

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 seen 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. Hoilet, 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.

AGRICULTURE SECTION POSTER PRESENTATIONS

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 adaptation 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*, *Symphytotrichum 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 ORTHOPHOSPHATE 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 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

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.

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.

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.

BIOCHEMISTRY, BIOMEDICINE, & BIOTECHNOLOGY SECTION POSTER PRESENTATIONS

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.

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 were 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.

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

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.

BIOLOGY SECTION POSTER PRESENTATIONS

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 amphib-

ians 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. 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.

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

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.

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 Materials 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 ULTRASONIC 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 $> 1800^{\circ}\text{C}$ 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.

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mental, 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

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

K. Nilsson, E. Edens and Y. Liu Department of Actuarial Science, Data Science and Mathematics, Maryville University of St. Louis. **RUIIN 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. Nikaïdo, 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. Lanning¹, W. Mabee¹ and M. Combes². 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. 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.

PHYSICS & ENGINEERING SECTION ORAL PRESENTATIONS

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.

SCIENCE EDUCATION POSTER PRESENTATIONS

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

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.

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.