and the electric conductivity (EC) ranged from 236-418 $\mu\text{S}/\text{cm}$. Normality Test (Shapiro-Wilk) on the IC data revealed passed ($P = 0.787$) whereas the equal Variance Test (Brown-Forsythe) has shown failed ($P < 0.050$). Using the Holm-Sidak method, the differences in the mean values among the treatment groups are greater than would be expected by chance ($P = <0.001$), while with a handheld optical Sensor, both the Normality Test (Kolmogorov-Smirnov) and Equal Variance Test (Brown-Forsythe) passed with P-values 0.155 and 0.713 respectively.

H. Johnson and R. Loesch, Department of Agriculture and Environmental Sciences, Lincoln University. **A CUSTOM-MADE AERATED STATIC PILE COMPOSTING SYSTEM**

WITH 3-E (ECONOMY, EASE OF ASSEMBLY AND EXPANDABILITY) FEATURES.

A modified Aerated Static Pile (ASP) composting system is introduced. This type of composting system has been tested at Lincoln University with favorable results. It is economic and easy to assemble and expand. Variations can be made to the system to suit individual needs. The basic unit of the composting system is made up of 4" PVC schedule 40 drain pipes. Four 10' PVC pipes were cut and connected with Tee fittings to form a 40' central air duct. Two and three pairs of perforated PVC pipes with a pair $\frac{1}{4}$ " holes drilled at every foot were connected to the Tee fittings on the central pipes at the opposite sides. Flexible pipe coupling fittings and test plugs were used to connect pipes and seal open pipe ends respectively to allow for easy assembly/disassembly and expansion. An air blower was connected to the system to push air through pipes and to pressurize the system. Wood chips were used to cover pipes to distribute air in the composting area. The forced aeration is controlled by an adjustable timer to avoid over drying compost materials and to conserve energy. For food waste composting, a solar powered electric net fence is recommended to frame the system boundary for deterring varmints. With increased awareness of waste management and waste nutrient recycling, this ASP composting

system would be effective in serving small farm producers, gardeners, and school officials, who are interested in composting and applying compost as natural fertilizer to their gardens.

ATMOSPHERIC SCIENCE SECTION ORAL PRESENTATIONS

W. Gilmore, National Weather Service-Little Rock, Arkansas. **A DETAILED OBSERVATIONAL ANALYSIS OF A RAIN-WRAPPED EF-2 QLCS TORNADO.** During the evening of March 24th, 2017, a rain wrapped tornado developed in close proximity to the LZK WSR-88D. This tornado formed within the precipitation shield of quasi-linear convective system, behind the leading edge of the convection with little to no lightning observed. Several mobile homes were either damaged or destroyed, resulting in an EF-2 rating along it's nearly 4 mile long path. A review of forecast and observation data will be presented, including polarized radar data analysis. This study will discuss the challenges the warning forecasters faced during this event and present some possible best practices to use in future warning situations.

J. Bongard, S. Marlow, and N. Fox, Atmospheric Science Program, University of Missouri. **MIZZOU'S NEWEST WEATHER RESEARCH INSTRUMENT: THE MICRO RAIN RADAR.** This presentation will be centered around one of MU's new resources: a Metek Micro Rain Radar. The MRR is a vertically pointing Doppler radar that can capture the characteristics of rainfall directly over the MRR as high up as 6000 meters (~20,000 feet). The characteristics utilized the most include Reflectivity (dBZ), Fall Velocity (m/s), Rain Rate (mm/hour), and Liquid Water Content (LWC). Included in the presentation will be examples of each of these characteristics presented in graphic style by the instrument's graphic software packages. Also included in the presentation will be a few examples of how data will be used for research now and into the future. Plans include a study of how to quantify evaporation and correct for it when account for this in evaluating reflectivity from a dual-pol radar (i.e. - The National Weather Service WSR-88D radar network).

K. Grempler, P. Market, and S. Ritter, Atmospheric Science Program, University of Missouri. **ANALYSIS OF SEVERE ELEVATED CONVECTION IN THE CENTRAL UNITED STATES.** Studies have shown that severe elevated convection is usually characterized by large hail, however, severe surface winds and tornadoes have been observed. This research further corroborates previous studies of occurrence, frequency, and severe characteristic distributions of elevated convection with severe weather. From 2004 to 2013, 42 events were recorded with high confidence of elevated convection 50 statute miles north of a boundary with 5 or more severe reports of hail, wind, or tornadoes. Secondly, the findings of this research will shed light on implementing a new tool for developing a better understanding of severe elevated weather. Using RUC 252 analysis data, four events were analyzed more thoroughly using downdraft convective

available potential energy (DCAPE) and downdraft convective inhibition (DCIN) on 2-D surface maps along with vertical profile analyses of the atmosphere. The findings of a DCAPE to DCIN ratio in the area of elevated convection with severe weather reports will provide insight for the possibility of an environment favoring severe weather.

C. Henson and P. Market, Atmospheric Science Program, University of Missouri.

EVALUATING THE FRONTAL INFLUENCE ON CONVECTION USING PARCEL TRAJECTORIES. Record-breaking rainfall events occurred along the East Coast in September 2011 and October 2015 in association with a coastal front and elevated convection. In both events, the synoptic environment consisted of a tropical cyclone in the Atlantic and an extratropical cyclone over the Eastern United States, resulting in a deformation zone and concentrated flow of moisture over the stationary front along the East Coast. Significant elevated convection brought more than 250 mm (10 inches) of precipitation in 24 hours to the coastal states. Preliminary research indicated that the cyclones contributed to the location of heavy precipitation, while the coastal front was the main contributor in the initialization and maintenance of convection in both cases. In either case, the tropical cyclone never made landfall and the coastal states still received life-threatening flooding. Thus, an investigation into the coastal front is necessary to further understand the cause of the copious amounts of rainfall. The Weather Research and Forecasting (WRF) – Advanced Research WRF (ARW) model was used to create control simulations of both events. Parcel trajectories were created using Read/Interpolate/Plot (RIP), which allows for further evaluation of the parcel environment along the trajectory. Backward trajectories beginning in the region of heaviest precipitation display the moisture flow in the synoptic environment originating in the mid-Atlantic. Cross-sections along the trajectory give the location of the coastal front, while thermodynamic profiles and diagnostics show the environmental changes for the parcel as it approaches and crosses the frontal boundary to evaluate the strength of the front and elevated convection. This methodology allows for the assessment of the region where convection initiates to verify the dominant forcing mechanism, which for both cases is the frontal boundary lifting parcels to the level of free convection (LFC).

G. Ruhbeck, C. Brown, J.S. Renken, and A.R. Lupo, Atmospheric Science Program, School of Natural Resources, University of Missouri. **INTERANNUAL VARIABILITY OF SEVERE WEATHER OVER THE USA SINCE 1991.** Previous studies have showed that ENSO-related variability in tornadoes and other severe weather in the USA is a function of the primary location where the severe weather occurs. This study examines the occurrence of the severe weather events and days by calendar month in relation to ENSO for three categories; tornadoes, high winds, and hail. Using the National Severe Storms Laboratory database, all events with more than 20, 145, 135 reports of tornadoes, high wind, and hail, respectively, were collected to provide a large sample size. The sample size was 271 days for tornadoes and high winds, and 275 days for hail. Initial results show that, as expected the pear number of severe weather events occurred in the spring. However, the La Nina phase produced more high-impact event days than

either El Niño or Neutral year events. Also, the absolute peak occurrence was in April for La Niña and May for El Niño and Neutral years.

C. Brown, G. Ruhbeck, J.S. Renken, and A.R. Lupo, Atmospheric Science Program, School of Natural Resources, University of Missouri. **UTILIZING THE DAILY SOUTHERN OSCILLATION INDEX CHANGES TO DETERMINE SEVERE WEATHER POTENTIAL ON A SUBSEASONAL SCALE.** The ability to predict severe weather outbreaks on a subseasonal scale is paramount to the agriculture, emergency management, energy, and defense sectors. Since the daily Southern Oscillation Index only goes to 1991, via the Australian Bureau of Meteorology website, we cross-referenced them with the ENSO Index provided by the Climate Prediction Center. We are exploring the statistical significance of severe weather events based on the Storm Prediction Center Day-1 High and Moderate Categorical Risk that were analyzed in combination of multiple datasets. These datasets were separated by three categories of ENSO (El Niño-Southern Oscillation), season, daily Southern Oscillation Index rise and drop of 10 points, and daily Southern Oscillation Index rise and drop over three days of 20 points (80 cases). Using El Niño Springs after 1991 that had 3-day 20-point drops of the daily SOI as an example, we noticed the post 18-day composite matched the composite of post-1991 El Niño Spring Moderate and High Severe Weather Days (108 cases).

A.P. Korner, K. Rojas, M. Garcia, A.R. Lupo, and J. Gilles. Atmospheric Science Program, School of Natural Resources, University of Missouri. **ENSO AND PDO-RELATED VARIABILITY IN SOUTH PACIFIC CIRCULATION PATTERNS AND SEASONAL RANGE PREDICTION FOR BOLIVIA IN SOUTH AMERICA.** It has been demonstrated that seasonal range prediction over North America can be related to variability on time scales from intraseasonal to interdecadal. Predictability is related to the Pacific North America (PNA) pattern, atmospheric blocking, El Niño and Southern Oscillation (ENSO), and the Pacific Decadal Oscillation (PDO). Similar relationships have been found for seasonal range prediction over South America when examining ENSO-related variability in the South Pacific Jetstream as well as atmospheric blocking. Using the National Centers for Environmental Prediction / National Center for Atmospheric Research (NCEP / NCAR) reanalyses, the character of circulation patterns was studied over the South Pacific / South America sector from 1976 – 2017. Initial results show that there is a negative correlation in the upper air circulation over the East Pacific and weather conditions in the Altiplano region of Bolivia during winter for ENSO. Also, the ENSO-related variability in the jet-stream pattern in the South Pacific shows a 180 degrees phase difference. Finally, there is evidence that the circulation pattern between phases of the PDO may be different, as indicated by a recent reversal of the interdecadal variability of atmospheric blocking over the South Pacific Region.

T. Eichler, School of Education, Saint Louis University. **IMPACT OF GLOBAL WARMING ON CYCLONE TRACKS IN THE NARCCAP MODEL SUITE.** A topic which is gaining

an increasing amount of attention from the climate community is the role that synoptic-scale cyclones play in the current and future climate. Alterations of mid-latitude cyclone tracks has strong implications on socioeconomic health due to their effects on agriculture, industry, transportation, and the general public. This study generates cyclones from the North American Regional Climate Change Assessment Program (NARCCAP), which uses eight GCM-regional climate model combinations at a resolution of 50 km. Two 33-year scenarios are described: The first is a historical scenario for current climate from 1968-2000, while the second is a warming scenario from 2038-2070 using A2 conditions, which assumes steady population growth. It will be demonstrated that global warming causes large-scale shifts in cyclone frequency and intensity in an ensemble-sense. Results will also be shown for areas which have frequent and/or intense cyclones such as the North Pacific, Iceland, the U.S. Midwest, and the U.S. East Coast. Results will also be compared to cyclones generated from high-resolution reanalysis including the CFSR and ERA Interim datasets to gauge how well the NARCCAP generates cyclone climatology relative to pseudo-observations.

B. Efe, İ. Sezen, A. R. Lupo, A. Deniz, Department of Meteorology, İstanbul Technical University & Atmospheric Science Program, University of Missouri. **THE EFFECTS OF ATMOSPHERIC BLOCKING ON TEMPERATURE OBSERVATIONS IN TURKEY.** Temperature is the most important meteorological parameter used to define the climate of any region. Daily temperature is analyzed from different perspectives for Turkey including synoptic analysis. The relationship between atmospheric blocking and temperature has not been studied in depth for Turkey. In this paper relationship between blocking and temperature observations in Turkey is investigated. The 500 hPa geopotential height data of National Centers for Environmental Prediction (NCEP) and National Center for Atmospheric Research (NCAR) Reanalysis-1 dataset were used to detect atmospheric blocking events. The daily mean temperature data were obtained from Turkish State Meteorological Service for the same period. The blocking index used here is a one – dimensional detection method. The daily geopotential data for 0000 UTC were used in this study for the period of 1977 - 2016. The seasonal mean temperature anomalies in all stations during blocked days varies between -2.1°C and 0.8°C . There are three main patterns in the mean seasonal anomaly curve of all stations. When focusing on the spatial distribution of mean seasonal anomalies, winter and fall, almost all stations show negative temperature anomalies although anomalies are around zero during warm seasons. There is a statistically significant (95% confidence level) weak negative correlation between blocking intensity and temperature anomalies in all seasons except spring. There is no relation between both blocking duration and longitudinal extent and seasonal mean temperature anomaly except winter. Winter has a weak negative correlation. There is a Rex type of atmospheric blocking during not only the period that maximum anomaly observed but also the period that minimum anomaly observed. However, the location of the blocking differs. The center of blocking is located near Siberia during cold event and located in Europe during a warm event.

A.R. Lupo and P.S. Market. Atmospheric Science Program, School of Natural Resources, University of Missouri. **CLIMATE CHANGE AND THE BUTTERFLY.** In the mid-1960s, Lorenz used a low-order primitive equation model for convection in a closed hydrodynamic system and demonstrated that the system's behavior could serve as an analogue for flow regime transitions in the hemispheric jet-stream pattern as represented in the phase space as two basins of attraction. This work gave rise to two ideas; a) that predictability beyond a certain time-frame is not possible using the primitive equations, and b) the northern or southern hemisphere flow could be characterized as two different flow regimes. The two basins of attraction for the Lorenz attractor resemble a butterfly, and represent a concept known as sensitive dependence on initial conditions. Recently, it has been postulated that an increased carbon dioxide atmosphere and concomittant climate warming will lead to large-amplitude excursions in a weaker jet stream that are more persistent. Others have suggested less predictability in the atmosphere. A re-examination of the Saltzman and Lorenz equations as well as the Lorenz attractor in an increased CO₂ environment indicate no change in the synoptic and large-scale predictability. This study supports the results of a recently published study on predictability in a higher CO₂ atmosphere.

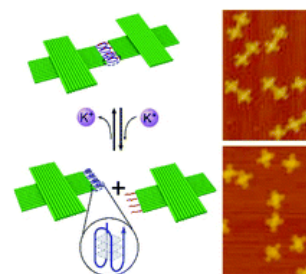
ATMOSPHERIC SCIENCE SECTION POSTER PRESENTATION

M. Alkhalidi, Department of Agriculture and Environmental Science, Lincoln University of Missouri. **THE PRODUCTION OF AMMONIUM SULFATE FROM SULFUR DIOXIDE BY THE DESULFURIZATION OF A FLUE GAS USING AQUEOUS HYDROGEN PEROXIDE AND AMMONIUM SOLUTION.** Sulfur dioxide (SO₂) is an inorganic gas that is known for its toxicity and harmful effects to the environment. Since the solubility of SO₂ is very high, the atmosphere becomes a hospitable environment for the formation of acid rain. SO₂ is also an irritant to the respiratory system in humans and can cause serious damage to other body organs. Anthropogenic sources of SO₂ add load on what both the earth and the atmosphere can endure. One anthropogenic source is the production of SO₂ gas as a by-product in the combustion of coal and fossil fuel in industries. By the process of flue gas desulfurization, SO₂ can be controlled and recycled into ammonium sulfate which is a soil fertilizer. The process consists of reacting SO₂ through series of chemical reactions using both aqueous hydrogen peroxide and ammonium solution to produce the desired product. The process has been introduced to Aspen-plus; a process simulation for the design of chemical plants to ensure that this process is applicable and will produce the expected results. The outcome of the design showed promising results on the applicability of the process. From the results of the process simulation, the process insured the complete consumption of SO₂ and the production of ammonium sulfate at high purity enough for commercial use. It also showed a profitable plant design that produced positive cash flow. The limitation present in this work is the physical application of the series of reactions to support the design results.

BIOCHEMISTRY, BIOMEDICINE, & BIOTECHNOLOGY SECTION ORAL PRESENTATIONS

M. Moreno Imery, R. Knoerdel, J. Li, T. Hidvegi, D.H. Perlmutter, C.J. Luke, G.A. Silverman and S.C. Pak. Department of Pediatrics, Washington University School of Medicine. **HIGH-THROUGHPUT SCREENING FOR DRUGS TO TREAT ALPHA-1 ANTITRYPSIN DEFICIENCY.** Alpha-1 antitrypsin (AT) deficiency is a common, lethal genetic disorder in which misfolded AT protein aggregates in the liver, causing liver disease. Currently, there is no cure for this condition, and the only viable treatment for severely ill patients is liver transplantation. To gain a better understanding of the molecular and cellular aspects of this disease, we developed a *C. elegans* model in which the wild type AT was processed and secreted efficiently from the intestinal cells. In contrast, the mutant AT (referred to as ATZ), which differs by one amino acid, misfolded and accumulated as large intracellular globules similar to those observed in the liver of humans affected by the disease. Using the *C. elegans* model, we developed a live-animal based high-throughput procedure to screen for small molecule compounds capable of reducing the misfolded ATZ protein accumulation. A screen of an approved drug library identified a compound that significantly reduced mutant ATZ accumulation. Studies in mice indicated that this compound was able to significantly reduce misfolded ATZ accumulation and the associated liver fibrosis. Taken together, these results validate the usefulness of small animal models of genetic diseases and high throughput screening methods to accelerate drug discovery.

S. Yang, W. Liu, R. Nixon, and R. Wang. Chemistry Department, Missouri University of Science and Technology. **METAL-ION RESPONSIVE REVERSIBLE ASSEMBLY OF DNA ORIGAMI DIMERS: G-QUADRUPLEX INDUCED INTERMOLECULAR INTERACTION.** We present a novel metal-ion stimulated organization of DNA origami nanostructures by employing G-quadruplexes as stimuli-responsive bridges. The reversible assembly process of DNA origami was the result of conformational changes between the G-quadruplex and its single-strand state induced by monovalent cations. This study might stimulate a new design of responsive DNA-based intelligent nanomaterials.



A. Cristea, R. Bliss, J. Liu, W. Stoecker, H. Shi, J. Parks, and C. Burton, Department of Chemistry, Missouri University of Science and Technology. **ADVANCED BIOASSAY TECHNIQUES FOR BROWN RECLUSE SPIDER SEX PHEROMONE IDENTIFICATION.** Brown recluse spiders are common house pests in the Midwest. Their

venom can lead to slowly healing wounds and occasional fatalities. Commercially available traps are inadequate for control of their populations in homes. Study of the cautious and reclusive behavior of these spiders has led to a new approach for better control of brown recluse spider populations. By combining advanced analytical chemistry methods with behavioral analysis, a novel approach has been developed to identify this toxic spiders' sex pheromone. Upon identification of the semiochemical, it will be combined with a novel trap designed specifically to catch brown recluse spiders. The new approach is anticipated to provide better control brown recluse in homes.

H. Marino, R. Ulbricht, R. Morris, and J Wang. Department of Biomedical Sciences, Missouri State University. **THE ROLE OF THE P2Y₂ RECEPTOR IN GLUCOSE TOLERANCE.** The nucleotide ATP and UTP release from cells into the extracellular compartment in inflammation. Nucleotide P2Y₂ receptor has been shown to play an important role in inflammatory responses, such as increased microvascular permeability and leukocyte recruitment. Given that Inflammation impairs glucose tolerance, the objective of the study is to investigate the novel role of P2Y₂ receptor (P2Y₂R) in regulating glucose tolerance. Wild type C57BL/6 and P2Y₂R knock out mice were fasted for 5 hours on the day of the experiments. Blood obtained from the tail vein was used to determine glucose level under fasting condition. To assess the ability to tolerate exogenous glucose, fasted mice received an intra-peritoneal injection of 50% (g/100 ml) dextrose at the dose of 2g/kg per body weight. Tail vein blood were obtained at 10, 20, 30, 45, 60, 75, and 90 minutes after dextrose administration. The blood glucose levels were measured by a glucometer and blood glucose test strips. We found that the blood glucose levels after dextrose administration were greater in P2Y₂ KO mice than wild type mice in both males (n=6) and females (n=6). The preliminary data showed impairment of glucose tolerance in P2Y₂R KO mice, suggesting protective role of P2Y₂R in glucose tolerance. In addition, impairment of glucose tolerance in P2Y₂R KO mice differs in females compared to males.

P. Ballhorn, J. Smothers, V. Nguyen, and K. Kim, Department of Biology, Missouri State University. **YEAST MYOSIN 2 FOR THE TRAFFIC BOUND TO THE TRANS-GOLGI NETWORK (TGN).** Myosin family proteins are motors that use the chemical energy provided by ATP-hydrolysis in the head domain to generate the "power stroke" necessary to "walk" along actin filaments. The present study reveals the potential roles of all five yeast myosins in the recycling of two membrane cargo, Snc1 and Vps10. It appears that all myosins except myosin 2 are not required for the Snc1 traffic, while it was found that myosin 1 and 2 play important roles for Vps10 traffic to the TGN. Multiple *myo2* mutants including temperature sensitive strains, such as *myo2-16* and *myo2-66*, demonstrated trafficking defects of those cargoes. Together, our data provide novel insights into the function of Myo-family proteins in protein recycling traffic destined towards the TGN.

C. Horstmann and K. Kim. Department of Biology, Missouri State University. **SILVER NANOPARTICLES ON YEAST VIABILITY WITH BIOINFORMATICS ANALYSIS.**

Nanoparticles have become common in many commercially used products such as zinc sunscreen and water-resistant clothes. They may also be utilized in the targeted treatment of cancer, printable monitoring systems, and cost-effective phones in the future. The effects nanoparticles have on biological organisms is crucial for the responsible use of these technologies. We investigated the effects of silver (Ag) nanoparticles on budding yeast (*Saccharomyces cerevisiae*) using growth assays, FUN-1 staining for metabolic activity, RNAseq, and RTPCR. Our growth assay showed that Ag has an inhibitory effect with its concentrations above 5µg/ml. Hundreds of genes in Ag treated cells were differentially expressed according to our transcriptome investigation. A large fraction of upregulated genes is identified to regulate ribosomal biogenesis and RNA processing, whereas downregulated genes are known to be responsible for mitochondrial functions based on our analysis of gene ontology terms. Furthermore, we validated the RNAseq results using an RTPCR assay. The resulting expression profile leads us to suspect that Ag nanoparticle exposure creates a stress environment in the cell.

Z. Ingram, R. Martin, and A. Hulme. Department of Biomedical Sciences, Missouri State University. **HIV-1 UNCOATING IN A HUMAN MICROGLIAL CELL LINE.** In order to eventually develop a cure or vaccine for HIV/AIDS we need to better understand how the virus infects and replicates in human cells. After entering the cell, the conical capsid of HIV disassembles by a process called uncoating. Uncoating is required for viral replication, yet many questions remain about the kinetics and factors involved with the process. Previously we used the CsA washout assay to study the process of uncoating in HIV-1 infected owl monkey kidney (OMK) cells and HeLa cells (Hulme et al, Journal of Virology, 2015). In these experiments HIV uncoated more rapidly in HeLa cells compared to OMK cells even when accounting for differences in viral fusion. Mutations in the capsid protein altered the rate of uncoating. Interestingly, the capsid mutation N74D resulted in a more pronounced delay in uncoating in HeLa cells compared to OMK cells, suggesting that cell specific factors can alter the process of uncoating. While studies in OMK and HeLa cells have been useful in identifying viral and cellular components involved with uncoating, these cell lines are not representative of the cells that HIV-1 naturally infects. Therefore, we extended this study to the immortalized human microglial cell line CHME3. Microglial cells are natural targets of HIV-1 infection and are implicated in AIDS-associated dementia. CHME3 cells were engineered to stably express TRIM-CypA from owl monkeys so the CsA washout assay could be used to study the process of uncoating. In this cell line, HIV uncoated within an hour of viral fusion. Treatment with the reverse transcriptase inhibitor nevirapine delayed the process of uncoating. Finally, the N74D mutation delayed uncoating to a greater degree in CHME3 cells compared to OMK cells. These data suggest that OMK cells may contain a factor which affects HIV uncoating that is present

altered levels in CHME3 cells. Future experiments are aimed at examining the expression level of cellular proteins that have been implicated in early steps of HIV in both cell lines.

R. Mullner and J.J. Smith, Department of Biomedical Sciences, Missouri State University. **CHARACTERIZATION OF NUCLEOTIDE EXCISION REPAIR DAMAGE SENSOR RAD4 IN *TETRAHYMENA THERMOPHILA*.** Xeroderma Pigmentosum Complementation Group C (XPC) serves as the damage sensor in the Global Genome - Nucleotide Excision Repair (GG-NER) pathway for the detection and removal of bulky adducts generated by Ultraviolet (UV) light in silent DNA. Mutations within *XPC* result in Xeroderma Pigmentosum (XP), a condition characterized by increased UV sensitivity and predisposition to cancer. To further examine the role of XPC in GG-NER, we found a Rad4 homolog in *Tetrahymena thermophila*. *Tetrahymena* are binucleated ciliates, containing a larger, transcriptionally active Macronucleus (MAC) and a smaller Micronucleus (MIC) that stores genetic information to be passed on during conjugation. This compartmentalization allows us to investigate the function of XPC/Rad4 in DNA repair away from transcription-coupled DNA repair mechanisms. In this study, *RAD4* was tagged with GFP (Green Fluorescent Protein) and RFP (Red Fluorescent Protein) as well as FH6 (FLAG-His₆) and 2xHA epitope tags. Localization of GFP-Rad4 was seen in both the MAC and MIC following damage with 100 J/m² UV, which induces NER, but not after other types of damaging agents inducing Base Excision Repair (H₂O₂) and double stranded breaks (MMS). This indicates that GG-NER is happening in *Tetrahymena* and that Rad4 is a key player in the repair of DNA damaged specifically by UV. RFP-Rad4 can now be used to study colocalization with GFP-Rad23, and co-immunoprecipitation can also be performed with 2HA/FH6-Rad4 to identify other interacting proteins. These studies will further characterize Rad4, confirm that Rad4 is a functional homolog to XPC, and identify GG-NER associated proteins in *Tetrahymena*.

B. Abraham, T. Bross, J. Teagarden, S. Thomas and J. Ory, Department of Basic Sciences, St. Louis College of Pharmacy. **INDUCED EVOLUTION OF COPPER TOLERANCE IN *CRYPTOCOCCUS NEOFORMANS*.** *Cryptococcus neoformans* is a pathogenic fungus capable of causing an opportunistic infection, cryptococcal meningitis. The fungus is commonly found in the soil and in the droppings of pigeons but does not cause infections in healthy patients. One of the many virulence factors of *C. neoformans* is the ability to sense and import environmental copper. Proper import of copper also plays an important role in the regular growth and survival of *C. neoformans*. The *CUF1* gene of *C. neoformans* is a transcription factor that senses copper levels and regulates transcription of genes accordingly. The purpose of this study was to determine what survival mechanisms *C. neoformans* can be selected for when it lacks the *CUF1* gene. We have shown that a strain of *C. neoformans* lacking the *CUF1* gene (Dcuf1) exhibits inhibited growth relative to wild type if grown either in copper starvation conditions or in copper excess conditions. Repeated passage of the Dcuf1 strain on low copper conditions produces a range of growth phenotypes, with some colonies exhibiting growth rates similar to wild type. To

see how common these phenotypes were and if it can be selected for, we repeatedly passaged Dcuf1 on low copper media (no added copper) and high copper media (10mM copper sulfate). Repeated selection of Dcuf1 on low copper conditions appears to cause gradual adaptation, producing stable colony sizes after 15-20 passages. Selection of Dcuf1 on high copper conditions appears to cause almost immediate adaptation for a very small number of colonies. Our ultimate aim is characterizing the genetic changes that allow these adapted strains to grow in these high stress environments.

R. Islam, H. Du, J. Park, H. Shim, and S.J. Kim, Natural Sciences, Northwest Missouri State University. **DNA BINDING MOTIFS OF MAP/ERK KINASE KINASE 1 (MEKK1).** Previously we have shown that MEKK1 in association with antitumor protein p53 binds an atypical DNA sequence in the proximal PKD1 promoter and represses its expression. In a follow up work, we defined the nuclear localization signal and p53 binding sequence in MEKK1. In this study, using ChIP (Chromatin Immunoprecipitation) DNA fragments isolated from HEK293T cells and p53 negative HCT cells transfected with MEKK1 were cluster sequenced to obtain over 5000 sequence data. Using UCSC Browser and Galaxy identified only 113 gene sequences common to both cell types. Analysis of these sequences using MEME (Multiple Em for Motif Elicitation) identified three putative consensus binding sequences: MBM1 (MekK1 Binding Motif1) a 15 bp wide sequence found in 110 sites with e-value of $4.0e^{-024}$, MBM2- a 20 bp wide sequence in 7 sites with e-value of $4.0e^{-010}$, MBM3- a 20 bp wide in 20 sites with e-value of $4.0e^{-002}$. EMSA (Electrophoretic Mobility Gel Shift Assay) analysis supported binding of site 1 and 2. RT-PCR analysis in transfected cells validated some of the results.

K. Kim, P. Makaraci, U. Saimani, and J. Smothers, Department of Biology, Missouri State University. **YEAST DYNAMIN FOR MEMBRANE FUSION.** Yeast dynamin (Vps1) has been implicated in the recycling traffic from endosomes to the *trans*-Golgi network (TGN). We previously revealed a genetic interaction of Vps1 with Ypt6 and all components of the GARP tethering complex that anchors an incoming vesicle to TGN membrane. The present study identified a 33 amino acid segment of Vps51, a GARP subunit, which interacts with Vps1. Based on sequence homology between Vps51 and its mammalian homolog Ang2, we identified two key residues of Vps51, E127 and Y129, which bind Vps1. The replacement of these residues led to severe defects in endosome-to-TGN transport of Snc1, providing evidence of the physiological relevance of the interaction of Vps51 with Vps1 for the traffic. Furthermore, our functional analysis revealed that Vps1 acts upstream of Vps51 and that the absence of Vps1 resulted in defects in targeting of Vps51 and its binding partner Tlg1 to the TGN. The present study also reveals that Vps1 physically interacts with Ypt6. Interestingly, severe defects in retrograde trafficking caused by loss of Ypt6 were rescued by overexpression of Vps1, and vice versa. Furthermore, overexpression of Vps1 GTPase mutants was not sufficient enough to rescue abnormal Snc1 recycling in *ypt6Δ* cells. These results suggest that the GTP binding and hydrolysis of Vps1 is essential for this trafficking pathway and that Vps1 and Ypt6 may function

parallel. Finally, this study shows that Vps1 interacts with Golgi SNARE proteins, pointing to a novel role of Vps1 in the late stage of the endosome-to-Golgi traffic. Therefore, we propose that Vps1 and Ypt6 converge on the GARP tethering machinery for efficient tethering/fusion at the TGN.

**BIOCHEMISTRY, BIOMEDICINE, & BIOTECHNOLOGY SECTION
POSTER PRESENTATIONS**

E. Nischwitz, and J.J. Smith, Department of Biomedical Sciences, Missouri State University.
ROLE OF RAD4 IN DNA REPAIR AND ITS INTERPLAY WITH *TETRAHYMENA THERMOPHILA*'S TELOMERES. Telomeres are repetitive parts of the genome that act as a protective end cap to the chromosomes and help protect the integrity and stability of the entire genome. Telomeres are so critical to the overall integrity of the genome that ensuring they are properly repaired is crucial. One repair protein that has been understudied at the telomeres is Xeroderma Pigmentosum C (XPC), which plays a part in recognizing damage in the nucleotide excision repair pathway (NER). Due to the high amount of thymines found in *Tetrahymena thermophila*'s telomeres (GGGGTT), they are more susceptible to thymine dimers, which must be repaired by nucleotide excision repair. Much of the pioneering work for telomeres has been conducted in ciliates, and specifically in *Tetrahymena thermophila*, which makes this organism ideal for telomere repair studies. To further understand the interplay, *RAD4* knockdown strains were established alongside a DIG-labeled probe telomere detection assay. This detection assay will be used to study the telomeres in the presence and absence of *RAD4* and will help begin to elucidate their relationship.

J. Mooney, D. Morrone, and N. Sanguantrakun, Department of Basic Sciences, St. Louis College of Pharmacy.
O-CONJUGATION OF C5-CURCUMIN WITH VARIOUS CARBOHYDRATES TO EXAMINE PHARMACOTHERAPEUTIC EFFECTS. Curcumin, a naturally occurring pigment in turmeric (*Curcuma longa*), has been used for centuries in Ayurvedic South Asian traditional medicine to treat various pathologies resulting in inflammation. Interestingly, synthetic monocarbonyl C5-curcumin reportedly has superior anti-inflammatory and antibacterial properties to curcumin, presumably due to the latter's rapid metabolism *in vivo*. Additionally, C5-curcumin has been shown to possess anti-cancer effects. As an adjuvant, C5-curcumin is able to improve the effects of other chemotherapy agents by preventing the cancer cells from developing inherency to other agents. Various reports demonstrate that glycosylation of bioactive compounds can augment both selectivity for glucose-avid cancer cells and drug uptake across the blood-brain barrier. Accordingly, we have identified C5-curcumin as a candidate for glycosylation to enhance its pharmacotherapeutic effects. We present work on various synthetic approaches for O-conjugated analogs of C5-curcumin with various monosaccharides and disaccharides.

J. Stubbs, K. Wiele, C. Lemmons, and A. Barry, Biology Department, Missouri Southern University. **FIBROUS METAPLASIA OF SMOOTH MUSCLE TISSUE OF THE TUNICA MEDIA IN TORTUOUS ARTERIES.** Tortuosity is a phenomenon of twisting and bending of blood vessels which, in severe cases, can lead to a transient ischemic attack of distal organs. Despite this being a common anomaly that affects a wide range of blood vessels; at present day, its etiology is not widely understood. The prevalence of tortuosity is associated with several factors including age, hypertension, and diabetes mellitus. The present study was undertaken to identify changes of tunica media associated with tortuosity. Six formalin-preserved adult human cadavers were dissected at MSSU cadaver suite. Morphological variations of the arteries were documented before tissue collection for histological examination. Fifteen arterial samples were analyzed using hematoxylin-eosin staining; six of them were additionally stained with smooth muscle actin antibodies. Histologically, the arteries in cadavers with tortuosity showed decreased thickness of tunica media with signs of fibrous metaplastic transformation. Reduction of smooth muscle cells and elastic fibers replaced by connective tissue with fibroblast-like cells in tunica media were observed in affected blood vessels. Decreased amount of smooth muscle cells was apparent in the samples stained with smooth muscle actin antibodies. Metaplasia is a reversible condition; in such instance, elimination of catalyst should restore normal morphology of the vessel. Understanding phenomenon of metaplasia in tortuosity along with triggering factors could lead to less invasive interventions of symptomatic tortuosity and prevention of the disease. Next step of this study will use immunofluorescence microscopy to objectively verify remodeling of tunica media in tortuous blood vessels.

R. Nixon, S. Yang, W. Liu, and R. Wang, Department of Chemistry, Missouri University of Science and Technology. **DNA DECORATED MULTIFUNCTIONAL GOLD NANOPARTICLES.** Gold nanoparticles have attracted extensive research interests due to their unique optical, electrical, and physical properties. The hybridization of gold nanoparticles, along with other nanomaterials, has stimulated applications in biomedical imaging, plasmonic enhancement, and catalysts. However, the rational organization of gold nanoparticles with precisely controlled distance and orientation remains difficult in nanotechnology fields. This challenge can be overcome by using DNA origami scaffolding as templates. One such method of organization is by anchoring the nanoparticles, which are functionalized with single-stranded DNA, to a two-dimensional DNA origami tile surface via DNA hybridization. In this work, multi-functionalized gold nanoparticles were developed to determine the effect of nanoparticle coating composition on binding efficiency at two separate anchor sites of a DNA origami template. The ratio of coated DNA sequences as well as the functional strand length were varied to elucidate their influences on gold nanoparticle-conjugate functionality and stability.

N. Thyparambil, S. Greaney, L. Gutgesell, and J. Semon. Department of Biological Sciences, Missouri University of Science & Technology. **BORATE BASED BIOACTIVE GLASS EFFECTS ON HUMAN ADIPOSE DERIVED STEM CELLS.** Stem cell therapy has

emerged as a promising approach for the treatment of chronic dermal wounds. Mesenchymal stem cells (MSCs), a type of adult stem cell, are found in most tissues and organs. They can undergo multi-lineage differentiation to replenish multiple cell types. They secrete growth factors that can enhance wound-healing processes by promoting angiogenesis which increases local blood supply. They also secrete paracrine factors which down-regulate inflammatory responses, a critical step in the healing process. Though bone marrow stem cells (BMSCs) were the first source of MSCs studied in the field of regenerative medicine, their clinical use has two main drawbacks: The harvesting procedure is painful with possible donor site morbidity, and BMSCs need to be expanded *ex vivo* before clinical use due to their low yields upon isolation. Adipose derived MSCs (ASCs), are sparking interest as an ideal alternative to BMSCs. Subcutaneous adipose deposits are accessible, abundant, and can be collected in large quantities, which provides a potential adult stem cell reservoir for each individual. Adipose tissue contains 100-500 times more MSCs per ounce than bone marrow. This makes it possible to acquire therapeutic doses of ASCs without the need to expand them in culture. Bioactive glass is another candidate for stimulation of wound repair. Bioactive glasses are biocompatible and resorbable in the body, can be formed into custom compositions and geometries, tailored to degrade rapidly or slowly, and can be doped with antibacterial ions (i.e. copper). The borate bioactive glass 13-93B3 is 5-10 times more bioreactive than silicate Bioglass, is more resorbable in the blood stream, and is angiogenic, antimicrobial, and osteo-stimulatory. It has been used in the clinic to speed up the healing of ulcers in a majority of patients with no inflammation or infection around the areas where it was distributed, completely closed dermal wounds, left little or no scarring, and regrew hair. However, little is known about the effects of borate-based bioactive glass on ASCs. Our research investigates the mechanism of repair of 13-93B3 borate bioactive glass on dermal wounds by determining its effect on ASC extracellular matrix secretion, cytokine secretion, viability, and differentiation. This work will further elucidate the role of both 13-93B3 and ASCs in wound healing.

J. Stenberg and J. Wang, Department of Biomedical Sciences, Missouri State University.

EFFECT OF LOSS OF P2Y₂ RECEPTOR ON PURINERGIC P2Y RECEPTOR FAMILY

EXPRESSION. The P2Y₂ Receptor (P2Y₂R) is a purinergic G-coupled protein receptor that is stimulated by the nucleotides ATP and UTP. The P2Y₂R has been shown to mediate immune-regulating functions such as vascular inflammation and leukocyte migration. However, the absence of P2Y₂R does not result in complete lack of immune-regulating functions. The aim of the study is to determine transcript expression of seven isoforms of the P2Y R in microvascular endothelial cells (MEC) derived from both wild type (WT) and P2Y₂R knockout (KO) mice. MEC from skeletal muscle isolated from C57BL/6 WT and P2Y₂R KO mice were cultured. RNA was isolated from cultured cells, then reversely transcribed into cDNA library. The gene transcription levels for P2Y₁R, P2Y₂R, P2Y₄R, P2Y₆R, P2Y₁₂R, P2Y₁₃R, and P2Y₁₄R were assessed using quantitative PCR. MEC from P2Y₂R KO showed an increase in expression of the P2Y₁₂R (2.66 ± 0.48 -fold, $P < 0.05$, $n=6$) relative to WT cells. The P2Y₁₃R expression became

detectable in MEC from P2Y₂R KO mice in contrast to undetectable level in MEC from WT mice. The P2Y₂R KO MEC also experienced a decrease expression of P2Y₁₄R (0.11 ± 0.01-fold, P<0.05, n=6) compared to WT cells. The P2Y₄R transcript was undetectable for both the WT and P2Y₂R KO MEC. The P2Y₆ levels was the highest for both WT and KO cells. This study reveals that knocking out P2Y₂R causes compensatory alteration of P2Y₁₂R, P2Y₁₃R, and P2Y₁₄R transcript level. Further, it can be interpreted that comparisons of knock out to wild type models do not exhibit a direct causative effect. Even if the mutation of a single gene results in a lack/gain of function, further evidence is needed to determine whether it is due to the knocked-out gene or the altered expression of off target genes.

R. Schafer, C. Wilke, E. Csiki-Fejer, and J. Bashkin, Chemistry Department, University of Missouri-St. Louis. **TIME-DEPENDENT EFFECTS OF POLYAMIDES DECREASING HUMAN PAPILLOMAVIRUS DNA IN CELLS.** Human Papillomavirus (HPV) is a double-stranded DNA virus that infects the body's epithelial cells causing cervical cancer and other cancers. A strategy to eliminate "high-risk" HPV is using potential antiviral agent's, pyrrole-imidazole polyamides. Polyamides (PA) selectively bind to AT-rich regions in the minor groove of viral DNA and potentially inhibit viral gene expression by blocking DNA-protein interactions in regulatory transcription regions. Antiviral assays were conducted to *determine the inhibitory concentration of polyamides that decrease HPV-16 episomes by 50% (pseudo-IC₅₀) and 90% (pseudo-IC₉₀)* at 72 hours, 48 hours, and 24 hours. Polyamide 1 (PA1) was found to decrease episomal levels in a dose-dependent manner. Also, Polyamide 25 (PA25) exhibited a lower IC₅₀ than PA1 indicating polyamides have different levels of activities when interacting with the viral DNA and the cells.

J. Tee and J.J. Smith. Department of Biomedical Sciences, Missouri State University. **INTEGRATION OF THE NOURSEOTHRICIN ACETYLTRANSFERASE (NAT) CASSETTE AS A NOVEL SELECTABLE MARKER IN *TETRAHYMENA THERMOPHILA*.** The streptothricin class of antibiotics consists of aminoglycosides that are derived from the *Streptomyces* genus, and are differentiated according to the number of β-lysine residues linearly attached as a homopolymer. Accordingly, different species of *Streptomyces* produce different streptothricins, with *Streptomyces noursei* producing nourseothricin, which is a mix of streptothricin F, E, D and C. As with other aminoglycosides, nourseothricin's mechanism of action involves the inhibition of protein synthesis by interacting with the ribosome and impairing translocation, leading to miscoded protein products. *S. noursei* possesses the nourseothricin resistance gene (*NAT1*) that permits survival when exposed to their antibiotics. The gene inactivates nourseothricin by coding for an acetyltransferase that monoacetylates the β-amino group of the first streptothricin lysyl moiety. *Tetrahymena thermophila* is a ciliated protozoan that possesses unique qualities, namely, a segregated and alternatively heterochromatinated somatic macronucleus and meiotic micronucleus, as well as a polyploid 45 copies of every chromosome. Often used to study chromatin remodeling and cilia, its fast growth

rate and easy upkeep makes it a great model organism. While the nourseothricin gene has been used as a selective marker in other protozoans, its use in *T. thermophila* has not been tested. Here we attempt to create a plasmid system that utilizes the NAT cassette. As the *NAT1* gene is not expected to inactivate other commonly used aminoglycoside markers in *T. thermophila*, such as neomycin, it is thought that our system would be compatible with other selectable markers and better permit multiple gene tagging in *T. thermophila*.

T.M. Walker, L. Daniels, and J.J. Smith. Department of Biomedical Sciences, Missouri State University. **CLONING OF VARIOUS GENES IN THE MODEL ORGANISM**

TETRAHYMENA THERMOPHILA IN AN INTRODUCTORY BIOMEDICAL

SCIENCES LAB. Over the course of a semester, genes within the model organism *Tetrahymena thermophila* that contained corresponding homologs in humans were cloned with the intent to gain a better understanding of their functionalities. The study began by isolating genomic DNA from the cells. Once the genomic DNA was isolated, further information had to be obtained. Therefore, a bioinformatics report was compiled to determine the specific homolog that was being studied as well as any additional information required to conduct the research. Once all of the necessary information was obtained, the DNA was quantified using a technique called PCR (Polymerase Chain Reaction). To double check which gene was amplified during PCR, gel electrophoresis was performed. Once confirmed, the gene was inserted into pENTR-TOPO-D plasmid vector that contains a gene for kanamycin resistance and transformed into *E. coli*. The cells were grown on kanamycin plates to select for the cells that contained the plasmids. Afterwards, the plasmids were isolated and cut via restriction enzymes to ensure proper orientation of the gene within the plasmid. The *E. coli* cells were then cryopreserved for future experiments. The information acquired within this study can aid researchers as they delve deeper into the functionality of different homologs through tagging the gene with Green Fluorescence Protein (GFP) or other epitope tags to study the localization and function.

S. Thomas, H. Montejó, A. Baker, and J. Wang. Department of Biomedical Sciences, Missouri State University. **A SEMI-AUTOMATIC LEUKOCYTE TRACKING (SALT) METHOD**

FOR ANALYSIS OF LEUKOCYTE ROLLING AND ADHESION IN VIVO. Leukocyte recruitment, rolling, and adhesion are hallmarks of inflammation. Fully understanding the step-wise process of leukocyte activation is most easily accomplished by direct visualization of leukocytes by intravital microscopy (IVM). Moreover, the accurate and objective analysis of leukocyte-endothelial interaction and microvascular hemodynamics is problematic due to motion artifacts, cell deformation, and image noise that impeded manual and automatic leukocyte tracking. Traditionally, leukocyte tracking is accomplished by manual observation and frame-by-frame analysis of intravital microscopy time-lapse images. This method is time consuming, cumbersome and introduces subjective investigator bias. Although, there are a diverse number of cell tracking techniques for in vitro cell analysis, a reliable and practical in vivo leukocyte tracking system does not appear to exist. The aim of the project was to create a fully integrated

semi-automatic leukocyte tracking (SALT) method for the quantification of leukocyte rolling and adhesion in vivo. Utilizing ImageJ, images were processed through an intelligent background removal and thresholding filter. Using a customized semi-automatic leukocyte tracking (SALT) module developed off the ImageJ Trackmate plugin and utrack 2.0 MATLAB code leukocyte detection was accomplished via morphology and optical density algorithms. Upon leukocyte identification, leukocyte movement tracking was accomplished using a customized linear motion LAP tracker based on input criteria (critical velocity and blood flow velocity). Quantification of leukocyte flux, rolling, and adhesion from the leukocyte tracks was then computed based on defined criteria. To validate our data, velocity and leukocyte analysis obtained using the SALT method was compared to data obtained using the classical manual leukocyte tracking technique of the same images. Accordingly, independent analysis using the SALT method performed and compared. From the data, the novel SALT method exhibited high inter-rater and intra-rater validity. Thus, the SALT technique will be implemented in the future, in the hope to eliminate subjective bias and increase high-throughput leukocyte analysis.

A. Jin, G. Jang, E. Nash, and D. Morrone, Department of Basic Sciences, St. Louis College of Pharmacy. **AN EFFICIENT SPLINTED SSRNA LIGATION ASSAY FOR RNA LIGASE ENGINEERING.** Assays for RNA ligases typically involve radioactively labelled substrates and costly or time-consuming techniques. These approaches are not ideal for quick screening of engineered RNA ligases by undergraduate researchers or non-radioactive users. Here we have set out to address these issues as a first step in our efforts to engineer RNA ligases. A structure-guided approach was used to design two oligos of ssRNA that are 60 and 38 nucleotides in length and predicted to lack secondary structure. These two ssRNA oligos are used in gel-shift ligation assays with agarose gel electrophoresis or urea-PAGE. In the presence of complementary, aligning DNA splints and ATP, the 5'P and 3'OH ends of the 38mer and 60mer ssRNA, respectively, are ligated by an RNA ligase. The site of ligation contains an AvrII scar, which allows for downstream manipulation of the ligation product if desired. The ligation product is intended to be easily visualized with commercially available fluorescent dyes. Our results also indicate that RNA ligase will not perform undesired intramolecular ligation, circularization, and concatemerization with our ssRNA substrate. In addition to developing a simple gel-shift assay, there is a need for robust and inexpensive production and purification of large amounts of ssRNA. We have found that optimization of transcription and purification protocols can rapidly and economically produce sufficient substrate for a gel-shift assay. Here we present the results of our ssRNA substrate designs, ligation conditions, electrophoresis conditions, transcription optimization and purification. These results will allow us to begin the process of testing engineered RNA ligases.

R. Ulbricht, H. Brecount, Department of Biomedical Sciences, Missouri State University. **TISSUE SPECIFIC CAPSI RNA EDITING IN P2Y₂ RECEPTOR KNOCKOUT MICE.** RNA editing is a molecular mechanism by which individual nucleotide sequences transcribed

from the genome are altered to generate different nucleotides at selected positions. For example, CAPS1 transcribed RNA is altered by RNA editing to change a single nucleotide (adenosine to inosine), that changes a single amino acid (glutamate to glycine), which ultimately alters the function of the encoded protein. The enzymes that catalyze RNA editing are encoded from inflammatory-response genes and increase in amount with inflammation. The research performed here utilized the P2Y2 receptor knockout mouse model to address whether inflammation affects tissue-specific CAPS1 RNA editing. Research methods include: developing a genotyping protocol for genetically modified mice that was essential to maintaining the mouse colony, analysis of CAPS1 RNA editing in P2Y2 receptor knockout and wild-type mice. RNA editing analysis is accomplished by isolating RNA from dissected tissues and then amplifying the region of CAPS1 mRNA containing the editing site by RT-PCR. The sequence of CAPS1 RT-PCR amplicons was then analyzed to quantify the percentage of transcripts that are edited in each individual tissue. It is anticipated that the data here will provide insights into to how conditions that cause chronic or acute inflammation can alter the identity and function of gene products that are subject to RNA editing.

G. Scheidemantle and M. Keithly, Department of Chemical and Physical Sciences, Missouri Southern State University. **GLCNAC-MAL INHIBITION OF FOSB.** Antibiotics are used for the treatment of bacterial infections. Fosfomycin, marketed under the name Monurol®, is an antibiotic currently used in the United States to treat urinary tract infections; it can also be used for the treatment of multi-drug-resistant infections. FosB is a fosfomycin resistance enzyme found in Gram-positive organisms, such as methicillin-resistant *Staphylococcus aureus* (MRSA), that if inhibited could lead to better antibiotic effectiveness. Previous, unpublished research found that N-acetylglucosamine-malate (GlcNAc-Mal) may inhibit the FosB catalyzed nucleophilic addition of bacillithiol (BSH) to fosfomycin, which inactivates the antibiotic. The current study investigates if GlcNAc-Mal can bind to the active site of FosB and act as an inhibitor. A derivatization method was developed that allows the analysis of products using high performance liquid chromatography (HPLC) with UV detection. Standard curve data for cysteine, one reactant of the reaction, was collected. Current experiments are exploring the inhibition of full enzymatic reactions, to ultimately determine if GlcNAc-Mal is able to inhibit FosB. It is expected that GlcNAc-Mal inhibits FosB by mixed inhibition. A better understanding of how these antibiotic resistant enzymes can be inhibited will lead to a better design of future antibiotics.

Z. Ingram and A. Hulme, Department of Biomedical Sciences, Missouri State University. **CYCLOPHILIN A ENHANCES EARLY HIV-1 REPLICATION STEPS IN MICROGLIAL CELLS.** The completion of the early steps of HIV replication are required to establish permanent infection making these pre-integration events ideal targets for the eventual development of vaccines and therapies. Following viral fusion with the cell membrane, the HIV capsid is released into the cytoplasm of the cell. As the capsid traffics towards the nucleus, early

products of reverse transcription help to initiate the disassembly of the HIV capsid, a process called uncoating. Uncoating of the capsid is required for nuclear import of HIV DNA which establishes permanent infection of the cell. Host cellular proteins have been implicated in direct interaction with the capsid to facilitate infectivity at different early stages of replication. Cyclophilin A (CypA) is a peptidyl prolyl isomerase that binds the HIV capsid in the cytoplasm to modulate viral infectivity in a cell type dependent manner. The function of CypA as a cofactor is primarily of interest in the early steps of the HIV replication prior to integration. Disruption of the CypA-capsid interaction, using the drug cyclosporine A (CsA), in microglial cells resulted in a decrease in infectivity at time points associated with early replication events. The evident interplay between reverse transcription, uncoating, and nuclear import also suggests that the role of CypA may encompass multiple steps. Microglial cells were infected with virus in the presence of CsA or ethanol containing media. At various time points post-infection, the cells were harvested and HIV DNA was extracted. Early and late reverse transcription products as well as 2-LTR products were quantified through qPCR to determine the replication steps altered by CypA. Elucidating which steps are primarily impacted by the inhibition of CypA-capsid interaction provides a better understanding of CypA's function in HIV infection as well as the early steps of HIV replication.

R. Ulbricht and B. Mitchell, Department of Biomedical Sciences, Missouri State University. **RNA EDITING MEDIATES OLIGOMERIZATION STATE OF CALCIUM-DEPENDENT ACTIVATOR PROTEIN FOR SECRETION 1 (CAPS1).** CAPS1 RNA undergoes a site-specific adenosine-to-inosine RNA editing even that alters a genomically-encoded glutamate (GAG) to a glycine (GIG) codon within the carboxyl-terminal domain of the encoded Calcium-dependent activator protein for secretion 1 (CAPS1) protein. We functionally compare the CAPS1 protein isoforms generated from edited and non-edited transcripts in cultured neurons, showing that editing has a biphasic effect on synaptic vesicle distribution, release and recycling. Increasing expression of the non-edited CAPS1 isoforms negatively affects vesicle recycling and evoked release, leads to a more diffuse distribution of synaptic vesicles and increases spontaneous release from synaptic vesicles. Conversely, elevation of edited CAPS1 isoforms stimulates increases clustering of synaptic vesicles within the synaptic bouton and decreases constitutive release from synaptic vesicles. We hypothesize the mechanism for the distinct editing-dependent phenotypes is related to the effect of editing on CAPS1 protein interactions. To assess the oligomerization state of CAPS1, recombinant isoforms of edited and non-edited CAPS1 are isolated from transfected human embryonic kidney cells and detected by western blot of clear native PAGE. Overall, we conclude that RNA editing serves as a molecular switch, allowing CAPS1-mediated organization of synaptic vesicle distribution to promote robust, regulated release while preventing release from vesicles in the absence of a stimulus.

M. Alalem and M. El-Dweik, Cooperative Research Programs, Department of Life and Physical Sciences, Lincoln University. **A HIGHLY SPECIFIC METHOD FOR RAPID CAPTURE**

AND DETECTION OF ESCHERICHIA COLI O157:H7 FROM GROUND BEEF SAMPLES. *E. coli O157:H7* bacteria can cause human diseases following ingestion of contaminated food and water. Testing water and food products for potential bacterial contamination is becoming a standard procedure in many industries. However, the conventional bacterial detection methods require relatively long sample-enrichment time and painstaking testing processes with sophisticated equipment. Our proposed detection method is based on our lab's previous research to achieve rapid bacterial capture using highly specific immunomagnetic-beads. The current study attempts to combine specific bacterial-capture with rapid colorimetric-detection without elution using sandwich ELISA. Therefore, protein A-coated magnetic beads are incubated with anti *E. coli O157:H7* capture-antibody. The resulting complexes are subsequently incubated with blocking buffers followed by the test samples to capture target bacteria. Then the complexes are incubated with HRP-linked anti *E. coli O157:H7* detection-antibody. After washing, the complexes are incubated with chromogenic enzyme substrate for colorimetric results. This proposed detection method demonstrated good response to low bacterial concentrations allowing for shorter sample enrichment and total actual testing time less than one hour. However, weak direct binding of the detection antibody to the magnetic beads could not be completely excluded, which imposes a challenge of false positive results to be addressed by further research for the optimization of detection. The relatively low bacterial cell count detected by this method; the short testing time and the colorimetric results make this method suitable for pathogen detection in the field, which could pave the road for pathogen detection methods with minimal technical and expertise requirements.

BIOLOGY SECTION ORAL PRESENTATIONS

D. Penning. Department of Biology and Environmental Health, Missouri Southern State University. **TUBE WRESTLING: USING INTEGRATIVE APPROACHES TO UNDERSTAND HOW SNAKES EAT SNAKES.** Snakes are elongate vertebrates with hundreds of skeletal elements and thousands of muscles with complex interconnections. Many snakes use their musculature to constrict and kill by exerting forces around prey. In general, larger snakes produce higher constriction pressures than smaller ones, but previous work has shown that snake-eating snakes (kingsnakes; *Lampropeltis*) produce higher constriction pressures than similarly sized intraguild competitors (ratsnakes; *Pantherophis*). Although kingsnakes produce higher constriction pressures than their ratsnake prey, there are currently no identifiable differences in their muscle size and anatomy. Here, I investigated muscle physiology by quantifying and comparing *in vivo* muscle force and endurance in two epaxial muscles of kingsnakes (*L. holbrooki*) and ratsnakes (*P. obsoletus*) in order to better understand how muscle performance relates to whole-body performance. The semispinalis–spinalis and longissimus dorsi muscles from larger snakes produced higher isometric forces (0.23–1.35 N)

than those from smaller snakes, but there was no significant difference in maximum isometric force between muscles or species. In endurance tests, all muscles lost 25% of their maximum isometric force in an average of 58 s, and muscle force was reduced to an average of 38% of the maximum force over 4 min of stimulation. There was no significant relationship between body size and endurance, and there was no difference in endurance between muscles or snake species. These and previous results indicate that kingsnakes are superior constrictors that can prey upon other large constrictors not because of differences in their physiology, but because of their more consistent use of an effective coil posture (behavior).

C. Neff and D. Penning. Department of Biology and Environmental Health, Missouri Southern State University. **AN ANALYSIS OF THE INTRACRANIAL PRESSURE OF MICE DURING CONSTRICTION.** How a predator effectively kills its prey plays a key role in predator-prey relationships and has been an important factor in the evolution of every species, including snakes. Specifically, the multitude of methods that snakes have evolved to incapacitate their prey has partially offset the disadvantages of limblessness. Constricting snakes wrap or wind portions of their body around prey while squeezing to quickly and safely incapacitate prey that can be much larger than itself. Although the belief of how constriction effects prey has evolved over the last century, not all hypotheses have been thoroughly tested. The known hypotheses underlying the mechanisms of constriction currently include suffocation, cardiac arrest, blunt force trauma, and neural damage. Further, current research suggests that ectothermic animals (amphibians and reptiles) are not susceptible to many of the known constriction mechanisms. However, current research does not easily explain how constricting snakes are able to feed on ectothermic prey. A recently raised hypothesis (the red-out effect) states that some prey animals may be experiencing high pressures in their heads during constriction. This hypothesis has never been tested but potentially explains how some constricting snakes can kill other reptiles. Here, we seek to quantify the cranial pressure in prey that are constricted by snakes. This would provide evidence for the red-out hypothesis. Further, we aim to compare the constriction performance of snakes feeding on both lizards and mammalian prey in order to better understand this dynamic predator-prey interaction.

T. Pashia and D. Penning. Department of Biology and Environmental Health, Missouri Southern State University. **PUTTING THE SNAP IN SNAPPING TURTLE: PROXIMATE DETERMINANTS OF BITE FORCE IN *CHELYDRA SERPENTINA*.** In biology, size matters. Often, smaller organisms are preyed upon more frequently than larger ones. A mechanism of both predation and defense for many organisms of varying sizes is biting behavior. Bite behavior is often quantified as a performance measurement of bite force. Bite force has been shown to be related to many aspects of size including overall body size, head size, and head shape; it has also been shown to be related to the type of prey eaten. This relationship between bite force, size, and shape is known to exist for many species. However, little data exist for one of the animal lineages in which it is likely highly important – the turtles. By trapping

numerous common snapping turtles (*Chelydra serpentina*), we aim to capture and measure bite performance and various aspects of size and shape to better understand the relationship between form and function.

J. White and T.R. Boman. Department of Biology and Environmental Health, Missouri Southern State University. **THIRD YEAR ASSESSMENT OF CLEAR CREEK, SPRING RIVER WATERSHED, MO, FOLLOWING FISH KILL MAY 2014.** Water is necessary for all life to survive; therefore, taking care of the little freshwater on Earth is essential. In May 2014, Tyson Foods, improperly discharged ALIMET™, a chicken food supplement, to the Monett Municipal Waste Water Treatment Facility (MMWWTF). This resulted in the destruction of the biological treatment at the MMWWTF. The death of the bacteria in the wastewater treatment plant led to the discharge of improperly treated sewage, with high ammonia concentration, into Clear Creek. This resulted in one the largest fish kills in Missouri history affecting >8km of waterway downstream. The purpose of this study was to continue the monitoring of chemical, bacteriological and biological parameters of Clear Creek since the fish kill. Three sample locations, with varying distances from the wastewater treatment plant, have been monitored January-April since 2016. Sampling has been performed on a weekly basis with the following parameters measured: dissolved oxygen (mg/L), pH, temperature (°C), conductivity (µs/cm), turbidity (NTU), nitrate (mg/L), soluble reactive phosphorous (mg/L), total suspended solids (mg/L), total fecal coliforms (MPN/100ml) and *Escherichia coli* (MPN/100ml). A biological assessment of benthic macroinvertebrates will take place in late March 2017. Spatially, results indicate decreasing concentrations of nutrients, conductivity and increasing temperature as sample sites move further downstream of MMWWTF. Temporally, trends in measured parameters have been more variable. Overall, research on the condition of the Clear Creek has shown the potential for recovery; however, some results indicate continued impairment that may slow the recovery process.

B. Thomas, R. Little and S. Lankford. Department of Biology and Agriculture, University of Central Missouri. **DEVELOPMENT OF PREDICTIVE EGG QUALITY INDICATORS IN PADDLEFISH: EGG MORPHOLOGY, TISSUE CULTURE, AND HORMONAL INDICATORS.** In the past, Blind Pony Fish Hatchery (BPH) has experienced inconsistent ovulation, fertility, and development rates in female paddlefish. Even if ovulation occurs, some paddlefish eggs stop developing prematurely; at times only half of the paddlefish spawned have resulted in usable fry. This inconsistency decreases the effective management of the put-grow-take paddlefish fishery, as well as drives up Missouri Department of Conservation's (MDC) production costs. This project aims to develop a paddlefish broodstock ranking index for both egg quality and spawning readiness. The specific end points to be evaluated include spawning readiness indicators (i.e., egg polarity index [PI], and egg bioassay) and egg/progeny quality indicators (i.e., plasma estradiol, testosterone, and cortisol concentrations). The goal is to

improve MDC's efficiency in selecting fish that will spawn in response to the hormonal injection and produce high-quality progeny that are more likely to survive the rearing process.

B. Chikuru, R. Mori-Kreiner and S. Lankford. Department of Biology and Agriculture, University of Central Missouri. **DOSE-DEPENDENT EFFECTS OF E2 AND EE2 ON VITELLOGENIN GENE EXPRESSION IN MALE RAINBOW TROUT (*ONCORHYNCHUS MYKISS*)**. Endocrine disrupting compounds (EDCs) are ubiquitous in our environment and are capable of altering endocrine-based functions in both humans and wildlife. This is possible because EDCs have similar structures to hormones, the signaling molecules of the endocrine system, which allows them to bind to endogenous receptors. One major concern with EDCs is the rising estrogenicity of our water supply, which has been linked to sources such as landfills, agriculture, and human pharmacological contamination via wastewater. Thus, it is critical to study the effects of xenoestrogen in animals like fish because of their vulnerability to point source exposure – as they live in and breathe our water supply. Exposure potentially alters sex organ development, and egg and sperm production, which can lead to reduced fecundity, altered sex ratios, and possibly infertility. The objective of the project was to investigate the dose-dependent response of male liver tissue to two common xenoestrogens that are found in our watersheds and municipal water supplies, 17 β -estradiol (E2) and 17 α -ethynylestradiol (EE2). The experiment was conducted *in vitro* using samples of liver tissue from nine males and six females. The samples were treated at four different environmentally relevant concentrations: 1ng/L, 10ng/L, 100ng/L, and 1000ng/L. Real-time polymerase chain reaction was utilized to measure the messenger RNA expression of vitellogenin (*vtg*), an egg yolk protein that is produced in response to the presence of estrogen. Preliminary results suggested an upregulation of *vtg* for both E2 and EE2 treated male samples, which in turn indicate endocrine disruption, because males do not need to produce eggs, and thereby should not express any *vtg* naturally. This technique could serve as a very non-invasive way to determine exposure of wild fishes to xenoestrogens.

N. Saali and M. Penumetcha. Department of Nutrition and Kinesiology, University of Central Missouri. **REGULATION OF GENE EXPRESSION BY DIETARY OXIDIZED LIPIDS: IMPLICATIONS FOR GLUCOSE HOMEOSTASIS**. Previous studies from our lab and others have demonstrated that commonly consumed foods contain oxidized lipids. Emerging research suggests the consumption of highly oxidized lipids can cause hyperglycemia even in the presence of reduced fat storage. Peroxisome proliferator activated receptor gamma (PPAR γ) is a transcription factor that is necessary for developing healthy adipose tissue and mediating glucose homeostasis. In a recent study using C57BL/6J mice we demonstrated that exposure to a diet with soybean oil heated for 6 hrs (a source of oxidized lipids) promoted glucose intolerance. Currently, a gene expression study has begun in the UCM molecular technology lab to determine the expression of PPAR γ , CEBP/ α , SREBF-1, GLUT4 and LPL (genes involved in adipose storage and glucose homeostasis) in fat pads isolated from these mice. Following MIQE

guidelines, RNA was isolated from fat pads, cDNA synthesized, primer sets were designed, annealing temperatures and melt curves determined for all genes of interest. Melt curve analyses followed by gel electrophoresis have confirmed that for each of the genes there is a single amplicon with the correct amplicon size. For example, PPAR γ primer set (F Primer 5'-CGAGAAGGAGAAGCTGTTGG-3' R Primer 5'-TCAGCGGGAAGGACTTTATG-3') was designed using Primer3 and yielded only the predicted product (122 bp) as confirmed below with melt curve and gel electrophoresis. Moving forward, PCR efficiency will be determined and relative expression studies conducted to present the data at this conference.

BIOLOGY SECTION POSTER PRESENTATIONS

N. Remex¹, J. Schaefer² and D. Duvernell¹. ¹Biological Sciences, Missouri University of Science and Technology. ²Biological Sciences, University of Southern Mississippi. **CONTRASTING THE PATTERN OF HYBRIDIZATION AND INTROGRESSION AMONG REPLICATED HYBRID ZONES BETWEEN TWO BROADLY DISTRIBUTED TOPMINNOW SPECIES.** Two topminnow species in the *Fundulus notatus* complex (*F. olivaceus* and *F. notatus*) exhibit broadly overlapping sympatric distributions. Co-occurrence of these species is very common across a range of stream habitats over a broad geographic area. The overlapping distribution always follows an upstream-downstream orientation with contact zones occurring where tributary habitat transitions to large rivers. Naturally replicated hybrid zones are excellent systems to understand the pattern of hybridization and introgression that plays a role in evolutionary processes that impact biodiversity. We have previously used five single-nucleotide polymorphism (SNP) loci to compare hybridization patterns among isolated drainages containing *F. olivaceus* and *F. notatus*. A wide range of rates of hybridization were noted among drainages, ranging from no hybridization to virtual random mating. In this present study, we have selected four drainages from this previous study with the highest rates of hybridization. We genotyped several thousand SNPs using the genotype by sequencing (GBS) method and asked if the patterns of hybridization and introgression vary among drainages where high rates of hybridization have been previously documented. We found that the proportions of F1 hybrids between contact zones are similar, but the extent of back crossing varies substantially among zones. This could reflect variation in F1 hybrid reproductive viability across geographic regions.

C. Neff and D. Penning. Department of Biology and Environmental Health, Missouri Southern State University. **A MULTI-SPECIES COMPARISON EVALUATING THE CONSTRICTION PERFORMANCE OF THE BORNEO PYTHON (*PYTHON BREITENSTEINI*).** Size and shape play a fundamental role in the lives of all animals. For snakes, size plays an important role in their performance both as predators and prey. Many snakes can use constriction behaviors to capture and kill prey. Constriction involves the

wrapping or winding of the body around a prey animal. Once a coil has been formed, snakes contract their muscles, tightening around their prey. These muscle contractions deliver forces that the prey experience as pressure. Constriction pressures have been measured in a variety of snake species, but to date, comparative data are lacking. Here, we quantified the constriction performance of a little-studied species, the Borneo python (*Python breitensteini*). The Borneo python is a very short and stout species of python endemic to the island of Borneo. Adult specimens rarely exceed 1.2 m in length but can weigh upwards of 12 kg. We report some of the first constriction performance data on the Borneo python and compare the results to the known measures from other snake species.

H. Counts and A. Bossert. Department of Biology, Rockhurst University. **USING SOCIAL MEDIA AND CITIZEN SCIENCE TO CATALOGUE ANNUAL TRENDS IN OCCURRENCE OF MISSOURI REPTILES AND AMPHIBIANS.** Social media websites present the potential opportunity to collect useful historic data for a number of scientific investigations. Historic records of amphibian and reptile occurrences can give researchers insight into past environmental conditions, weather patterns, and can also play an important role in determining species distributions. For this study, the posting history of an active social media group dedicated to the amphibians and reptiles of Missouri was downloaded and analyzed. Any posts to that group that included an identifiable picture, a reliable date, and county-level locality were collected. These detections were then compared against the verified, historic detections of amphibians and reptiles in the Missouri Herpetological Atlas Project. Using the combined datasets, updated or expanded records for a number of species and counties were identified.

E. Kern, N. Mahinda and C. Espinoza. Department of Science, Technology and Mathematics, Lincoln University. **FUNCTION OF CHITIN RECEPTORS *CERK1* AND *LYK4* IN THE SALT STRESS RESPONSE PATHWAY IN *ARABIDOPSIS* PLANTS.** Salinity stress and fungal invasion are two factors that limit the productivity of agricultural crops. Chitin, a fungal cell wall component, enhances the tolerance to salinity stress in the plant genetic model, *Arabidopsis*. Mutants without a functional chitin receptor, CERK1 (CHITIN ELICITOR RECEPTOR KINASE 1), showed more sensitivity to salt stress, indicating that *CERK1* is necessary for stress tolerance in plants. Triple mutants of *cerk1*, *lyk4* (*LYSM-CONTAINING RECEPTOR LIKE KINASE 4*, another chitin receptor), and *sos1* (*SALT OVERLY SENSITIVE 1*, a Na⁺/H⁺ antiporter important for salt stress responses) are being constructed to further investigate if chitin receptors are in the same pathway that regulates salt stress tolerance in plants (the Salt Overly Sensitive pathway). Currently, we are PCR genotyping to identify the triple mutant *cerk1 lyk4 sos1*. We are also assessing the response to salt stress of the *lyk4* mutant and *cerk1 lyk4* double mutant. Understanding of the mechanism of how plants respond to salt may lead to more sustainable methods to increase crop stress tolerance.

V. Moser. Department of Biology and Environmental Science, Westminster College. **THE EFFECTS OF BISPHEENOL-A (BPA) ON SEA URCHIN EMBRYOGENESIS.** Bisphenol-A (BPA) is a controversial chemical and has been covered in the news over the last decade because of it being found in various products and plastics. BPA has a similar structure to the hormone estrogen allowing the probability for it to bind to estrogen receptors and affect the function of your body. Other research studies found that it can have a negative effect on fertility and the life of a baby including hormonal development, behavior, and cancer risk later in life. Since Sea Urchins develop closely to ourselves giving us a great idea of what early developmental stages look like, we are able to study the effects of various chemicals, such as BPA, on their development. The focus is on testing various concentrations of BPA, ranging from concentrations found in waterways (around 0.1 µg to 100 µg per liter) to those which are higher (up to 3000 µg per liter), to determine its effects on the development of the Sea Urchin Embryo and to see what concentrations, if any, cause significant changes in development.

V. Brown, M. Barrett, L. Mihindikulasooriya and A. Campbell. Department of Natural Sciences, Northwest Missouri State University. **QUANTIFYING ALGAE AND PROKARYOTES IN OLD WOMAN CREEK NATIONAL ESTUARY.** Old Woman Creek National Estuary (OWC) is a tributary creek in the Lake Erie drainage basin. Previous studies have tried to understand how this tributary's community and nutrients are resulting in harmful algal blooms (HAB). With this research, we aim to quantify microbes associated with these blooms using quantitative PCR (qPCR) and compare these data to other methods of quantification. Forty-eight samples were collected from OWC from July 11-15, 2017. Three extraction methods were initially compared to determine the most efficient DNA extraction process for bacterial and phytoplankton communities. The most efficient method involved passing 10 mL of each sample through a 0.22-µm filter, and DNA was extracted from each filter using Qiagen DNeasy Blood and Tissue kit. Following extraction, qPCR assays were used to assess relative concentrations of phytoplankton, bacterial and archaeal communities for each sample. These data will be compared to reflectance data and microscopic counts of algae to determine the best method of monitoring for HAB.

E. Burns, G. Gomes and J. Escudero. Department of Basic Sciences, St. Louis College of Pharmacy. **NOT ALL OXACILLIN RESISTANT GRAM POSITIVE COCCI ARE STAPHYLOCOCCUS AUREUS.** *Staphylococcus aureus*, *Enterococcus faecium* and *Enterococcus faecalis* are common inhabitants of humans, as well as animals. Because *S. aureus* is commonly found in the nares and on the skin of humans, and *E. faecium* and *E. faecalis* are found in the intestines of both humans and animals, the rise of multidrug-resistant strains is a serious concern in the community as well as the hospital setting. In order to address this concern, cats' pharyngeal and perianal regions and cat feces were tested for the presence of β-lactam-resistant genera using the selective and differential medium mannitol salt agar (MSA) and the

antibiotic oxacillin. Forty-nine cats were tested with two samples per cat; throats and perianal regions of 17 of the cats carried putative MRSA. However, sequencing of a conserved region in *rpoB* led to the identification of seven *S. aureus*, seven *S. gallinarum*, two *S. xylosus*, and one *S. cohnii* subsp. *urealyticus*. Additionally, six of these cats had catalase negative, oxacillin resistant perianal region isolates which were identified as *E. faecalis*. Thirty-six fecal samples were collected from cat kennels housing individual cats in order to determine if testing feces of aggressive cats would be accurate for determining the presence of MRSA. Eleven of the fecal samples carried resistant (non-*mecA*), catalase negative strains; seven *E. faecalis* isolates and four *E. faecium*. The focus of this study was to identify MRSA in these companion animals, however, the results showed that MRSA and other species of oxacillin-resistant *Staphylococcus* and *Enterococcus* species were present, highlighting the role pets may play in the transmission of these resistant pathogens.

T. Lay Guterres and M. Taban. Department of Biology and Environmental Science, Westminster College. **SOIL MICROORGANISMS AND THE CARBON CYCLE.** Soil is an important component that provides ecosystem services vital for life; it acts as a water filter, an important storage of minerals, and a vital living ecosystem that sustains plants and animals. Our research takes a simple experimental approach by using an enzyme assay (β -glucosidase) to see how well soil microorganisms utilize soil carbon. We collected and tested soil samples from three different sites: a woodland, a native prairie, and a restored prairie. We then looked for correlations between enzyme activity and soil respiration and active carbon measures. We hypothesized that microorganism activity is higher in the unplowed native prairie site, compare to the restored prairie and the woodland sites. We anticipate positive correlations between enzyme activity and soil respiration as well as active carbon. This research helps illustrate the role of soil microorganisms in prairie and woodland biomes. In addition, it furthers our understanding of the role that soil microorganisms play in the carbon cycle, in particular in carbon sequestration.

CHEMISTRY SECTION ORAL PRESENTATIONS

H. Shrestha, M. Shaw, B. Adhikari, A. Patel, M. J. Meziari, J. H. Campbell, Department of Natural Sciences, Center for Innovation and Entrepreneurship, Northwest Missouri State University. **SYNTHESIS AND CHARACTERIZATION OF COMPOSITE RESIN INCORPORATING METAL AND MAGNETIC NANOPARTICLES WITH ENHANCED ANTIBACTERIAL PROPERTIES.** The objective of this study was to investigate a new way for the synthesis and characterization metal and magnetic nanoparticles coated cation resin beads with different loading by adjusting the metal precursor concentrations and evaluate their potential in deactivating bacteria. The metal-resin nanocomposites were characterized using X-ray diffraction (XRD), Fourier transform infra-red (FT-IR), scanning electron microscope

(SEM), and energy dispersive spectroscopy (EDS) to analyze the functional groups, morphology and the presence of metal and magnetic nanoparticles in the resin. The metal-loaded resins were tested for antibacterial activity in vitro against Escherichia coli B (derived from ATCC 8739), showing an efficient growth inhibition within 3 hours.

J. Miranda, T. Shrum, Division of Science, Chemistry, State Fair Community College, **CHEMISTRY IS A BREWING.** Brewing whiskey and beer is a way to perform macro-scale and food grade labs to prepare students for work force situations. The breakdown of starch into sugars and converting sugars into ethanol is an important reaction in chemistry and biochemistry. By conducting tests to measure macromolecules present while the reaction is taking place, we utilize the basic fundamental skills and knowledge acquired during general chemistry and organic chemistry. Brewing whiskey and beer allows students to measure large quantities of ingredients, maintain sterile conditions, and evaluate the macromolecules present in the reactions.

I. M. Abdullahi^a, V. Mochalin^{a, b} and W. Fahrenholtz^{b, c} ^aDepartment of Chemistry, Missouri University of Science and Technology, 142 Schrenk Hall, Rolla, MO 65409-0010 ^bDepartment of Materials Science and Engineering (MSE), Missouri University of Science and Technology, 223 McNutt Hall, 1400 North Bishop, Rolla, MO 65409-0330 ^cMaterials Research Center, Missouri University of Science and Technology, 101 Straumanis-James Hall, 401 W 16th St, Rolla, MO 65409-1170. **COLD SINTERING PROCESS FOR SALT ASSISTED ULTASONIC DEAGGREGATED CERAMIC-NANODIAMOND COMPOSITES FOR IMPROVED MECHANICAL PROPERTIES AND DENSIFICATION IN ALUMINA.** Alumina and Zirconia have received a lot of attention for a very long time, as high temperature materials due to their high strength, deformation and wear resistance, as well as structural stability when sintered at high temperatures. However, the current methods use very high temperatures of > 1800 °C for hours or days, and most of the ceramic-composites out there suffer from poor dispersibility of filler in the matrix. In this work, highly dense Alumina and Zirconia-Nanodiamond composites were produced via Salt Assisted Ultrasonic Deaggregation (SAUD) approach, then sintered using a cost effective, low temperature sintering process, at extremely low temperature of 180°C and a pressure of 400 MPa applied over a short time. The size, shape and inert nature of nanodiamond, as well as its superior mechanical properties, render it one of the best candidates for mechanical reinforcement of ceramics to suit various applications. A novel ceramic-nanodiamond composite synthetic approach yielding uniform dispersion of the nanofillers will be presented. Theoretical densities and mechanical properties of these composites at various nanodiamond concentrations will be discussed.

B. Carman, Division of Science, Chemistry, State Fair Community College. **THE SYNTHESIS OF ZINC OXIDE NANOPARTICLES USING TRADITIONAL LABORATORY EQUIPMENT.** Nanoparticles are an ever expanding part of the medical field. Often used in

protein detection, tissue regeneration, and manipulation of cells, nanoparticles are quickly becoming a hot and useful topic. Within this lab, zinc oxide nanoparticles are synthesized using traditional lab equipment found within most freshman lab settings. This lab shows how the development and synthesis of nanoparticles can be expanded and researched in more commonly accessible places.

E. Larson, A. Kryshchendyuk, Division of science, Biochem, State Fair Community College. **JUST KEEP SWIMMING.** The fish, plants, and other aquatic life have an obvious effect on the physical and chemical aspects of the ecosystem. The levels of nutrients are directly affected by the life in the environment. In this experiment we tested the aquatic environment for different filtration methods for pH, ammonia, nitrates, nitrites, and phosphates. We had a mechanical, biological, and chemical filtration methods. The ideal pH level is 7.0. The ideal level of ammonia is 0ppm. Nitrates and nitrites should be 0ppm. Phosphates should also be 0ppm.

A. Asaduzzaman^{1,2}, K. Muralidharan² and G. Ganguly³, ¹Department of Science, Technology, and Mathematics, Lincoln University, ²Department of Materials Science and Engineering, University of Arizona, ³Department of Geosciences, University of Arizona. **DELIVERY OF WATER INTO THE EARTH AND ELEVATED D/H RATIO.** The delivery of water into the Earth has been a perplexing problem because of two reasons: the kinetics for the formation of hydrous minerals is too sluggish to delivery water within the lifetime of solar nebulae and the relatively high abundance (~4 times) of deuterium (D) in the Earth compare to that in solar nebulae. Using the density-functional theory study, we have shown that a few ocean equivalent of water could have accreted to the Earth within the life time of the solar nebula by a process of dissociative chemical adsorption on olivine grains. We are also investigating the mechanistic details on the enrichment of D/H in the Earth compare to solar nebulae. Using DFT and statistical thermodynamics, we have shown the enrichment D/H in the earth through gas-grain fractionation of D and H. These results provide with an important explanation on the perplexing questions on the water delivery mechanism into the Earth.

M. Huang, K. M. Lee, and K. Woelk, Department of Chemistry, Missouri University of Science and Technology. **NMR-SPECTROSCOPIC PH DETERMINATION USING ¹⁹F CHEMICAL-SHIFT DATA.** The NMR chemical-shift information of certain test molecules can be used to determine the pH of aqueous solutions. Those test molecules must be sensitive to the hydrogen ion concentration of the solution and, at the same time, change the electronic environment around an NMR-sensitive atom depending on the pH. The chemical shift of fluorine atoms in 2-, 3-, and 4-fluorophenols, for example, changes with pH. In this study, we present that fluoropyridines show an even larger pH sensitivity of the ¹⁹F nuclei. However, fluoropyridine compounds are generally insoluble in aqueous solutions, and only water-soluble fluoro-hydroxypyridines and fluoro-hydroxymethylpyridines are suitable candidates for chemical-shift

dependent pH test molecules. We have tested several different fluoro-hydroxypyridines and fluoro-hydroxymethylpyridines, in order to maximize the ^{19}F chemical-shift dependence on pH.

M. R. Van De Mark, A. Ashish, P. Geng and A. M. Braden, Missouri S&T Coatings Institute, Department of Chemistry, Missouri University of Science and Technology. **COLLOIDAL UNIMOLECULAR POLYMER PARTICLES THEORY AND APPLICATION.** The synthesis and characterization of a new type of 2-12nm diameter polymer particle based upon a single strand of polymer was developed. The particles have a narrow size distribution, are thermodynamically stable aqueous suspensions and can be made in large industrial scale at a relatively low cost. The ultra-high surface area per gram coupled with an associated surface water layer of about 0.6 nm produced unique characteristics such as the inhibition of water freezing. Their application to several real-world problems will be discussed.

J. D. Steinkruger^{†*}, G. J. Bartlett[§], D. N. Woolfson^{§‡}, and S. H. Gellman[†] [†]Department of Chemistry, University of Wisconsin–Madison, Madison, Wisconsin 53706, USA [§]School of Chemistry and [‡]School of Biochemistry, University of Bristol, Bristol BS8 1TS, UK *Current Address: School of Environmental, Physical, and Applied Sciences, University of Central Missouri, Warrensburg, Missouri 64093, USA **SIDE-CHAIN PAIRING PREFERENCES IN THE PARALLEL COILED-COIL DIMER MOTIF.** Pairing preferences in heterodimeric coiled coils are determined by complementarities among side chains that pack against one another at the helix–helix interface. However, relationships between dimer stability and interfacial residue identity are not fully understood. In the context of the “knobs-into-holes” (KIH) packing pattern, one can identify two classes of interactions between side chains from different helices: “lateral”, in which a line connecting the adjacent side chains is perpendicular to the helix axes, and “vertical”, in which the connecting line is parallel to the helix axes. We have previously analyzed vertical interactions in antiparallel coiled coils and found that one type of triad constellation ($a'-a-a'$) exerts a strong effect on pairing preferences, while the other type of triad ($d'-d-d'$) has relatively little impact on pairing tendencies. Here, we ask whether vertical interactions ($d'-a-d'$) influence pairing in *parallel* coiled-coil dimers. Our results indicate that vertical interactions can exert a substantial impact on pairing specificity, and that the influence of the $d'-a-d'$ triad depends on the lateral a' contact within the local KIH motif. Structure-informed bioinformatic analyses of protein sequences reveal trends consistent with the thermodynamic data derived from our experimental model system in suggesting that heterotriads involving Leu and Ile are preferred over homotriads involving Leu and Ile.

CHEMISTRY SECTION POSTER PRESENTATIONS

R. Ibarra, Department of Chemistry Drury University and City Utilities, Springfield, E Robertson, City Utilities, Springfield. **A COMPREHENSIVE REVIEW OF MAJOR**

WATER QUALITY PARAMETERS AND APPLICATIONS. There are important water quality parameters that serve as controlling variables and those that strongly influence the behavior of many other constituents present in water. Alkalinity, hardness, pH and several other parameters are investigated in this work. Additionally, the byproducts created when using chlorine disinfection in water treatment are explored by using the city of Springfield's analytical archive to extrapolate information. The methods used in this work were performed using conventional water treatment equipment and include complexometric titration, flocculant formation using a coagulant, and GC-MS analyses.

E. Siech, V. Thurman, and A. Vummenthala College of Arts and Sciences, Maryville University of St. Louis. **ANTIOXIDANT ACTIVITY OF EUGENOL DERIVATIVES.** Eugenol, major constituent of cloves is a yellowish liquid. It is known to possess excellent antioxidant, antimicrobial and anesthetic activities. If consumed in excess, it forms a toxic quinone methide intermediate. Its toxicity is due to the oxidant and electrophilic behavior which causes oxidative stress and damages biological systems in the human body (Monks, T J, and D C Jones *et al.*). The objective of this study is to identify an alternate ester derivative of eugenol that possibly cannot form quinone methide, while maintaining its beneficial properties. We synthesized various ester derivatives of eugenol using Fisher esterification method and tested their antioxidant activity using DPPH scavenging method. Fluorinated ester derivatives of eugenol showed comparable antioxidant activity properties to that of Eugenol. However, dose dependent studies showed a decrease in the antioxidant activity of these derivatives.

L. Chi¹, M. Huang¹, A. Pfaff¹, R. E. Gerald II³, J. Huang², K. Woelk¹, ¹ Department of Chemistry, Missouri University of Science and Technology, ² Department of Electrical and Computer Engineering, Missouri University of Science and Technology, ³ American Inventor Institute. **OPTIMIZING NMR HARDWARE AND PULSE SEQUENCES WITH CAPPACK™ DEVICES.** CapPack™ devices are capillary-tube assemblies developed for the evaluation and optimization of NMR hardware, pulse sequences, and parameters. They subdivide the existing sample volume (e.g., 5-mm NMR tube) into smaller volumes that are isolated from each other (e.g., 360- μ m capillaries). Depending on the application, the individually glass-sealed capillaries may contain the same or different NMR-sensitive solutions. This contribution focuses on two different CapPack™ device geometries, which were assembled for two different performance tests: (1) a 10-capillary side-by-side gradient CapPack™ for monitoring the on- and off-resonance performance of adiabatic hyperbolic secant pulses and (2) a seven-capillary clustered T_1 CapPack™ for examining the T_1 robustness of the solvent suppression sequence EXCEPT.

N. Sanguantrakun. Department of Basic Sciences, St. Louis College of Pharmacy
ALTERNATIVE MILLISECOND-TIME SCALE PROTEIN HYDROGEN DEUTERIUM EXCHANGE METHODOLOGY VIA ONLINE TOP DOWN ANALYSIS

Hydrogen/deuterium exchange (HDX) is used in protein biophysics for folding dynamics, intermolecular interactions, epitope and other mapping. The typical procedures often involve HDX in solution (D₂O buffers), followed by pepsin digestion, and LC-ESI-MS analysis. Given the ability of native MS to introduce native or near-native protein ions in the gas phase, as indicated by their low charge state distributions and collision cross section corresponding to the folded form of the proteins, we are motivated to conduct HDX in the gas phase. In this work, we exposed both denatured and native electrospray droplets of ubiquitin and myoglobin to D₂O vapors in the source region of Bruker SolariX12T FTICR-MS. This is a millisecond-time-scale HDX compared to conventional-minutes-to-hours HDX in solution phase.

J. Mooney and D. Morrone, Department of Basic Sciences, St. Louis College of Pharmacy. **SYNTHESIS OF GLYCOSYLATED DERIVATIVES OF C5-CURCUMIN.** Curcumin, a naturally occurring pigment in turmeric (*Curcuma longa*), has been used for centuries in Ayurvedic South Asian traditional medicine to treat various pathologies resulting in inflammation. Interestingly, synthetic monocarbonyl C5-curcumin reportedly has superior anti-inflammatory and antibacterial properties to curcumin, presumably due to the latter's rapid metabolism *in vivo*. Additionally, C5-curcumin has been shown to possess anti-cancer effects. As an adjuvant, C5-curcumin is able to improve the effects of other chemotherapy agents by preventing the cancer cells from developing inherency to other agents. Various reports demonstrate that glycosylation of bioactive compounds can augment both selectivity for glucose-avid cancer cells and drug uptake across the blood-brain barrier. Accordingly, we have identified C5-curcumin as a candidate for glycosylation to enhance its pharmacotherapeutic effects. We present work on various synthetic approaches for O-conjugated analogs of C5-curcumin with various monosaccharides and disaccharides.

COMPUTER SCIENCE AND MATH ORAL PRESENTATIONS

C. McIlvaine, D. Hengel, R. Backus, M. Ward, and F. Wang, Information Technology, University of Missouri-Columbia. **THE DESIGN AND DEVELOPMENT OF A 3D VIRTUAL REALITY LAB TRAINING ENVIRONMENT.** Immersive virtual reality technology is changing the way institutions and organizations train students and employees. Studies have shown people learned faster and better in virtual reality environment as it allows greater interaction with the contents that are perceived as being really there. In addition, traditional lab training is often hampered by limited access to resources, high lab maintenance costs, and inability to deliver the content in a distance learning setting. We have developed 3D interactive models to train electrical engineering students at The University of Missouri-Columbia on how to operate a variety of machines in a cleanroom lab environment. By replicating a model that can be accessed remotely, repeatedly, and without

penalty, we have devised a safe, supplemental training method to prepare students and researchers to use this equipment.

K. Nilsson, E. Edens and Y. Liu Department of Actuarial Science, Data Science and Mathematics, Maryville University of St. Louis. **RUIN PROBABILITY IN THE PRESENCE OF RISK INVESTMENT AND INFLATION.** The solvency of insurance companies is a very important topic. There is abundance of previous research on this topic including the Sparre Anderson model, Compound-Poisson risk model with constant interest, and Compound-Poisson risk model with stochastic interest. One shortfall of these models is that they neglect to account for the effect of inflation on future claims. Our model addresses this shortfall by projecting future inflation rates and using these rates to inflate our future claims. We achieve this by using R to model future inflation rates, and then use a stochastic differential equation to model an insurance company's surplus over time. By making these additions to the current models we are able to more accurately predict insurance companies' ruin probability.

CONSERVATION SECTION ORAL PRESENTATION

S. Nikaido, S. Salah and J. Raveill, Department of Biology and Agriculture, University of Central Missouri. **DETERMINING RED, WHITE AND HYBRID MULBERRY (MORUS SPP.) USING RESTRICTION FRAGMENT LENGTH POLYMORPHISM (RFLP).** Asian (white) mulberry was introduced to North America almost four centuries ago. Since then, it has hybridized with the native (red) mulberry throughout its range in North America. Determining red, white or hybrid individuals can be challenging since few morphological characters definitely distinguish the three groups. Ribosomal RNA (rRNA) gene sequences have been used to distinguish species through comparison of internally transcribed spacer sequences. DNA was isolated from leaves of mulberry from seven states, two east and five west of the Mississippi River. Examination of the rRNA gene sequences revealed RFLPs, which resulted from single nucleotide polymorphisms (SNPs) and insertion-deletions (INDELs). Twenty-one SNPs and INDELs cluster mulberry rRNA sequences into two groups, where only one group matches Asian mulberry ITS sequences from GenBank. Some hybrid individuals produced both red and white mulberry sequences. Using RFLP, it is possible to determine if an individual mulberry is white, red or hybrid without sequencing DNA.

CONSERVATION SECTION POSTER PRESENTATION

S. Lanning ¹, W. Mabey ¹ and M. Combes ². ¹ Missouri Department of Conservation, Central Region Office and Conservation Research Center, ² Missouri Department of Conservation,

Agriculture Systems Field Station. **PROCAMBARUS ACUTUS (DECAPODA: CAMBARIDAE) INVASION OF A HEADWATER STREAM IN NORTH FORK OF THE SPRING RIVER DRAINAGE IN THE OSAGE PLAINS OF SOUTHWESTERN MISSOURI.** An adult Form I male specimen of the crayfish species *Procambarus acutus* (White River crayfish) was found in an unnamed headwater tributary in North Fork of the Spring River drainage within the Osage Plains of southwestern Missouri during 2016. Sampling techniques and taxonomy used in collection and identification of the specimen are provided, and habitat characteristics of the reach where *P. acutus* was found to occur are presented. *Procambarus acutus* is regarded as an invasive species within drainages of most ecological sections of Missouri, and extensive sampling efforts combined with detailed studies of biotic communities, physical habitat, and water quality of sites invaded by *P. acutus* are warranted to assess status of this species with regard to affects to freshwater organisms and systems where it is invasive.

GEOGRAPHY SECTION ORAL PRESENTATIONS

D. Fox¹, S. Hageman¹, K. Seramur², and B. Hoffman.¹ ¹Department of Natural and Physical Science, Park University. ²Seramur and Associates, PC. **USE OF GEOSPATIAL TECHNOLOGIES TO STUDY THE NECROGEOGRAPHY OF THE OLD PARKVILLE, MISSOURI, CEMETERY.** Necrogeography involves the study of the spaces associated with death, dying, and the dead. Over the past ten years, several faculty and staff at Park University in Parkville, Missouri, have been engaged in a variety of interdisciplinary research projects in support of the Old Parkville Cemetery, which consists of 438 marked graves with 90% dating to a 100-year period between 1849 and 1949. However, the cemetery also consists of sizeable unmarked areas that have been presumed to contain interments that were either never marked or the markers have been lost due to various factors. The use of ground penetrating radar (GPR) technology has been employed in several similar cases with varying degrees of success. In May 2017, GPR was utilized to attempt to identify disturbed soil associated with excavated and backfilled grave shafts. Although GPR does not normally work well in clayey soils due to attenuation of the radar energy, this survey produced exceptional results as 178 areas of disturbed soils (unmarked graves) were identified in significant contrast to the undisturbed clay soil. These sites were marked with a magnetic nail and GPS coordinates recorded in order to facilitate mapping and further spatial analysis with GIS. This presentation will include a discussion of the methodologies and results and their potential contributions for further interpretation and historic preservation of this cultural landscape.

D. Quintanilla. Department of Geography, University of Missouri – Columbia. **CONTENT ANALYSIS OF AL QAEDA OF THE ARABIAN PENINSULA'S *INSPIRE* MAGAZINE.** Al Qaeda of the Arabian Peninsula has been producing an online jihadist magazine for years.

The magazine called *Inspire* has gained a large readership by highlighting and promoting extremist Islamic ideals. By utilizing a content analysis approach, each issue of *Inspire* is reviewed and an overall methodology is discovered. By highlighting, praising, and glorifying lone perpetrators, AQAP's *Inspire* magazine seeks to influence individuals to attack infrastructures, places of worship, places of recreation, and places of commerce within western nations to achieve their political goals.

GEOGRAPHY SECTION POSTER PRESENTATION

K. Leach and D.M. Drake. Department of History and Geography, Missouri Western State University. **IMPLEMENTING TACTICAL URBANISM THROUGH GOVERNMENT-COMMUNITY PARTNERSHIPS.** Temporary, low-cost urban projects are growing in popularity across the United States. Known as tactical urbanism, these projects use tactics to transform or improve urban environments. Tactical urbanism employs small-scale urban design interventions to create large-scale impacts. What is unique about tactical urbanism is that it usually develops from the bottom up rather than top down, which helps individuals feel more invested and connected to their community. These small-scale interventions help create a sense of place within urban landscapes and turn community members into stakeholders. Tactical urbanism can also be utilized by community officials with the same effects. The Metropolitan Planning Office (MPO) in St. Joseph, Missouri, is creating a mobile lab for implementing tactical urbanisms. The lab supports the creation of temporary traffic-calming demonstrations within the area serviced by the MPO and Mo-Kan Regional Council, a regional planning and economic development organization also located in St. Joseph. The lab is available for use by organizations within the St. Joseph metropolitan area, but also to smaller, more rural communities within the six counties in the Mo-Kan service area. This poster will focus on the way in which bottom-up projects can be mainstreamed through official adaptation of tactical urbanism methods to still allow for creation of a sense of place and community investment.

GEOLOGY & GEOSCIENCE SECTION ORAL PRESENTATIONS

B. Benz, G. Michelfelder, J. Quick, and T. Sundell, Geology, Geography, and Planning, Missouri State University. **U-Pb ZIRCON GEOCHRONOLOGY OF RHYOLITE TUFFS FROM THE BELL TOP FORMATION, SOUTHWEST NEW MEXICO.** The Mogollon-Datil Volcanic Field (MDVF) in Southern New Mexico has many exposed ignimbrites of Eocene-Oligocene age. During this time, subduction of the Farallon Plate beneath the North American plate transitioned to extension of the Rio Grande Rift, leading to an ignimbrite flare-up in southern New Mexico. The caldera forming eruptions produced numerous ash flow tuffs

including the Bell Top Formation tuffs, which are divided into four members. The Bell Top Tuffs have been dated by $^{40}\text{Ar}/^{39}\text{Ar}$ with ages ranging from 31.4 Ma to 42.1 Ma. Here we present new thin section petrography and major and trace element geochemistry from 16 samples representing Tuff 2-4 and compare these data with samples from the Kneeling Nun Tuff (Bell Top 5) and similar age ignimbrites from southern New Mexico. We also are presenting new radiometric age dating by using U-Pb dating in zircons that were extracted from each of the Bell Top tuffs.

C. O'Dowd and G. Michelfelder, Geography, Geology, and Planning, Missouri State University. **PETROLOGY AND GEOCHEMISTRY OF THE BEARWALLOW MOUNTAIN ANDESITE, MOGOLLON –DATIL VOLCANIC FIELD, NEW MEXICO.** The Mogollon-Datil volcanic field (MDVF) in southern New Mexico, is the result of punctuated volcanism and the transition between arc and rift magmatism. This project addresses the Bearwallow Mountain Andesite (BWA), to understand the petrogenesis of intermediate composition lava flows erupted from the MDVF and understand the petrologic conditions which allowed the transition between rhyolite dominated volcanism to intermediate composition volcanism. Studies on MDVF intermediate composition rocks are lacking and have yet to be integrated into the volcanic history of the MDVF. This study will review volcanism in western North America and test the hypothesis that basaltic magma rose through deep conduits, enabled by crustal extension, to produce the abrupt change in volcanic lithology from ignimbrites to basaltic andesites. We will test this hypothesis by determining whole-rock and mineral elemental compositions of BWA lavas.

S. K. Nandi, K. Mickus and M. McKay, Department of Geography, Geology, and Planning, Missouri State University, Springfield. **CRUSTAL ARCHITECTURE OF ACCRETED TERRANE BOUNDARY IN WESTERN IDAHO, EASTERNMOST BLUE MOUNTAINS.** The Salmon River suture zone (SRSZ) in western Idaho (western USA) represents deformation originating from Mesozoic accretion of volcanic island arc terranes to Laurentia. The near vertical boundary of the accretionary orogen to the Precambrian North America is represented by the transpressional western Idaho shear zone (WISZ). The temporal and structural relationship of the SRSZ and WISZ is controversial and still debated. Four oceanic metamorphic terranes: Wallowa, Olds ferry, Baker, and Izee cross Oregon to Idaho after going through overlapping deformation with each other and going through low-grade metamorphism and ductile deformation during accretionary amalgamation to North America. This study investigates this complex accretionary boundary using gravity and magnetic analysis of the SRSZ and WISZ. The 2.5-D crustal scale gravity models through SRSZ and WISZ help constrain the subsurface relationship of the SRSZ with WISZ and present a newer proposed extent of the WISZ towards the west.

A. McClanahan and M. Gutierrez, Geospatial Science in Geography, Geology, and Planning, Missouri State University. **EFFECTS OF HISTORIC MINING ACTIVITIES IN THE TRI-STATE MINING DISTRICT.** The Tri-State Mining District (TSMD) was located in southwestern Missouri, southeastern Kansas, and northeastern Oklahoma and encompassed over 2,500 square miles. During the district's peak production period, the TSMD was one of the world's largest producers of lead and zinc. Commercial mining of lead and zinc ores began in the district around the 1850s. The district continued to grow until the 1920s when the mining activities slowly began to cease due to depletion of metal ores and competition from imports. Unfortunately, the consequences of the mining industry have come at a cost to the TSMD. Abandoned mining sites have continued to cause lead and zinc contamination in the soils, sediments, and streams throughout the district. I plan on documenting historic mining sites in Missouri to locate possible sites that remain contaminated. Additionally, I am in the progress of plotting concentrations of lead and zinc that may have remained scattered throughout the district regardless of remediation episodes of the recent past. I will use GIS, aerial photography, and available data from theses and reports to verify the success of remediation at these sites and explore possible future remediation options within these sites.

D. Jones, Division of Physical and Life Sciences, Geoscience, Chadron State College. **APPLICATIONS OF OPEN-SOURCE PHOTOGRAMMETRY TOOLS TOWARD GEOLOGIC ANALYSIS OF SOUTHWESTERN MISSOURI – OZARK OUTCROPS.** Geology is three-dimensional in nature, but traditional mapping methods are two-dimensional, involving hand-drawn information on flat base maps. Photogrammetry, the science and art of creating accurate and reliable models of a 3-D scene from 2-D data using two or more photographs, can be used for modelling geologic features, improving knowledge of geologic processes, designing mitigation plans for mass wasting events, sourcing and controlling erosion, and for monitoring resources. The technology is advancing rapidly, with new methods (software and hardware) for acquiring and processing 3D geological data. Southwestern Missouri's "hills and hollers" landscape provides many geologically-interesting road cuts available for testing photogrammetric collection of geologic data. The stratigraphy, structural geology, and karst features have not yet been widely analyzed using photogrammetry in this area. My work utilized two open-source solutions for photogrammetry—AgiSoft and Autodesk ReCap—in real-world outcrop situations. Focus on close-range documentation of high-contrast features in sedimentary rocks reveals that this method can, indeed, be effective in collecting outcrop data. The software used in this study was found to be practical in most situations, however, was not without flaws. Reliability of these programs was a notable limitation, as well as limited spatial resolution and some image/model distortions. Photogrammetry holds great promise for geological data collection. The use of currently-available open-source solutions, however, requires technological improvement in order to create reliable, precise, and accurate results.

C. Dunham and D. Schmidt, Department of Environmental Science and Geology, Westminster College. **THE “THUNDER BEASTS” OF THE EOCENE: ESTIMATING AGE-AT-DEATH, SEX, DIET, AND DEFORMITIES OF TWO FOSSILIZED BRONTOTHERE MANDIBLES.** Brontotheres are large ungulates that lived approximately thirty-five million years ago. These giant herbivores are best known for the large, bifurcated horns that projected from their snouts. In this study, we examine two fossilized brontothere mandibles found by Westminster College field crews: BGNG-6-17-WC12 excavated from South Dakota in 2012 and TS-1-7A-WC17 excavated from Nebraska in 2015. The goal of this study is to build biological profiles on the two specimens, which include determining taxonomy; estimating sex, age-at-death, and diet; and determining possible causes for the visible deformation of specimen BGNG-6-17-WC12. Based on the location in which the two specimens were found, we know they are *Megacerops* sp.. Data on brontothere size, as well as dental eruption and dental attrition, suggests that 1) BGNG-6-17-WC12 is a female between twenty-five and thirty years of age and 2) TS-1-7A-WC17 is male between two and four years old. Data taken from scanning electron microscopy (SEM) of the two specimens supports data from literature on brontothere diet by showing that the specimens belonged to browsing individuals. Specimen BGNG-6-17-WC12 has a visible deformation, curving to the right along the horizontal axis of the mandible, running anterior-posteriorly. This deformation could have occurred pre- or post-fossilization; however, the presence of a malocclusion suggests that the deformation occurred pre-fossilization.

K. Hirst and D. Schmidt, Department of Environmental Science, Geology, Westminster College. **TWO EOCENE ENTELODONT MANDIBLES: LIFE HISTORIES AND PRELIMINARY ISOTOPIC ANALYSIS.** Two entelodont mandibles (TS-1-107-WC15 and TS-1-7-WC16) were collected from late Eocene strata in the Oglala National Grasslands of Nebraska. To identify taxon, the mandibles were prepared and repaired so that qualitative and quantitative analysis could be tested. Morphologically, entelodont mandibles exhibit significant variation. Furthermore, entelodonts are a diverse group making the description and identification of individual species difficult. In order to learn more about taxonomic relationships, the two mandibles were compared to museum specimens and known taxa recorded in the literature. TS-1-107-WC15 suffered multiple fractures through the bone and is missing several teeth but did manage to retain its first molar and canines. TS-1-7-WC16 was preserved relatively well, with most of its teeth and some of the ramus intact but did not retain its canines. To help with identification, length and width measurements of the fossils teeth were taken. This data was then compared to other specimens to look for patterns. A quantitative analysis of M/1 was compared between TS-1-107-WC15 and TS-1-7-WC16 and the three most common species (*Archaeotherium mortoni*, *Archaeotherium wanlessi*, and *Archaeotherium latindens*) recorded from the White River Group. When comparing the dimensions between length vs. width of M/1 a linear relationship between these three species is observed. The linear relationship has some overlap between the species therefore a t-interval test was used to create confidence intervals in

which specimens can be identified with 95% confidence should they land in one of the established intervals. TS-1-107-WC15 and TS-1-7-WC16 measurements of M/1 landed between the intervals a *A. mortoni* and *A. wanlessi*. According to our quantitative analysis of M/1, and qualitative characteristics, we propose TS-1-107-WC15 and TS-1-7-WC16 belong to the species *Archaeotherium mortoni*.

S. Young, R. Roth, D. Schmidt, and C. Halsey, Department of Environmental Science, Geology, Westminster College. **GROUND AND AERIAL SURVEY OF FOSSIL EOCENE BONE BED IN OGLALA NATIONAL GRASSLANDS, NEBRASKA.** In the summer of 2016, a preliminary aerial and ground survey of an Eocene bone bed was conducted in the Oglala National Grasslands, Nebraska. Concentrated cranial and post-cranial elements are associated with channel sandstones and consist of a variety of mammalian taxa. A surveyed 91 m² grid was established and all surface specimens were mapped and recovered for each meter square. Individual elements from each square were identified and counted. Squares with greatest concentrations overlay the ancient stream channel, other high concentrations are from squares that overly natural drainages. Approximately 3009 fossil specimens were recovered and counted from the grid where 882 (29%) were those that were identifiable. Identifiable specimens within the grid consist of 73% small-sized, 15% medium-sized, 10% large-sized animals, and 1% plant material. We estimate that approximately 35 small-sized (cat-sized and smaller), 5 medium-sized (larger than a cat to deer-sized), and 2 large-sized (larger than a deer) animals are represented within the area of the grid. At least eight taxa are mammalian, but also include bird, crocodile, tortoise, amphibian, and fish. Plant varieties include petrified wood and two different seed types. A hand-drawn map of the grid and bone-bed was constructed to show areas of high bone density and orientation. This data will then be compared to aerial images containing spectral data (RGB, IR, and UV) from drones. Using MATLAB programming software, the spectral signature of bone phosphate was isolated, and used to locate potential zones within our designated field area where samples may be exposed. The specific spectral signature of bone phosphate was compared to the spectral signatures of the surrounding environment in order to designate regions in which bone material is most likely to be found. This was done using MATLAB to analyze the spectral data of every pixel of the aerial images and convert the data into a plot graph that indicates where spectral signatures suggest fossil specimens may be found. If successful, drone technology could provide a more efficient technique for prospecting of fossil specimens within the White River Group.

GEOLOGY & GEOSCIENCE SECTION POSTER PRESENTATIONS

K. Wu, L. Ferreira, D. Schmidt and C. Halsey. Departments of Environmental Science and Chemistry, Westminster College. **STABLE ISOTOPIC ANALYSIS OF FOSSIL ENAMEL: PRELIMINARY INVESTIGATION OF EOCENE TAXA.** Macro and microvertebrate fossils were collected from the late Eocene in the Oglala National Grasslands of Nebraska. Teeth were separated from sediment, identified, and processed for stable isotopic analysis. Using oxygen isotopic ratios from bone phosphate, this project will compare mammalian taxa and make inferences about environmental conditions. According to petrographic analysis of fossil bone collected from the same area, no diagenesis had occurred. Therefore, we assume the original isotopic composition of phosphate in teeth is preserved and allows us to evaluate parameters like the isotopic composition of meteoric water and paleotemperature. Preliminary isotopic data for three taxa (*Megacerops*, *Mesohippus*, and *Archaeotherium*) show $\delta^{18}\text{O}$ values (reported relative to SMOW) that range between +15.8 and +19.0‰, and average +17.7‰. *Megacerops*, *Mesohippus*, and *Archaeotherium* average 18.3, 18.8, and 16.8‰, respectively. *Megacerops* has the least variation of $\delta^{18}\text{O}$ values with a standard deviation (σ) of 0.4, followed by *Archaeotherium* ($\sigma = 0.9$) and *Mesohippus* ($\sigma = 1.4$). These variations could represent differences in diet and stratigraphic position. *Megacerops* and *Mesohippus* are herbivorous grazers, whereas *Archaeotherium* is an omnivore. Furthermore, *Archaeotherium* specimens were collected from different stratigraphic intervals and likely represent temporal changes in isotopic compositions of variable environmental conditions. Little is known about the isotopic composition of fossil mammals from the late Eocene of northwest Nebraska. Thus, the current study, if successful, will attempt to establish the foundations of isotopic compositions from bone phosphate of late Eocene taxa and interpret paleoenvironmental conditions.

PHYSICS & ENGINEERING SECTION ORAL PRESENTATIONS

M. Trueblood and A. Miller, Center of Excellence for Aerospace Particulate Emission Reduction Research, Missouri University of Science & Technology. **PERFORMANCE OF AN ELECTROSPRAY AEROSOL GENERATOR.** Aerosol particles with diameters in the 10 nm range and above are very useful for calibrating modern aerosol equipment. Knowledge of the exact particle diameter can often be quite necessary. Commercially available particles of polystyrene latex (PSL) with diameters in the range 60 nm suspended in water/surfactant are available, but somewhat expensive. These particles are aerosolized using a nebulizer, which sprays out water droplets with typical diameters of 4500 nm. Ideally each 4500 nm droplet would contain one PSL and pure water. However, even very good distilled water contains much unknown compounds, meaning that when the water droplet evaporates, one is left with a PSL

particle that is larger than the manufacturer's nominal size. The electrospray aerosol generator (ELSPRAY) produces water droplets in the range of 150 nm, meaning that there is very little junk on the final PSL particle. A homemade ELSPRAY has been designed, built and tested. When spraying a weak solution of NaCl, it produces particles in the 10 nm range with concentrations of approximately $7E+05$ p/cc. The effects of changing the various operating parameters, such as carrier gas, high voltage, radioactive charging, etc. have been investigated.

M. Trueblood, Center of Excellence for Aerospace Particulate Emission Reduction Research, Missouri University of Science & Technology. **HYBRID AEROSOLS OF INSOLUBLE POLYSTYRENE LATEX AND AMMONIUM SULFATE.** Although an aerosol particle generated by some source and emitted into the atmosphere may be almost a single chemical species when introduced into the environment, it will soon coagulate with other particles from other sources and become a hybrid. Thus, these particles will contain some soluble and some insoluble material. The soluble mass fraction (SMF) will determine the probability that the particle will nucleate water and precipitate out as a rain drop. Many researchers have used a hygroscopic tandem differential mobility analyzer (HT-DMA) in the last 20 years to determine the SMF of ambient aerosols in many different air masses all over the world. Laboratory generated hybrid aerosols of ammonium sulfate and polystyrene latex (PSL) particles would be a very useful tool in calibrating an HT-DMA. We report progress in formulating such hybrid aerosols and their measured SMF as compared to their theoretical SMF.

M. Trueblood, Center of Excellence for Aerospace Particulate Matter Reduction Research, Missouri University of Science & Technology. **CALIBRATION OF A CONDENSATION PARTICLE COUNTER USING AN ALTERNATING GRADIENT CLOUD CHAMBER AND LABVIEW.** Particles as small as 3 nanometers and larger are of interest in current research into the effluents of modern gas turbine engines used in aircraft. The adverse health effects and effects on climate are of interest. These particles are released into the environment around airports and at cruise altitude of 36,000 feet. The presence of these particles is typically measured with a condensation particle counter. This device draws in a small flow of the particle laden gas and condenses butanol onto the particles making each one large enough to detect optically. The smaller the particle, the more difficult it is to condense the butanol onto them. The performance of these CPCs is determined by an alternating gradient cloud chamber (ALGR). For accurate measurements, all the gas flows in the ALGR must be held quite stable. A LabVIEW program was developed to keep the flows constant allowing reliable data to be taken. Supported by Lasea Aerosol Services, Ltd.

G. Nail, Department of Engineering, The University of Tennessee at Martin, and R. Kopsky, Jr., St. Louis District, U.S. Army Corps of Engineers. **WAPPAPELLO DAM SPILLWAY OVERTOPPING EVENT OF 2011.** The one-dimensional HEC-RAS multi-purpose open channel flow modeling software was successfully used, with ArcMap and HEC-GeoRAS, to

simulate flow over the Wappapello Dam limited-use Ogee spillway (Wappapello, Missouri). Initial computational hydraulic modeling results predicted a lake elevation of 132.9 m (405.0 ft) [NAVD 1988] would be required for the resulting floodwaters overtopping the spillway to reach the nearby Wappapello Lake Management Office. An intense rainfall event during 2011 led to the spillway being overtopped for the first time since 1945. Spillway performance during the 2011 event was analyzed afterwards. Results indicated that the spillway crest was not submerged by backwater. A technique was employed which successfully estimated the design energy head of 7.160 m (23.49 ft) for the spillway. Hydraulic modeling developed after the 2011 event incorporated this estimated design energy head, allowing the spillway discharge coefficient to vary with discharge in the course of an unsteady modeling run. Results indicated that, while the spillway did perform as designed, the performance is limited by the shallow approach depth.

K. K. Gonzalez and J. P. Sundararajan, Department of Chemical and Physical Sciences, Missouri Southern State University. **EXPERIMENTAL INVESTIGATION OF DIRT FILLED PLASTIC BOTTLES VS SAND FILLED PLASTIC BOTTLES AS SUSTAINABLE MATERIAL FOR BUILDING CONSTRUCTION.** Every year millions of people lose homes through natural disaster or armed conflict. Safe, inexpensive homes can serve as an optimum alternative for places that are highly prone to such calamities. This project will help resolve the crisis by building houses reusing trash, namely two-liter plastic bottles filled with dirt. It will also help to reduce some of the waste that is plaguing the planet by putting it to a constructive use. The variables tested during this project were the strength of the bottles as bricks using dirt as well as the durability of the wall against the force of different bullets fired from a firearm. Sand filled two-liter plastic bottles will be studied simultaneously and the results will be compared. The bullet sizes tested for this project were .40 caliber, .22 caliber and a 9-millimeter bullet. Using the amount of energy read by an infrared thermometer we determined the velocity of the bullet as it hit the wall and thus could determine the force of the projectile at the moment of impact. This enabled us to easily determine how deep the bullet penetrated the wall, without risking further damage to the wall. We tested the same bullets against both the walls constructed from dirt filled and sand filled plastic bottles.

J. P. Sundararajan, Department of Chemical and Physical Sciences, Missouri Southern State University. **EXPERIMENTAL AND SIMULATIONS STUDIES ON TRANSIENT PHOTOCONDUCTIVITY IN GALLIUM NITRIDE NANOWIRES.** Photoconducting and time dependent photoexcitation properties of GaN nanowires before and after Au nanoparticle decoration have been investigated upon exposure to lasers of three different wavelength. The nanowires exhibited sensitivity to wavelength with higher excitation at shorter wavelengths irrespective of its diameter. Observation of steady-state transient photoconductivity in GaN nanowires will be reported upon excitation with laser source at ambient air conditions. The decay times for shallow and deep trapping levels will be reported for different nanowire diameters studied. Here we present our analysis on the transient photoconductivity in GaN nanowires and

discuss the role of Au nanoparticles in increasing the reset time of the GaN nanowire photodetector. Our results prove vital in improving the performance of the light sensor and represent a significant step towards the application of nanowire based opto-electronic devices.

PHYSICS & ENGINEERING SECTION POSTER PRESENTATIONS

L. Meyer, Webster University, **MAGNETORECEPTION IN WESTERN HARVESTER ANTS.** The Western harvester ant (*Pogonomyrmex occidentalis*) is a species of ants commonly found in western parts of United States, typically in grasslands and deserts of altitude 1,900 meters or below. Recent experiments have shown evidence that these species may be using earth's magnetic field for homing or migration. Studies of this ant show traces of ferromagnetic compounds found in the head, antenna or abdomen areas, suggesting magnetoreception. An experimental setup was constructed to study possible magnetoreception of western harvester ants. The path taken by foraging ants from home to food source was observed and recorded under different conditions. An intricate system of tunnels was built to channel the foraging paths and photodetectors were used to measure foraging activity along these channels. Helmholtz coils were used to counter earth's magnetic field and also to apply desired artificial magnetic fields. Care was taken to eliminate other directional cue such as visual and pheromone as much as possible. Multiple experiments were conducted and foraging activity was recorded and analyzed. The experimental parameters were the presence (and absence) of magnetic field, the direction of the magnetic field and the magnetic field's strength. Initial results indicate a significant response to magnetic fields in harvester ants.

J. McDonald and D. Marsh, Department of Chemical and Physical Sciences, Missouri Southern State University. **ASTRONOMICAL OBSERVATIONS USING A LOW COST, RADIO TELESCOPE.** An affordable and functional radio telescope may be constructed from off the shelf components. This radio telescope may be used in an undergraduate physics teaching laboratory or for demonstrations in undergraduate physics or astronomy classes. We will present the materials selection and engineering involved in building the telescope from commercial off the shelf equipment, and present examples of the data obtained from the telescope.

A. Roberts¹, Gaston Dana², and A. Sithole³. ¹Indiana Craniofacial Center, USA; Indiana University School of Dentistry, USA; College of Medicine and Veterinary Medicine, University of Edinburgh, UK. ²Johnson Memorial Hospital, Indiana, USA. ³Missouri Western State University. **TCD MEASUREMENTS OF BLOOD VELOCITIES IN CEREBRAL ARTERIES UNDER NSS VAGAL NERVE STIMULATION.** Electrical stimulation for acute pain treatment is a new field that requires research. Transcranial Doppler (TCD) measurements of blood velocities following NSS vagal nerve stimulation indicated a slight increase in the MCA. No significant changes were observed in the PCA flow.

SCIENCE EDUCATION ORAL PRESENTATIONS

E. Hobbs and A. Cherry, Global PRiSE, Curriculum and Instruction, Texas Tech University. **USE OF ADVANCED PLACEMENT SCORE SUBMISSIONS TO DETERMINE INTEREST IN HISTORICALLY BLACK COLLEGES AND UNIVERSITIES PRE AND POST MICHAEL BROWN.** This study explores high school student interest in Historically Black Colleges and Universities (HBCU'S) before and after the death of Michael Brown. The University of Missouri-Columbia and other land grant institutions recently faced protests regarding their treatment of minority students, which may have impacted students' perception and desire to attend. Using the metric of the number of Advanced Placement test scores submitted to selected universities, several statistical tests will be used to see if there is a significant difference in submission numbers pre and post Mr. Brown's death. Implications and further studies will be addressed.

E. Schmoll, E. Nischwitz, T. Walker, and J. Smith, Department of Biomedical Sciences, Missouri State University. **FROM STUDENT TO TEACHER - FULL CIRCLE LEARNING.** Giving undergraduate students a hands-on opportunity to conduct original research projects during their class laboratories requires the true application and understanding of introductory course material. The undergraduates are able to begin to understand and apply the research process, as well as practice autonomy and ownership over their own individual project. To allow this original research to be conducted in the classroom, however, a great deal of preparation and work must occur behind the scenes. Undergraduate Learning Assistants (ULAs) in the Biomedical Sciences department have been instituted using the BMS490: Peer Instruction in the Biomedical Sciences course. Students in this course learn different pedagogical models for teaching and learning, and work to develop their own unique teaching styles and philosophy statements. This experience allows students to more completely understand the aspects of course and lab preparation, as well as demands of lecture and exam development. This Peer Instructor experience not only benefits the students in the BMS 490 course, but also the undergraduates who are provided with multiple resources and perspectives for learning and assistance in the lab. As a result, this course trains a diverse group of students within the department to be competent instructors and teaching assistants, all while facilitating the unique and invaluable experience of original undergraduate research in the classroom.

G. Saha, Department of Education, Lincoln University of Missouri, Jefferson City, MO 65102. **IDENTIFYING AND OVERCOMING PRE-SERVICE MISCONCEPTIONS OF SCIENCE.** Science misconceptions pose a serious bottleneck in teaching and learning science with understanding in particular when a teacher naively perpetuates this unscientific view among his/her students. Although there is a large body of research on the common existence and

implications of science misconceptions among science students, very few studies focused on preservice teachers' misconceptions of science. This study used two sets of formative probes to identify 47 preservice teachers' science misconceptions from a Mid Missouri University and compared with those of 34 other community members who never took any college-level science course in their life. Although preservice teachers demonstrated a fewer number of misconceptions than those of others, both samples displayed equally egregious misconceptions about a very basic science concept. In particular, both groups provided a pattern of unscientific reasonings to support their explanation in claim, evidence & reasoning (CER) process. Implications of these findings and strategies for overcoming science misconceptions of these samples and in teaching at large are discussed.

SCIENCE EDUCATION POSTER PRESENTATIONS

J. Kaiser and A. Barry, Division of Science Education, Missouri Southern State University.
ACADEMIC AND PSYCHOSOCIAL IMPACT OF CADAVER BASED LEARNING IN UNDERGRADUATE SCHOOLS. The use of cadavers in undergraduate anatomy labs helps to better prepare students for future graduate programs by giving an early in-depth exposure to anatomy that mirrors medical school curriculum. Missouri Southern State University provides not only the observation of cadavers in anatomy labs, but also the opportunity for pre-professional students to dissect the cadavers. This hands on Advanced Human Dissection class takes different areas of science and uses them to approach the cadavers as patients. MRI scans, genetic analysis, and antibody staining on histology samples collected from the cadaver are all used to find pathology. The use of cadavers in undergraduate programs also increases the students desire to be a whole-body donor and expands their gratitude towards those who are willing to donate their body to science.

N. D. Groves and D. P. Waters, Department of Basic Sciences, St. Louis College of Pharmacy.
STUDY METHOD COMPARISON FOR INTRODUCTORY PHYSICS EXAMS. Students entering an introductory college physics course are unsure of how to study for the exams. Many students aren't familiar with physics before entering college. We're looking at the ways that students study for exams helps or hurts their exam grades. With this project, we want to be able to provide helpful tips on how best to study for exams in Physics 1, an introductory physics course at St. Louis College of Pharmacy. We gathered data from students who took the physics 1 exams by asking questions pertaining to how much time they studied and what materials they used to study. Some of the materials that we asked about were reading the textbook, looking at class slides, and using the old exam. Students reported their results on a Moodle questionnaire. From our analysis, we have found that some study tools proved to be more beneficial than others, as well as some study methods that had a negative effect on exam grades. By determining which

of these study methods are most helpful, we hope to help future physics students determine how best to study for exams.

S. Boschert, C. L. Brown, and R. J. Ulbricht. Department of Biomedical Sciences, Missouri State University. **CRISPR/CAS9 IN YEAST AS A TOOL FOR TEACHING AND REINFORCING MOLECULAR BIOLOGY CONCEPTS TO UNDERGRADUATES.**

Undergraduate students in an upper-level molecular biology laboratory class used their training in biochemistry, cell biology and molecular biology to design and perform CRISPR/Cas9 genome editing on yeast. After an introduction to DNA repair and CRISPR/Cas9 in the lecture, the students took on the task to design an experiment using Cas9 to generate auxotrophic yeast mutants. They used readily available bioinformatics databases to retrieve yeast genome sequence and design CRISPR-associated sgRNA to target the gene of interest. They cloned genes for the sgRNAs into a commercially available CRISPR/Cas9 vector, and then transformed it into yeast along with a template for homology-directed repair. Next, the students phenotyped and genotyped the potential auxotrophic mutants generated by CRISPR/Cas9. As the penultimate laboratory course in the program, this lab introduced new skills, provided opportunity to apply concepts discussed in lecture, and reinforced skills and knowledge from previous courses. A survey, exam and formal lab report assessed positive outcomes in learning and affect. The reagents in this laboratory course are readily available and financially feasible for undergraduate laboratory courses, and the protocols/emphasis are adaptable to diverse program goals. Overall, incorporating the tractable, yet modern gene editing technology into undergraduate laboratory courses is both realistic and favorable to learning.

M. G. Tang and D. P. Waters, Department of Basic Sciences, St. Louis College of Pharmacy. **HOW PERCEPTIONS OF ACTIVE LEARNING STRATEGIES AFFECTS CLASS PERFORMANCE.** Active Learning has been shown to be a more helpful tool in teaching physics than lecture alone¹. Unfortunately, students don't always perceive active learning strategies as providing the benefit, as shown both in the literature² as well as in this study. We wanted to find out not only how students perceived using clicker questions as an active learning strategy and how that affected performance on class assessments. Students filled out a Moodle questionnaire halfway through the first semester of an introductory physics course at the St. Louis College of Pharmacy as well as a follow up questionnaire after changes were implemented to incorporate more lecture. We find that students find clicker and lecture more enjoyable but feel that lecture is slightly more helpful than clickers, which is why the change was implemented. After the amount of lecture was increased, students who wanted more time spent on clickers saw a decrease in their exam scores. Also, an increase in exam scores was seen for those who wanted more time spent on lecture when class time included more lecture. These discoveries can help us understand how perceptions can affect how well students learn using active learning strategies.

J. Kibirige, A. Sithole, and K. Harris, Missouri Western State University. **HOW SMART ARE NEXT GENERATION SCIENCE STANDARDS?** Currently, many States are increasingly adopting Next Generation Science Standards (NGSS). However, it is not clear whether the objectives are Specific, Measurable, Attainable, Realistic, and Timely (SMART) enough. The purpose of this study, therefore, was to assess whether the NGSS can suitably be applied to all schools at all levels. Data were collected from 214, K-12 school teachers in 17 states. Our results showed that 50% of the teachers were either unaware of NGSS or were not sufficiently equipped to merge them with their class curricula. This study presents and examines the teachers' concerns, views and suggestions and proposes possible courses of action.

SOCIAL AND BEHAVIORAL SCIENCES SECTION ORAL PRESENTATIONS

J. Martin, T. Spencer, and M. Aruguete, Department of Social and Behavioral Sciences, Lincoln University. **ATTITUDES TOWARDS TRANSGENDER PEOPLE.** This study examines whether a simple classroom intervention can alter beliefs about transgender people. We randomly assigned four classes to experimental and control groups. The experimental group was guided through a written, empathetic intervention encouraging them to relate their own experiences to those of transgender people. The control group also completed a written assignment about a non-social topic (recycling). After the manipulation, both groups were asked demographic questions (age, gender, and socioeconomic status-SES), their opinions about transgender people, and their degree of religiosity. Women and low-SES participants showed more positive attitudes toward transgenderism than men or higher-SES participants. The empathetic intervention improved attitudes towards transgender people low SES participants, but not in higher SES participants. Religiosity was weakly associated with more negative attitudes toward transgender people. Further research should examine interventions that target men and high SES populations.

A.A. Allen, T.A Creer, and V.R. Jackson. Department of Social and Behavioral Sciences, Lincoln University. **HOW JEZEBEL AND SAPHIRE STEREOTYPES OF BLACK WOMEN AFFECT COLLEGE STUDENTS.** We tested how exposures to stereotypes of Black women affect college student attitudes. The Jezebel is a stereotype of the seductive and sexual Black woman. The Sapphire is a stereotype of the angry, bitter, Black woman. College students were given a photograph along with a brief description of a woman portraying the one of the two stereotypes. A third group was not exposed to a stereotype. Students then answered a survey measuring colorism, ethnic esteem, identification with stereotypes, anxiety, depression, and ethnic identity. Based on previous research, people exposed to the Jezebel and Sapphire stereotype should be negatively affected compared to people who were not exposed to a

stereotype. Our results will suggest that viewing media that portrays these stereotypes will negatively affect people.

M. J. Brewer, S.A. Tackett, and E. C. Waller. Department of Social and Behavioral Sciences, Lincoln University. **YOUR SHOULDERS OFFEND ME: PERCEPTIONS OF WOMEN BASED ON THEIR CLOTHING.** We tested how women's dress affected how people view women and how they judge a case of mild sexual harassment. Lincoln University students and faculty were randomly assigned to one of four groups. The groups differed by which photo and paragraph scenario they received. We gave them each a photo of a woman in either provocative or conservative clothing and they received a scenario describing a mild sexual harassment situation with either a high- or low-income male. They were then asked to complete a questionnaire about the woman's character (Compassion, Assertiveness, Independence, Honesty and Intellect), and who was responsible for the sexual harassment scenario. We predict that women dressed more provocatively will be rated poorer in character and will be held more responsible for the sexual harassment than the conservatively dressed woman. We also predict that women will take more of the blame in the scenario with a high-income male rather than the scenario with a low-income male and that it is more likely to be viewed as sexual harassment with the conservatively dressed woman and the low-income male. This study will help people realize that women should not be defined by the clothes they wear. Further research might study how biases towards women in the workplace can be recognized and overcome.

C. Kerr, E. Williams, and S. Carroll. Department of Social and Behavioral Sciences, Lincoln University. **ONLINE DATING: THE ULTIMATE PICK AMONG COLLEGE STUDENTS.** This study explored college student evaluations of online dating profiles. Students were given male or female online dating profiles, according to their self-reported sexual preference. Participants were then randomly assigned to receive profiles that differed on levels of masculinity and femininity based on appearance and interests, making a total of four profiles: masculine male, feminine male, masculine female, and feminine female. All of the profiles included a photo and a biography that explained the characteristics of each person. After examining the profiles, the participants rated the profiles on masculinity/femininity, competence, attractiveness, and the honesty of the profile. In addition, we asked participants questions regarding demographics, the use of dating applications, and their sexual risk-taking habits. We predict that the profiles displaying counter-stereotypical gender expression will be preferred over those showing stereotypical portrayals. We also expect that the use of dating applications will correlate with sexual risk taking. Our results will suggest that attraction to stereotypical gender expressions have changed over time.

W. J. Wollo. Cooperative Research, Lincoln University. **ENTREPRENEURSHIP EDUCATION PROGRAMS: THE CASE OF MISSOURI COLLEGES AND UNIVERSITIES.** Entrepreneurship education has increased significantly in the United States

with many tertiary educational institutions integrating entrepreneurship into their curricula. Exploratory research was conducted to determine the extent to which entrepreneurship education programs have spread in colleges and universities in Missouri. A list consisting of fifty-eight colleges and universities in Missouri was obtained from the Missouri Department of Higher Education (MDHE). The list included both two-year and four-year institutions. A survey questionnaire consisting of a menu of entrepreneurship education programs was sent to all fifty-eight institutions. Twenty-one institutions, 36% responded. Among the number of respondents, 2 (9%) offer an MBA in entrepreneurship; 5 (24%) offer a Bachelor's degree; 2 (9%) offer a certificate; 17 (81%) offer elective courses; 12 (57%) offer seminars; and 10 (48%) offer a minor. These results indicate that a variety of courses or programs relating to entrepreneurship are offered at Missouri colleges and universities. The majority of entrepreneurship programs fall within undergraduate programs, both minors and majors, and Masters of Business Administration programs. These results are consistent with the National Survey of Entrepreneurship Education.

R. Amezcua, H. Foulks, T. Griffin and A. Johnson, Department of Psychology & Sociology, Park University. **THE FAST AND FURIOUS: RANKING VERSUS RATING PICTURES FOR CREATIVITY.** In previous research, we had participants complete a self-report creativity measure, the Remote-Associates Test (RAT), the Cognitive Reflection Test (CRT), and creativity ratings for 25 hand-drawn pictures. Participants ended the by rank ordering the 25 pictures from most creative to least creative. Among the results we found that there were no differences between the rating order and the ranked order for the pictures. This study is a modified replication in which the rating part of the study was removed. We hypothesize that by removing the picture rating processing section that it will take longer to rank order the pictures. In other words, we are testing for a priming effect and whether there are any significant rank-order differences between the studies.

J. Slayton & R. Ghinescu, Department of Social and Behavioral Sciences, Lincoln University. **ADHERENCE TO FLUID RESTRICTIONS IN DIALYSIS PATIENTS.** The present study investigates the effectiveness of a Cognitive Behavioral Therapy (CBT) intervention on fluid restrictions in dialysis patients. The patients were randomly assigned to two groups: half of the non-adherence to fluid restrictions patients (the experimental group) will receive CBT whereas the control group will receive counseling. Measures will include several questionnaires: the Satisfaction with Life Survey (SWL; Diener, Emmons, Larsen, & Griffin, 1985), Depression, Anxiety and Stress Scale (DASS; Anthony, Bieling, Cox, Enns & Swinson, 1988) and End-Stage Renal Disease Adherence Questionnaire (ESRDAQ; Evangelista, Kopple, & Youngmee, 2010). An objective measure of the average fluid gain between consecutive sessions of dialysis will be provided by the clinic technicians. The measurements will be taken in three phases: baseline, two weeks after therapy and four weeks after therapy. The data for each measurement will be analyzed by using repeated measures ANOVA. We hypothesize that the group receiving the

CBT therapy will have a smaller average fluid gain than the group which does not receive CBT (experimental group).

K. Graves, J. Perry, & T. Thomas. **COLLEGE STUDENTS' ATTITUDES ABOUT CONTACT SPORTS.** This study examined college students' views on contact sports. Two classes were randomly assigned to watch a video on traumatic brain injuries in contact sports or to watch a control video. Students then completed a survey measuring knowledge of head injury risks, attitudes towards contact sport safety, social values regarding sports, and femininity/masculinity. We also measured age, gender, athletic status, and socioeconomic status. We predict that, despite the risk inherent in contact sports, students will be willing to play the sports and encourage others to play as well. These results will suggest that intervention efforts should be aimed at developing a safer way to play contact sports rather than discouraging individuals from playing.

SOCIAL AND BEHAVIORAL SCIENCES SECTION POSTER PRESENTATION

E. Bucy and C. Yadon, Psychology Department, Missouri State University. **SENSORY PROCESSING AND BEHAVIORAL TRAITS IN RELATIVES OF INDIVIDUALS DIAGNOSED WITH AUTISM SPECTRUM DISORDERS.** Previous research has shown a higher prevalence of autistic traits in first degree relatives of individuals with Autism Spectrum Disorder (ASD) called the Broader Autism Phenotype (BAP). Sensory disturbances had not been included as part of the ASD diagnostic criteria until the most recent version of the DSM, so very little research has been conducted to investigate if relatives of individuals with ASD also show impairments in sensory processing. Participants will complete several surveys using Qualtrics such as the Broad Autism Phenotype Questionnaire (BAPQ), the Sensory Profile and the Sensory Gating Inventory to measure their sensory processing and behavioral traits. We will use these questionnaires to answer the following research questions: How do self-reported sensory experiences differ between the general population and relatives of individuals diagnosed with ASD? How does the presence of autistic traits relate to sensory processing? Do individuals with relatives with ASD report different preferences and behavioral traits compared to individuals who do not have a relative with ASD? Completion of this project will help us better understand the relationship between sensory processing and other behavioral traits, particularly for first degree relatives of individuals with ASD.