**MAS Abstracts**

**MAS Agriculture Section 2017**

**Oral Presentations:**

J. Weathers, S. Lowman, D. Kinkead and A. Carpenter. Department of Agriculture, Southeast Missouri State University. **PREFERRED PROTEIN SOURCE TASTE PANEL.** Grassfed Beef is a sector of the market, which is consistently gaining in popularity among the general public, with prices at least twice that of conventional Grainfed Beef, the question becomes, does the consumer prefer the taste of Grassfed, or is it a marketing niche? This study allows for the consumer to indicate their taste preference of Grassfed or Grainfed Beef with samples. Convenience sampling was used to gather participants for the study; subjects volunteered for the survey, by tasting two samples of beef, both samples were a two ounce portion cooked to medium rare. The participants then answered a 10 question survey including demographics, preferences, and purchasing power. The study was repeated twice (n=204), once with a comparison group of individuals (n=104) at a football tailgating event, and once with a controlled group (n=100) of Agribusiness and Agricultural Education majors only. The study found that the 70% of the Agricultural majors were Millennial Generation students, with 67% from a rural or farm background and 47% of them preferred the Grainfed sample over the Grassfed. While the comparison population was only 45% Millennial Generation, and 57% from a city background, and 37% preferred the Grainfed sample as well. In the controlled population only 11% were willing to pay more for the Grassfed label while in the non-controlled population 37% of people were willing to pay more for the Grassfed label. This leads to the conclusion that taste of the product is not influencing purchasing so much as the marketing of the Grassfed label, additional research will be necessary to determine if this is educational or simply marketing. An implication of this study could be greater development of marketing education either in the classroom or even to the community as a whole.

T.R. Higgins1 and J. Bergtold2. Cooperative Research, Lincoln University1 and Department of Agricultural Economics, Kansas State University2. **An economic assessment of grazing fall seeded cover crops.** Grazing fall sown cover crops is a means to recover additional value for a farming operation. Three grazing scenarios were evaluated for input costs and economic returns. Cattle were grazed for 90 or 120 days and the value of the gain was determined at various starting weights and rates of average daily weight gains. Economic returns on investment (ROI) were compared among the scenarios. ROI varied by length of grazing period and starting weights.

**Poster Presentations:**

T. Shivers, H. Johnson, and J. Piñero. Cooperative Research and Extension, Lincoln University. **GROWING LETTUCE USING JAPANESE BEETLE-BASED COMPOST AND VERMI-COMPOST**. In an attempt to utilize large amounts of Japanese beetles that have been captured using mass trapping, four compost bins were prepared using the layer method. Carbon sources used were shredded paper, wood chips, and leaves while our sole nitrogen source was Japanese beetles. Chemical analyses of the compost and vermi-compost produced indicated that Japanese beetle-based compost and vermi-compost are good quality soil amendments. Greenhouse studies were conducted to compare the effects of Japanese beetle-based vermi-compost and compost at varying proportions on lettuce weight and Leaf Area Index (LAI). A mixture of 15% and 30% of each material with germinating mix significantly increased plant weight and LAI compared to the germinating mix alone. Results indicate that Japanese beetle-based compost and vermi-compost provided nutrients readily available for plants to absorb and can be used to augment fertilization in support of organic production.

H. Johnson and M. Bayan. Cooperative Research and Extension, Lincoln University. **Comparing effects of compost tea and biochar blended compost tea on lettuce SEED germination and seedling growth on raft hydroponics.** The study was designed to compare compost tea and biochar-amended compost tea on seed germination and seedling growth of lettuce. A custom-made water culture system was assembled merging principles of Actively Aerated Compost Tea (AACT) brewing system and raft hydroponics for the comparative test. The test system had two compartments housing compost tea brewed from worm castings and from the castings blended with 3% (by weight) biochar respectively. The biochar was made through slow pyrolysis of air-dried switchgrass (*Panicum virgatum*) between 400 and 600°C in a custom made pyrolyzer. Worm castings and switchgrass were produced and harvested at the Lincoln University Allen T. Busby Agriculture Farm, an organic certified farm. The compost tea containing biochar showed inhibitory effect on lettuce germination and initial seedling growth as compared to tap water as control and compost tea. However in a subsequent test, seedlings of equal size were selected and transferring to a raft hydroponic system for the treatments. Compost tea containing biochar stimulated plants growth to four times taller, seven times larger in leaf areas, and more roots mass as compared to seedlings treated with compost tea alone. Laboratory tests did not reveal consistent differences in nutrient contents that can attribute to the observed plant growth differences. Additional research is needed to elucidate mechanisms of biochar blended compost in enhancing lettuce growth on a raft hydroponic system.

L. Wuri1,2\*, T. Wuliji1, W. Lamberson2, J. Hickford3, B. Shanks1, S. Azarqajouh4, and A. Bax1. Lincoln University1, Jefferson City, MO, University of Missouri2, Lincoln University3, Lincoln, New Zealand, Iowa State University4. **OVINE MHC GENE DQA2 AND DQA2 LIKE ALLELIC DISTRIBUTIONS IN KATAHDIN SHEEP**. The genes of the major histocompatibility complex (MHC) have been substantially studied in livestock populations. They play an important function as part of the adaptive immune system affecting individual fitness and population viability. Ovine MHC mediates specific immune responses to exogenous antigens in sheep. An extensive polymorphism at the DQA2 and DQA2-like loci located within the MHC have been identified and have subsequently have been used to develop a gene marker testing procedure for footrot resistance in sheep. Although hair sheep breeds, such as Katahdin, are reputed to have better disease resistance, no genotypic markers and allelic distribution patterns have been reported in relation to disease resistance. This project investigated the *DQA2 and DQA2 like* locus of 600 Katahdin and Katahdin crossbred sheep and classed them according to the putative allelic effect on footrot susceptibility in sheep defined as five genotypes. Both allelic and genotypic distributions were significantly different in the five gene marker score groups. The gene marker group of DQA2 with variation from highly resistant to highly susceptible to footrot alleles were present in Katahdin and Katahdin crossbred sheep. The results showed that the largest percentage (45.3%) of sheep tested were for a genotype with moderate resistance, and the second largest groups were with highly resistant (21.2%) and highly susceptible (17.6%) genotypes, whereas the smallest percentage of animals were of either with the highest (10.0%) resistance or disease susceptible (5.9%) genotypes. Results indicate that gene marker screening may shorten generation intervals and improve selection efficiency.

M. El-Dweik, N. Al-awwal and E. Eynard. Lincoln University. **DETECTION AND DETERMINATION OF NUTRIENT POLLUTANTS IN WATER SAMPLES USING OPTIMIZED AND PORTABLE TECHNOLOGY.** Water pollution from nitrogen and phosphorus compounds mostly is as a result of agricultural practices. An increased concentration of nitrogen compounds poses a high risk to both animal and human health. Farmland nutrient loss has become one of the major reasons causing agricultural non-point source pollution and water nitrogen, phosphorus eutrophication. Studies have shown that high concentrations of nitrogen and phosphorus compounds existed in the surface waters. Due to high concentrations of biogenic compounds occurred in both agricultural catchments and residential drainages, significant focus has been put forth by management and research communities alike to develop enhanced methods of filtration to counteract nutrient pollution. Detection of nutrient pollutants will serve as an underlying component of the study’s role in exploring the prospects of nanofiltration as a means for extracting nutrient pollutants from surface water. In this study, we try to match the detection limits of a handheld calorimetric instrument to that of Ion Chromatography.

L. Nelson, and F. Eivazi. Department of Agriculture and Environmental Sciences, Lincoln University**. IMPACT OF TOPOGRAPHY ON THE MOVEMENT OF SURFACE AND SUB-SURFACE WATER AND SOIL ENZYMES USING GEOGRAPHIC INFORMATION SYSTEMS.** It is widely known that soil enzymes increase the biochemical reaction rate and assist in organic matter decomposition along with releasing of plant available nutrients. Enzymes in soil also respond to soil management changes long before other soil quality indicator changes are detectable. Extracellular phenoloxidase and peroxidase measurements in ecosystems provide essential information on the stability of the carbon cycle. By contributing to the oxidation and transformation of both complex and simple phenolic compounds, these enzymes induces partial or complete degradation of such recalcitrant compounds, and finally, acts on the carbon cycling**.** Topography influences surface and sub-surface water flow, erosion of top soil, and drainage, which are important when studying the spatial distribution of enzymes in soil. Sustainable agriculture and precision farming is known to reduce cost and reduce unnecessary agricultural fertilization. Tools such as ArcMap (IDW) and GS+ statistic software can be utilized successfully to represent spatial variability of agricultural field data in a more efficient manner to reduce the cost of operation, minimize the adverse effect of over fertilization, pesticide and herbicide usage. The Lincoln University Carver Farm, which represents a variable topography was used in this study. Enzyme activities were measured and data will be presented.

P. Takhachhe, F. Liu, M. Dolan-Timpe, W. Hu, and J. Yang. Department of Agriculture and Environmental Science, Lincoln University. **Surface and Ground Water Quality across HeadwaterCatchments with Distinct Soils and Hydrologic Systems in Central Missouri.**  Surface water and groundwater contamination by herbicides and fertilizers continues to be a major water quality problem in central Missouri. The purpose of this study was to examine spatial variability of water quality among three different headwatercatchments–Goodwater Creek Experimental Watershed (GCEW) with claypan soils, Sulphur Creek Watershed (SCW) with deep loess soils, and Wet Glaize Creek Watershed (WGCW) with weathered forest soils and karst hydrology – to better understand hydrologic controls on contaminant transport. Samples were collected from February 2015 to December 2016 from streams, springs and groundwater and analyzed for major nutrients and herbicides. Mean nitrate concentrations in stream water were 2.9 (±3.37) ppm, 1.8 (±1.9) ppm and 1.8 (±0.89) ppm in GCEW, SCW and WGCW, respectively. Mean nitrate concentrations in groundwater were higher than those in stream water at GCEW and SCW, with 24.4 (±18.3) ppm in GCEW and 7.3 (±6.49) ppm in SCW. However, mean nitrate concentration in groundwater at WGCW (3.0 ±1.02 ppm) was similar to that in stream water, demonstrating the direct interaction of surface and ground water in karst hydrologic systems. Atrazine concentrations in stream water were higher than in groundwater at both GCEW and SCW. Mean atrazine concentrations in stream water were 2.4 (±4.6) ppb in GCEW and 1.46 (±2.04) ppb in SCW. In groundwater, mean atrazine concentrations were 0.08 (±0.2) ppb in GCEW and 0.13 (±0.08) ppb in SCW. The results indicated that surface water and groundwater interactions are much more important in understanding the controls on contaminant transport in the claypan and deep loess watersheds compared to a karst-dominated watershed. This approach provided insights into the differences in hydrologic controls on contaminant transport leading to better strategies for water quality management in central Missouri.

W. Doggett, and F. Eivazi. Department of Agriculture and Environmental Sciences, Lincoln University. **THE FATE OF METHYLCYCLOHEXANE METHANOL IN SOIL AND EFFECT ON ENZYME ACTIVITY.** Methylcyclohexane methanol (MCHM) is the chemical that leaked into the Elk River, in Charlestown, West Virginia on the 9th of January, 2014, causing a state of emergency for use of drinking water contaminated with the chemical. Methylcyclohexane methanol is an organic compound classified as a saturated higher alicyclic primary alcohol. It is commonly used in air fresheners and as frothing agent for coal processing and cleaning. The full toxicity of this chemical to humans was unknown at the time of spill and there is still lack of information on exact toxic effects of the crude MCHM. In a recent study it was determined that the MCHM can cause damage to human DNA and potentially cause cancer and reproductive problems. Soils are the ultimate recipient of all kinds of contaminates from different sources. There is a need to study and investigate the properties of the MCHM in water and soil especially with the crude MCHM. If released to soil, MCHM is expected to have very high mobility. Volatilization from moist soil surfaces is expected to be an important fate process. To determine toxicity of this chemical on soil biological properties, we measured acid phosphatase and b-glucosidase activities in soil treated with different rates and incubated for periods of one hour to 4-weeks. Results indicated that in short term enzyme activities were significantly inhibited by MCHM.

L. Luebbers, K. Turner, C. Schabbing, S. Lowman, and J. Weathers. Department of Agriculture, Southeast Missouri State University. **FENCE LINE WEANING VERSUS NOSE RING WEANING IN 6 MONTH OLD SIM-ANGUS CALVES.** The purpose of this study was to determine which method of weaning provided the greatest average daily gain in six month old Sim-Angus calves. It has been suggested that nose weaning creates less stress on the calf versus traditional weaning methods. The two methods utilized in this study were fence line weaning and nose weaning rings. Fence line weaning consists of the calf being placed in a pen, in this case a confined feeding lot, and is physically separated from the mother (n=20). The nose weaning calves had a non-invasive plastic flap placed in their nose (n=16), which served as a physical barrier between the calf and the mother’s teat only. Both herds were weighed at 24 hours after initial separation, and again every two days. After 14 days, the nose weaners were removed. Overall, the fence line herd had an average daily weight gain of 1.53 kg, while the nose weaning herd’s average daily weight gain was 1.55 kg. This study concluded that nose weaning created a less stressful environment for the calf, and provided a higher average daily weight gain compared to fence line weaning. Since this data set conflicts with previous trials of genetically similar cattle, further research will be conducted to see which data set is replicable.

S.E. Svenson. Charles Nemanick Alternative Agriculture Garden, Department of Agriculture, Southeast Missouri State University. **NATIVE PERENNIALS FOR BUTTERFLY AND POLLINATOR GARDENS: SECOND YEAR PERFORMANCE IN SOUTHEAST MISSOURI.** Perennials native to Missouri were evaluated for survival, growth, and flowering from fifteen to twenty-seven 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 second 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 second growing season included: *Echinacea pallida, Echinacea paradoxa*, *Echinacea purpurea*, *Eryngium yuccifolium*, *Eutrochium purpureum,* and *Zizia aurea*. *Ascelpias 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. *Coreopsis lanceolata* and *C. palmata* had foliage and stems eaten to the soil line by flea beetles (*Calligrapha* sp.; family Chrysomelidae). 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.

J. Thompson, J. Weathers, and S. Lowman. Department of Agriculture, Southeast Missouri State University. **UTILIZING FOCUSED ATMOSPHERE SEMINARS FOR IMPROVEMENT OF CAREER AND LEADERSHIP READINESS OF WOMEN IN AGRICULTURE.**  This study created a focused atmosphere, designed for female undergraduate students to increase preparedness and confidence with career decisions in Agribusiness. Though women in STEM (Science, Technology, Engineering and Mathematics) careers are becoming more common; limitations in traditional industries remain. The USDA (United States Department of Agriculture) finds 31% of farmers are women within the state of Missouri. This number indicates production agriculture only, which is less than two percent of agribusiness. A Women in Agriculture Career and Leadership Seminar was hosted by the Department of Agriculture for female Agribusiness and Agricultural Education majors. A pre and post-questionnaire was administered to participants (n=14) with students self-identifying on a Likert-type scale of *Strongly Agree* to *Strongly Disagree* in areas of: self-knowledge, professionalism, networking and career skills. Data indicated improvement from within the focused atmosphere of the Career and Leadership Seminar with post questionnaire results of *Strongly Agree* to the following statements: 75% of students identified, “I am confident in my ability to convey my skills and knowledge to a potential employer.” Similarly, 75% indicated to, “I believe I will be promoted within the agricultural industry based upon my qualifications and work ethic.” Comparatively only, 50% responded, “I am confident with my professional networking ability;” while, 100% of respondents believed they will have a successful career in the agricultural industry. This study shows promising results for continued research on focused atmosphere preparation for improving confidence within undergraduate female students entering the traditional industry of Agriculture.

M. Aide. Department of Agriculture, Southeast Missouri State University. **COWPEAS: AN EMERGING PROTEIN CROP.** Cowpeas [*Vigna unguiculata* (L.) Walp] are a stable protein food crop in Africa, India and Latin America. The Department of Agriculture desires to develop best management practices for growing cowpeas as a protein food crop. A three-soil greenhouse project was performed to assess the nutrient uptake patterns for developing plant tissue norms to assess plant nutrition. Cowpea grown in the Scotco series (sandy alluvial sediments) yielded an appreciable better root mass and greater chlorophyll leaf measurements compared to cowpea grown in the Dubbsseries (loamy alluvium) or the Menfro series (silty loess). Analysis variance showed significant ANOVA P-values (less than 0.02) for N, P, K, Ca, Mg and S uptake differences because of soil type. Cowpea grown in the Scotco series had significantly greater P uptake.

A. Dudenhoeffer, J. Miller, and J. Pinero. Integrated Pest Management, Lincoln University. **DEVELOPMENT OF HIGH CAPACITY JAPANESE BEETLE TRAPS FOR ORGANIC PEST MANAGEMENT IN AN ELDERBERRY PLOT**. Mass trapping of Japanese beetles (JB), *Popillia japonica* (Coleoptera: Scarabaeidae), has been implemented by the Lincoln University IPM program since 2012. The objective of this study was to determine whether ventilation can increase JB captures using 121-liter black trash bins. Results from a 2015 study suggested that ventilation bins can indeed influence JB catch. Results from a 2016 study indicated that JB captures increased significantly by using trash bins with increased ventilation (400%), using screen windows, compared to non-ventilated bins. The ventilated bin’s average JB capture equaled that of the standard mass trapping device. These results support the usefulness of ventilated bins for organic JB control.

**Abstracts MAS Atmospheric Science Section 2017**

**Oral Presentations:**

J. Wendt, M.J. Simpson, and N.I. Fox. School of Natural Resources, University of Missouri – Columbia. **COMPARISON OF X-BAND DUAL-POLARIZATION RADAR-DERIVED AND PRESENT WEATHER SENSOR DROP-SIZE DISTRIBUTIONS.** Radar rainfall estimation algorithms are predicated upon reliable drop-size distribution data. Algorithms are further developed by determination of least-squares trends of the drop size distribution data. Many studies have been done to evaluate the raindrop-size distribution and the parameters capable of being calculated from this data. The main focus of this study was to collect drop-size distribution data from areas surrounding the University of Missouri’s grant-based, x-band research radar to be compared against the values that the radar collected. Comparing drop-size distribution-calculated ZDRto the ZDR calculated from the X-band radar (MZZU).

C. Henson and P. Market, School of Natural Resources, University of Missouri – Columbia. **Moisture Transport Characteristics Associated with Hurricane Joaquin (2015)**. Hurricane Joaquin (2015), along with an extratropical cyclone located over the Southeast and a stationary front along the East Coast, contributed to heavy precipitation over South Carolina in October 2015. Using the Weather Research and Forecasting (WRF) – Advanced Research WRF (ARW) model, simulations of the event from 0000 UTC 01 October 2015 to 1200 UTC 05 October 2015 were analyzed. A control run modeled the actual event as closely as possible. Following the methodology of Tang et al. (2013), a vortex removal technique in the WRF model was used to remove the vortex associated with Hurricane Joaquin from the model initial conditions and integration. Further, the excess moisture associated with Hurricane Joaquin was removed in an effort to eliminate the moisture plume that was directed toward South Carolina. Results suggest that Hurricane Joaquin and its associated moisture contributed only 30% of the total rainfall received by South Carolina. To analyze the source of moisture for each scenario, the ARL HYSPLIT trajectory model was employed. The first objective was to investigate the source of moisture and the moisture transport characteristics in the observed event to determine if the moisture plume could be classified as an atmospheric river, as defined by Zhu and Newell (1998). Further, a comparison of the moisture transport between each simulation was completed and moisture budgets were calculated to further understand the dynamical and thermodynamical contributions of Hurricane Joaquin. A moisture plume was still present without Hurricane Joaquin, but the strength, duration, and position of the moisture transport was affected when the hurricane was removed.

M. Britt, J. Sieveking, and P.Walsh, NOAA/National Weather Service St. Louis, Missouri. **THE METEOROLOGICAL CONDITIONS LEADING TO TWO HISTORIC FLOODS ALONG THE LOWER MERAMEC RIVER BASIN.** This study will examine two separate multi-day cool season heavy rainfall events that impacted the Meramec River Basin across portions of southeast and east central Missouri.  The first event occurred on December 2-5, 1982, and caused record flooding at all of the forecast points along the lower Meramec River.  The second event occurred December 26-29, 2015, and established a new flood of record at most of the river gages below Sullivan, Missouri.  Both floods caused significant impacts to residences, businesses, and transportation. Rainfall analysis from both events was examined for similarities in the location, orientation, and magnitude of the heaviest rainfall in respect to the Meramec River Basin. The North American Regional Reanalysis Dataset was used to compare the mean daily synoptic patterns and climatological anomalies.  Both cases were characterized by strongly forced systems caused by the entrance region of upper jet streaks and an approaching deep mid-level troughs.  In addition, strong moisture transport from the Gulf of Mexico allowed for anomalously high amounts of moisture needed for historic rainfall for December.

C. Kelly and M. Britt, NOAA/National Weather Service St. Louis, Missouri. **MISSOURI and ILLINOIS SEVERE HAIL CLIMATOLOGY: 1996-2016.** Severe hail, defined as one inch or greater in diameter by the National Weather Service (NWS), is the leading cause of severe thunderstorm insurance losses in the United States. Over the past 20 years, the Greater St. Louis Metropolitan Area has experienced two of the top 10 costliest hail storms in United States history (April 10, 2001 and April 28, 2012) and has observed numerous instances of significant  severe hail (defined by the NWS as 2.75 inch or greater in diameter). A climatological study of severe hail was conducted for the period of 1996 to 2016 to obtain the hourly, monthly, and annual distribution of severe hail across Missouri and Illinois. Additionally, the spatial distribution of hail was examined to see if there are any favored locations or known biases for significant hail reports.

**Poster Presentations:**

M. Kebede, J. Adegoke, C. Ichoku, B. Abiodun, T. Matsui, Geoscience Department, University of Missouri-Kansas City, NASA Goddard Space Flight Center. **MODELLING THE IMPACTS OF BIOMASS BURNING INDUCED LANDUSE CHANGE ON CLIMATE IN NORTHERN SUB-SAHARAN AFRICA.** The importance of land use/land cover (LULC) change as a crucial driver in the climate system is orchestrated by several researchers. Fire is one of the major factors affecting the dynamics of LULC through time. In this regard, the northern Sub-Saharan Africa (NSSA) is one of the regions with highest fire frequency that accounts for 20-25% share of global carbon emissions in the world. Contemporary observations from satellite data in the NASA IDS Northern Sub-Saharan program shows that more than 75% of this fire is occurring in savanna and woody savanna land cover types. This study also revealed that there is a net decrease in fire activity on the order of 2-7% each year in different parts of NSSA especially in the savanna regions. Several researchers reported the diminishing of savanna land and replacement by agricultural land /cropland expansion. An increase in agricultural land expansion could potentially feedback to modify the local and regional climate over NSSA. However, the effects of expansion of cropland on future climate is largely unknown. Research has been going on to study the impacts of expansion of agriculture on future climate of NSSA in terms of rainfall, temperature, and soil moisture using state of the art modelling technologies. A total of three long-term simulations is currently on going in NSSA: One present day climate simulation for the period 1971-2004 and two future projections (2030–2064) using Weather Research and Forecasting model. Each of these simulations is composed of three different cases of simulations. Case-1: a control simulation using the present landuse data; case-2: 10% modification to the landuse according the current rate of change from literatures by different authors; case-3: assuming a 100% replacement of savanna and woody savanna landuse types by cropland to see the worst case scenario. Preliminary test results of this simulation shows a significant decrease in rainfall and soil moisture while an increase in near surface temperature owing to the conversion of savanna and woody savanna by cropland expansion in the NSSA.

**MAS Biochemistry, Biomedicine, & Biotechnology Section 2017**

**Oral Presentations:**

J. Capps and D. M. Virga, Department of Biology, William Jewell College. **DETERMINING THE MECHANISM OF ENTERIC NEURON DEGENERATION IN PARKINSON’S DISEASE.** Parkinson’s Disease (PD) is one of the most common and well-studied neurodegenerative disorders. Typically, PD is associated with severe tremors, slow movement, and muscle rigidity, all of which mark progressive neurological damage to the central and peripheral nervous systems (CNS/PNS). However, prior to CNS and/or PNS damage, most PD patients demonstrate gut motility failure. The enteric nervous system (ENS), which governs the functions of the gastrointestinal tract, may be critical to pathology progression in PD. Currently, the mechanism of neuron degeneration in the ENS is unknown; either degeneration occurs from the cell body and progresses to the axon, or vice versa. To investigate this, we isolated and cultured enteric neural crest cells, treating them with an environmental toxin, rotenone, to model PD. By utilizing Nmnat, a nearly universal axon-protecting protein when overexpressed, and Bcl-xL, an inhibitor of mitochondria-mediated apoptosis, we were able to show that overexpression of both proteins protected neurons from degeneration. We were therefore able to conclude that 1) degeneration may originate in the axon, and 2) the mechanism of degeneration involves caspase activation.

J. Tee and J.J. Smith, Biomedical Sciences Department, Missouri State University. **GATEWAY FLUORESCENT TAGGING PLASMID SYSTEM TARGETING THE BTU1-1 LOCUS OF TETRAHYMENA THERMOPHILA FOR THE STUDY OF NUCLEOTIDE EXCISION REPAIR.** The sun’s presence is indispensable for life, without which life would be unable to function. However, damaging photoproducts can form from DNA exposure to the sun’s UV radiation, leading to distorted DNA and breakage if left unrepaired. UV-induced lesions are repaired by nucleotide excision repair (NER) enzymes, which relies on many proteins across several steps. The relationship of any one repair protein to other cellular processes can be unwieldy to untangle in higher eukaryotes. *Tetrahymena thermophila* is a unicellular eukaryote that possesses unique qualities advantageous for studying DNA repair, namely, the segregated functions of its two nuclei, as well as its polyploid 45 copies of every chromosome. *T. thermophila* also has a fast growth rate, making it a great model organism. Fluorescent probe tagging is a common way to study protein interactions in *Tetrahymena thermophila*. Combined with immunoprecipitation, ectopic gene expression and colocalization studies elucidate and validate DNA repair pathways. We describe the development of an efficient technique to transform *T. thermophila* with GFP and RFP fluorescent-tagged genes using constructs that are compatible with Gateway cloning technology. Through site-specific recombination using Life Technology’s Gateway cassette, and homologous recombination into the beta tubulin 1 (BTU1) locus, we can exogenously induce NER protein expression from a metallothionein (MTT-1) promoter to study protein localization using confocal microscopy. Preliminary data provide proof-of-concept evidence for the success of our system, which can be widely utilized by the ciliate research community, while serving as an indispensable tool for the study of DNA repair in *T. thermophila*.

A. Metzger1, N. Akers2, J. Hile2, and A. J. Reese1, 1Department of Basic Sciences, St. Louis College of Pharmacy, St. Louis, MO. 2Department of Biological Sciences, Cedar Crest College, Allentown, PA.**GENOTYPIC AND PHYLOGENTIC ANALYSIS OF ENVIRONMENTAL AND CLINICAL SAMPLES OF *RHODOTORULA* FUNGAL STRAINS.**  *Rhodotorula* species are pink to coral encapsulated basidiomycete yeasts that have been isolated from various environmental locations. They are linked with disease in immunocompromised patients and are particularly associated with central venous catheter infections and meningitis. Little is known about the biology of these fungi, including their natural reservoirs and the role of their capsule. Clinical isolates are known to be naturally resistant to fluconazole, voriconazole, and caspofungin, leaving few antifungals available for treatment. We have collected environmental *Rhodotorula* species from trees, domesticated dog coats, avian excreta, and laboratory contaminants. In addition, we have obtained agricultural strains from a plant pathology lab and clinical isolates from a medical laboratory, resulting in a set of about 50 strains in total. We have extracted genomic DNA from all samples, amplified the internal transcribed spacer (ITS) regions with ITS1 and ITS4 primers, subcloned into TOPO plasmids, and sequenced primer sequences located on the plasmid. The resulting sequences have been aligned and analyzed for phylogenetic relatedness. Many of the strains are *R. mucilaginosa*, and clades of three other *Rhodotorula* species were also detected across the samples. There is limited genetic data available for these fungi in fungal databanks and the methods used to determine the species of clinical isolates is often vague or missing in the literature. Phenotypic and genotypic analyses for *Rhodotorula* species would allow a better understanding of these fungi and could prove instructive as more infections arise in our immunocompromised patient population from this emerging pathogen.

A. Abulibdeh and J.J. Smith, Biomedical Sciences Department, Missouri State University**. INTERPLAY BETWEEN THE HOMOLOGS Rad51 AND Dmc1 IN CELL DIVISION AND HOMOLOGOUS RECOMBINATION REPAIR**. Rad51 and Dmc1 promote the homologous and strand exchange steps of homologous recombination. Dmc1 is a Recombinase involved in meiosis-specific repair of double strand breaks (DSBs) via homologous recombination, whereas Rad51 has been found to be involved in meiotic and non-meiotic DSBs repair. Some studies in budding yeast show that when RAD51 is overexpressed, interhomolog recombination still occurs even when DMC1 is knocked out. It is still unknown whether Dmc1 and Rad51 interact directly, but evidence suggests that they may somehow work together. The aim of this study is to further define the role of Rad51 verses Dmc1 in *Tetrahymena thermophila* and determine if they interact with each other in a complex during the cell cycle and DNA repair. Bioinformatics was used to compare Dmc1 and Rad51 homologues from various species and their associated domains. RT-PCR studies showed an increase in DMC1 mRNA expression after treatment with MMS, UV, and H2O2, suggesting a possible role of Dmc1 in DNA repair outside of meiosis.  Survivability studies show that knocking out DMC1 makes *Tetrahymena* more sensitive to MMS treatment, but not to UV or H2O2. Data suggests they may play both similar and distinct roles in meiotic recombination, so transformation of Dmc1 and Rad51 with different epitome tags (HA, GFP, FH6) into *Tetrahymena* was done to further illustrate the correlation between them during DNA damage. The role of *Tetrahymena* Dmc1 and Rad51 in DNA repair has been elucidated through immunoprecipitation, fluorescence microscopy, and overexpression studies.

S. Thomas, H. Montejo, and J. Wang, Biomedical Science Department, Missouri State University. **INVESTIGATING THE ROLE OF P2Y2R IN LEUKOCYTE-ENDOTHELIAL INTERACTION AND MICROVASCULAR HEMODYNAMICS IN VIVO.** The role of purine nucleotides (ATP and UTP) as extracellular signaling molecules has been well established. Moreover, accumulating evidence suggests a pivotal role purinergic signaling plays in mediating immune and cardiovascular pathology. Preliminary evidence suggests purinergic signaling, mediated largely in part by extracellular P2Y2 receptors (P2Y2R), is responsible for vascular inflammatory phenotypes thought to be associated with vascular endothelial hyperpermeability and pathologically upregulated leukocyte-endothelial interaction that predominates under inflammatory conditions. However, there is a lack of studies investigating the role of P2Y2R on leukocyte-endothelial hemodynamics under *in vivo* physiological flow conditions. The aim of this current study was to investigate the role of P2Y2R on local microvasculature and leukocyte-endothelial hemodynamics *in vivo*, utilizing a novel epifluorescent intravital microscopy (IVM) approach. Using minimally invasive surgical exteriorization of the cremaster muscle, P2Y2R knockout and wildtype (C57BL/6) mouse cremaster flow was directly visualized by bright field and fluorescent IVM. Image processing and hemodynamics were analyzed under basal and UTP challenged conditions using offline ImageJ analysis of time-lapsed images. Hemodynamic parameters, including leukocyte rolling, adhesion, and flux were measured at various time points using a semi-automatic tracking methodology, incorporating LoG detection and linear motion LAP tracking. These findings will ultimately further determine the role of P2Y2R in altering local hemodynamics as well as the overall importance of P2Y2R in promoting inflammation.

C. Owensby1, P. Wittl1, H. Graves1, A. Oestreich2, C. Phillips3,4 and A.C. Brodeur1,3,4, Biomedical Sciences Department, Missouri State University1 and the Departments of Biology2, Biochemistry3, and Child Health4, University of Missouri. **INVESTIGATION OF BONE BIOMARKERS AND OSTEOCLAST FUNCTION IN SKELETAL FEATURES OF HURLER SYNDROME.** Hurler Syndrome (Mucopolysaccharidosis Type I, MPS I) is a lysosomal storage disease caused by a deficiency of α-L-iduronidase (IDUA). IDUA catalyzes the degradation of the glycosaminoglycans (GAGs), heparin sulfate (HS) and demantan sulfate (DS). The continual accumulation of HS and DS makes MPS I a progressive disease with inevitable degeneration of multiple organ systems, including the skeletal system. To evaluation the skeletal phenotype, biomarkers (protein and mRNA) of bone formation and bone resorption will be compared in wild-type, heterozygous, and MPS I (IDUA-W392X knock-in) mice. Preliminary data indicate that there were no differences among the genotypes for the serum protein biomarkers, PINP and TRAP5b. Preliminary analyses of tibial hydroxyproline content reveals a potential increase in type I collagen in the MPS I mouse skeleton, yet qPCR data indicates that there are no significant differences in expression of either chain of type I collagen. However, preliminary results indicate that there may be differential, or decreased, transcription of RANKL, OPG, TNFα, and CSF-1, markers of osteoclasts, in MPS I mice compared to wild-type mice. These data taken together, suggest that impaired osteoclast function may play a role in the skeletal phenotype previously described in the MPS I mice.

E. Nischwitz and J. J. Smith, Biomedical Sciences Department, Missouri State University. **Characterization of Nucleotide Excision Repair at the Telomere and Role of the Repair Protein Rad4 and Its Association with Shelterin Proteins.** 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 have intricate secondary structures that interact with a set of proteins called shelterin that protect and structure the telomeres.  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 the telomeres, telomeres 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 studies. To further understand shelterin and shelterin-like proteins relation to one another and in *Tetrahymena* extensive bioinformatics has been conducted to elucidate common domains and trends between organisms. Currently, 2HA and FH6 RAD4 (*Tetrahymena’s* XPC homolog) tagged cell lines are being developed to study the localization of RAD4. These cell lines will then be used to study protein-protein interaction of RAD4 and Pot1a, Pot1b, and Tpt1 (*Tetrahymena* shelterin) before and after damage via chromatin immunopercipitation. These interactions will begin to elucidate the manner in which RAD4, and in turn XPC, interacts with telomeres, and possibly elucidate the pathway of NER at the telomeres.

**Poster Presentations:**

S. Chen, and D. Morrone, Department of Basic Sciences, St. Louis College of Pharmacy. **A computationAL tool for designing smart, degenerate random DNA libraries.** Random-libraries with a desired amino acid bias can be constructed by leveraging the degeneracy of the genetic code. A useful first step in designing these libraries is to develop a simple computational tool to guide library design. This tool could provide the amino acid profile for a given degenerate codon input and be useful for designing random, reduced, and degenerate libraries. Accordingly, we have developed a user-friendly computational means to determine the amino acid distribution from a chosen codon input. Using this program, we have designed a random-library that can be assembled from a single oligo. Our smart library is designed to have an amino acid distribution that approximates the existing proteome and lacks stops codons. This random-library can serve as a tool for future applications in protein engineering and investigations into properties of the genetic code and proteins.

C. Pretorius, T. Schermann and S.K. Binz, Division of Science, Chemistry, Lindenwood University. **Investigating the role of DDK Phosphorylation on Rad24 Function.** Translesion synthesis (TLS) is a mechanism that utilizes special polymerases to replicate over sites of DNA damage. The kinase DDK is essential for the mutagenesis pathway of TLS, but the reason for this requirement is currently unclear. Recently, it was shown that DDK phosphorylates Rad24, a protein that instructs cells to slow their growth allowing time for repair. The purpose of this project is two-fold; 1) create plasmids that can mimic normal expression of phosphorylated or nonphosphorylated Rad24 in yeast and 2) create yeast double mutants to genetically delineate the role of DDK. The current plasmids that mimic phosphorylation states of Rad24 cannot be used for normal expression in yeast. Two DNA sequences, one that affects the amount of protein synthesized and the other that may alter protein function, will be removed by cloning. The updated plasmids, when placed into yeast cells, will provide a realistic view of how Rad24 phosphorylation affects the ability of yeast to repair/grow after exposure to UV. To genetically delineate the role of DDK in TLS, yeast with deletions of both DDK and Rad24 genes will be created through mating. If single mutant and double mutant variants of DDK and Rad24 confer similar resistance to UV damage, the proteins function in the same pathway. If however, cell death after UV exposure is additive (meaning there is less growth than either single deletion), the proteins must function in separate repair pathways. This project is currently in a preliminary stage.

L. Andres1, J. Yockey1, C. Bradshaw2, Y. Choi 2, C. Olson2, A. Gray2, K. McIntyre2, J. Reed2, and A. J. Reese1. 1Department of Basic Sciences, St. Louis College of Pharmacy, St. Louis, MO. 2Department of Biological Sciences, Cedar Crest College, Allentown, PA. **INVESTIGATION INTO THE CAPSULE BINDING MECHANISM OF THE FUNGUS *RHODOTORULA*.** Introduction: Cryptococcus and Rhodotorula are fungi that can cause disease in immunocompromised humans. What makes them different from other pathogenic fungi is that they are encapsulated with a sugar coating, which protects them. In Cryptococcus neoformans cells, the capsule is attached via cell wall alpha-1,3-glucan. We hypothesize that Rhodotorula species bind capsule material in a similar fashion. Our study is designed to generate an acapsular mutant though exposure to ultraviolet (UV) light and to evaluate capsule binding mechanisms using fluorescent-tagged antibodies to capsule or lectins to cell wall components. Methods: Rhodotorula cultures were grown overnight, 100 cells plated, exposed to UV light, incubated at 30˚C, and colonies of interest restreaked onto fresh media. To study the capsule interaction of Rhodotorula samples, we use a polyclonal rabbit antibody specific to Rhodotorula capsule material, which is detected with a fluorescently-tagged secondary antibody. We also tagged the cells with fluorescently tagged wheat germ agglutinin (WGA) and Concanavalin A (ConA). Results: Mutagenesis generated seven different strains that varied from the original pink and glossy colony phenotypic. These strains were cultured, catalogued, and evaluated with our fluorescent antibodies in comparison to wild-type (WT) strains. The WT Rhodotorula strain bound the Rhodotorula specific polyclonal anti-capsule rabbit antibody, WGA, and ConA at about 50%. The mutated strains bound the Rhodotorula anti-capsule antibody and the WGA, but did not bind ConA. These results may suggest the mutants still have capsule but may have change in mannose accessibility. Conclusions: We will continue to pursue an acapsular mutant, as it would facilitate our studies to determine how capsule binds to Rhodotorula cells. Little is known about Rhodotorula biology, though it is known that clinical strains are naturally resistant to fluconazole, voriconazole, and caspofungin. New information about these cells may be helpful in future anti-fungal design.

N. Nuthikattu, and J. Rodriguez, Basic Sciences Department, St. Louis College of Pharmacy. **Apparatus for measurement of mechanical properties of EYE LENS SUSpensory fibers In mice.** The suspensory ligaments that hold eye lenses in place have been of interest to vision scientists for over a century. In addition to keeping the lens centered on the visual axis, these fibers act as a conduit for forces generated by small muscles near the eye wall. The forces act on the lens to change its shape, and consequently its optical power. The fibers are under constant tension and relax when the eye focuses on near objects. How the structure of the fibers enables them to restore their basal tension and survive repeated strain over a lifetime remains an open question. Here we describe the development of an apparatus that measures the tensile strength and elasticity of the fibers in wild-type and genetically modified mice lacking key fiber constituents.

R. Mullner and J. J. Smith, Department of Biomedical Sciences, Missouri State University. **CHARACTERIZATION OF THE NUCLEOTIDE EXCISION REPAIR HOMOLOG RAD4 IN *TETRAHYMENA THERMOPHILA.*** *Homo sapiens* Xeroderma Pigmentosum Complementation Group C (XPC) and its yeast homolog Rad4 plays an important role as the damage recognition sensor in the Global Genome Nucleotide Excision Repair (GG-NER) pathway, which is responsible for repairing bulky adducts in the DNA caused by ultraviolet light (UV) and drugs like Cisplatin. Mutations in XPC/Rad4 result in Xeroderma Pigmentosum (XP) - a condition characterized by increased UV sensitivity and predisposition to cancer. Much remains unknown about XPC and the various roles it plays in the cell. To further examine this, we used *Tetrahymena thermophila* – a binucleated ciliate. The larger Macronucleus (MAC) is transcriptionally active in the cell, while the smaller Micronucleus (MIC) is used to store genetic information and pass it on during conjugation. By tagging the XPC homolog in *Tetrahymena*, Rad4, with Green Fluorescent Protein (GFP) and using DAPI to stain the nucleus, we can monitor the localization of Rad4 in both the MAC and the MIC after DNA damage with UV light to determine its role in repair of silent verses transcription active DNA. Live cells with the GFP-Rad4 were viewed for localization following damage with 100 J/m2 Ultraviolet Light and localization was detected in both the Macronucleus and Micronucleus. Further experiments with other DNA damaging agents that are known and not known to cause DNA damage that is repaired by NER will be studied. Additionally, further tagging of other NER repair genes with GFP-Rad4 can now be studied to look at co-localization after DNA damage.

D. Kuziez1, R. N. Lien2, and J. Telford. 1Department of Chemistry, Maryville University. 2University of Iowa. **SYNTHESIS AND CHARACTERIZATION OF β -CYCLODEXTRIN DERIVATIVES.** β-cyclodextrin (CD) is a torus-shaped molecule composed of seven α-1,4-linked D-glucopyranose units. Cyclodextrins have been recognized for their ability to form inclusion complexes in aqueous solutions with molecules fitting in the hydrophobic cavity. Functionalization of CD with different chemical groups have applications in fields including drug delivery and enzyme mimetics. The synthesis of two β-cyclodextrin derivatives, using methyl anthranilate and ethylene diamine, was carried out. The products were characterized using IR and NMR and compared to literature values. Future projects could include testing the functionality of the derivatives in catalysis or cellular uptake.

E. Schmoll, C. McCann, L. Allen, J. Mettlach, and J. J. Smith, Department of Biomedical Sciences, Missouri State University. **CHARACTERIZATION OF UBIQUITIN CONJUGATING ENZYME 2 HOMOLOGUE IN *TETRAHYMENA THERMOPHILA.*** Ubiquitylation is an essential cellular process that requires a variety of genes, proteins, and mechanisms in a cascade of activity. One of the genes involved in this pathway, referred to as UBE2S, is present in numerous organisms including the model T. thermophila. It is active within several cellular processes, most notably mitosis regulation and protein degradation, as its name suggests. Bioinformatic analysis allowed for identification and initial characterization of the homologue, and a series of procedures, including PCR, restriction enzyme digest, and insertion into E. coli, allowed for the gene to be cloned and tagged with both Green Fluorescent Protein (GFP) and two immuno-tags (HA and FLAG). It was reintroduced via biolistic transformation into T. thermophila in order to analyze its localization following genotoxic stressors. Using qRT-PCR, changes in expression in the presence of genotoxic stressors were studied in order to identify when it may be needed in Tetrahymena. This epitope tagging and qRT-PCR expression will allow for further study in the mechanism, interaction, and localization of the UBE2S in Tetrahymena thermophila.

H. Rector and S.K. Binz, Division of Science, Chemistry, Lindenwood University. **COMPARISON OF CORTISOL COLLECTION METHODS AND ANALYSIS.** Cortisol is a hormone produced by the adrenal glands. Cortisol works to influence and regulate many of the changes that occur in the body in response to stress. Cortisol is found in the blood, urine and saliva. The levels of cortisol can be used as a biomarker for stress. Although cortisol is usually detected by using blood, this method is invasive and can be stress inducing. Therefore, collection of cortisol from saliva is preferred because it is non-invasive and stress free. This project’s goal is to determine a more cost effective way of collecting and analyzing saliva cortisol levels. The first part of the project has been completed. Current cortisol collection methods utilize Salivette tubes which cost $1.03 per tube. We tested gauze, cotton rounds and cotton balls placed in microcentrifuge tubes. It was determined that using two microcentrifuge tubes and half a cotton ball obtained a similar volume of saliva while being more cost effective at $0.09 per sample. For the second part of the project, to reduce the cost of biochemically testing cortisol levels via ELISA, we are comparing individually purchased ELISA materials to a Cayman Cortisol ELISA kit. Preliminary work is still being done to generate a reliable standard curve. Eventually we would like to test the cortisol levels of saliva, at different times of the day and different stress conditions.

G. Mobley, M. Alalem, and M. El-Dweik, Division of Science, Environmental Science, Lincoln University. **A RAPID IMMUNOMAGNETIC PURIFICATION AND ENZYMATIC-BASED OPTICAL DETECTION METHOD FOR *E. COLI O157:H7* FOOD CONTAMINATION.** Despite the fact that some strains of bacteria are beneficial for living beings, there are pathogenic strains of bacteria that cause disease in humans. One of the major routes for pathogenic bacteria to infect the human body is via ingestion of contaminated food materials. Due to the huge impact of foodborne bacterial morbidity on the community, it is imperative to ensure that consumers receive food materials free of any potential contamination. Therefore, testing and surveying food materials for potential foodborne pathogens are, nowadays, standard procedures in many food industries. Adherence to such standards have yielded better qualities of food products and earned the industries more confidence in the eyes of the consumers. However, most of the conventional methods for testing food samples require relatively long periods of time to complete. From this perspective, the need is always emerging to search for more rapid and accurate methods to screen and test food materials to decide in a relatively quicker time with a greater confidence as which of the food materials are truly contaminated to be legitimately retracted. Unnecessary withdrawal of false positive results for contaminated food products also come at a huge cost not only to the industry, but also to the community at large. Therefore, our lab has been working on a novel optical detection method that allows for capture and identification of the potential food contaminants with high specificity and sensitivity using one–step immunomagnetic approach and optical detection modalities for potential instantaneous identification of the contaminants. Our research aims at paving the road for new modalities for testing food materials by comparing the indices of performance to the current standards.

J. Blain, E. Lehrke, S. Zou, and J. Escudero, Division of Biochemistry, Biomedicine, & Biotechnology, St. Louis College of Pharmacy. **PREVALENCE OF METHICILLIN RESISTANT STAPHYLOCOCCUS AUREUS (MRSA) IN RETAIL AND HOSPITAL PHARMACIES.** Staphylococcus aureus is a commensal organism of healthy individuals associated with the skin and mucosal membranes. This potential pathogen is easily transmissible amongst individuals living in close proximity to each other, interacting during contact sports or transmitted indirectly via fomites. Studies indicate that S. aureus is capable of surviving on surfaces up to two weeks after prolonged exposure to antimicrobials. Because retail pharmacies have a lot of walk-in clients in varying health conditions and hospital pharmacies and their personnel have contact with sick patients or objects that go out to the hospital rooms, ER or ICU every day, this study was designed to determine if pharmacies may play a role in the transmission of S. aureus and MRSA. Samples were collected from different locations throughout the pharmacy including the computer keyboards, keypad for payment, swipe badges of employees, medical doses, crash carts, counters and paper prescriptions. Thus far, 108 samples have been collected and 46 (42.5%) of these were positive for S. aureus. Twenty-one (45.7%) have been classified as MRSA based on their ability to grow in 0.04 µg/ml oxacillin in Mueller-Hinton broth. MRSA is a serious health concern due to its resistance to antibiotics and because the infections it can cause range from mild skin irritations to fatal infections including septicemia, endocarditis and osteomyelitis. If in fact, MRSA or even non-resistant S. aureus is common in our pharmacies, a more careful approach to disinfecting our pharmacies must be made to help reduce the transmission of disease.

B. Collins, T. Privet, and J. Escudero, Division of Biochemistry, Biomedicine, & Biotechnology, St. Louis College of Pharmacy. **THE DETECTION OF TWO DNASES OF STAPHYLOCOCCUS AUREUS**. Staphylococcus aureus infections range from mild skin irritations to fatal infections including septicemia, endocarditis and osteomyelitis. The production of biofilms contributes to persistence of these infections even after antibiotic treatment. Two DNases have been described that may play a role in both the production and dispersal of biofilms. Thirty-five Staphylococcus aureus were characterized based on the presence of the two genes, nuc1 and nuc2, and the corresponding proteins’ enzymatic activities. Thus far, two isolates have been characterized as nuc1 negative and nuc2 positive; nine isolates as negative for both genes and corresponding protein activities; finally, 29 isolates were characterized as nuc1and nuc2 positive. The isolation of the nuc1 mutant strains should be useful in helping to clarify the role of nuclease 2 in biofilm dispersal, which is unknown at this time.

S. Chen, B. Frederick, and D. Morrone, Department of Basic Sciences, St. Louis College of Pharmacy. **A facile computational tool for designing smart, random DNA libraries.** The degeneracy of the genetic code can enable random-library construction with a biased amino acid distribution. While a precisely controlled bias requires expensive library construction techniques, a rationally designed DNA cassette of various degenerate codons can achieve a particular bias for a fraction of the price. Accordingly, a simple computation tool that displays an amino acid profile for a given degenerate codon input is a necessary first step for the design of such random-libraries. We have developed a user-friendly computational means to determine the amino acid profiles for degenerate codon libraries. Using this computational tool, we have designed a series of libraries biased towards certain amino acid profiles. These libraries can be used for developing protein engineering techniques as well as studying properties of the genetic code and proteins.

H. Chen, M. Reed, G. Zheng,Cooperative Research Programs and Department of Agriculture and Environmental Science, Lincoln University. **FATE OF *CAMPYLOBACTER JEJUNI* IN PIG MANURE DURING ANAEROBIC DIGESTION.** Pig manure can be used as a biomass resource for the production of renewable energy (i.e., methane) through anaerobic digestion (AD), but it can be potentially a reservoir of human and animal pathogens. The objective of this project was to minimize the pathogen output from pig manure over AD process. For this propose, the fate of the leading pathogen in pig waste, *Campylobacter jejuni*, was assessed during psychrophilic (at 22°C), mesophilic (at 37 °C) and thermophilic (at 55 °C) AD. The abundance of *C. jejuni* was measured through its signature virulence gene, *hip*O, using a quantitative polymerase chain reaction (qPCR) assay. Our preliminary data demonstrated that the abundance of *C. jejuni* changed over time with a similar pattern during the psychrophilic, mesophilic, and thermophilic AD. The abundance of *C. jejuni* increased at the beginning of the AD and then decreased by the end. In general, the thermophilic AD appeared to be more effective in removal of *C. jejuni* than the psychrophilic and mesophilic.

J. Teagarden, T. Bross and J. Ory, Department of Basic Sciences, St. Louis College of Pharmacy. **INDUCED EVOLUTION OF LOW 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 a copper transporter, *CTR4*. Expression of *CTR4* allows the organism to import copper into the cell. The purpose of this study is to determine what survival mechanisms *C. neoformans* can be selected for when it lacks the *CUF1* gene. Previous experiments have shown a strain of *C. neoformans* lacking the *CUF1* gene growns slowly in low copper conditions. However, if grown over time in that same low copper condition, *C. neoformans* has been found to revive itself, producing some colonies that grow faster than others. To see how common this phenotype is and see if it can be selected for, we streak the *CUF1* knockout strain onto YPD plates after growing overnight in liquid culture at 30°. We then start a new overnight culture with the fastest growing colony and repeat the process, continually selecting for fast growing colonies on low copper. Plates are imaged and analyzed for colony size and the cells frozen down for future study after each selection step. We find that with each successive selection step, the number of colonies that survive plating on low copper increases, and the time it takes colonies to appear after plating decreases. Selection of the *CUF1* knockout strain on low copper conditions appears to be causing adaptation, though we do not yet know the mechanism. Our ultimate aim is to sequence the genome of the fastest growing strains and determine what genetic changes allows it to grow in this high stress environment.

H. Chen, D. Deng, M. Reed, G. Zheng, Cooperative Research Programs and Department of Agriculture and Environmental Science, Lincoln University. **A GENETIC MARKER HIGHLY ASSOCIATED WITH *E. COLI* OF RACCOON ORIGIN.** Accurate identification of the sources of fecal pollution in water is critical for an effective control and management of water quality. This study is a part of the project to identify potential genetic makers for the identification. Currently, *E. coli* are used as the fecal indicator bacteria worldwide to determine fecal contamination. The DNA fragment IT3E of *E. coli* was reported to be associated with *E. coli* isolated from deep groundwater, based on the polymerase chain reaction (PCR) assay targeting IT3E. Interestingly, the majority (>50%) of *E. coli* strains isolated from Raccoon feces generated an unexpected amplicon as the result of the PCR amplification, which was not seen in *E. coli* isolated from the feces of human, goose, pig, chicken, and duck. DNA sequencing analysis revealed the amplicon to be a gene coding for a transposase. Our preliminary data suggest that the transposase may be highly associated with raccoon *E. coli* and can be used as a genetic maker, together with the others, for accurate identification of the sources of fecal pollution in water.

T. Pottorf, C. Robertson and A. Mann. Division of Biology, William Jewell College. **Understanding the Mechanism of Golgi Fragmentation, the Endolysosomal pathway, and Protein Phosphatase 2A on Axonal Degeneration.** There are over 600 neurodegenerative diseases (e.g., Alzheimer's, Parkinson's, MS, and ALS). In most neurodegenerative diseases, axon degeneration occurs early on in the disease process; by discovering the cellular pathway of axon degeneration, one could potentially treat and prevent the progression of neurodegenerative conditions. Golgi apparatus fragmentation, lysosome inhibition, and protein phosphatase 2A (PP2A) inhibition are common among neurodegenerative diseases, and occur upstream of axon degeneration. By pharmacologically inhibiting normal Golgi function with Brefeldin A in DRG sensory neurons, it can be determined if Golgi malfunction/fragmentation is a causality or a side effect from axon degeneration, and specific interactions of Golgi fragmentation on other organelles and proteins can be determined to discover the exact sequential cellular pathway in which axon degeneration occurs. By pharmacologically inhibiting lysosomes with NH4Cl in DRG sensory neurons, the decreased production of autolysosomes, endolysosomes and consequently, reduced degradation of dysfunctional intracellular and engulfed extracellular components can be observed. By pharmacologically inhibiting PP2A with Okadaic Acid, tau is expected to become hyper-phosphorylated leading to unstable microtubules and poor mitochondrial transport, all of which is associated with axonal degeneration. In all cases of axon degeneration, NMNAT is able to prevent the progression of axon degeneration, but the exact cellular process which this occurs is unknown. By inducing Golgi fragmentation, lysosome inhibition, and PP2A inhibition, axon degeneration is expected to occur; an up-regulation of NMNAT is expected to prevent the progression of axon degeneration. This research will result in a better understanding of axon degeneration.

**MAS Biology Section 2017**

**Oral Presentations:**

D. Penning1 and B. Moon2. 1Department of Biology and Environmental Health, Missouri Southern State University. 2Department of Biology, University of Louisiana at Lafayette. **THE KING OF SNAKES: PERFORMANCE AND MORPHOLOGY OF INTRAGUILD PREDATORS (*LAMPROPELTIS*) AND THEIR PREY (*PANTHEROPHIS*).** Across ecosystems and trophic levels, predators are usually larger than their prey, and when trophic morphology converges, predators typically avoid predation on intraguild competitors unless the prey is notably smaller in size. However, a currently unexplained exception occurs in kingsnakes in the genus *Lampropeltis*. Kingsnakes are able to capture, constrict and consume other snakes that are not only larger than themselves but that are also powerful constrictors (such as ratsnakes in the genus *Pantherophis*). Their mechanisms of success as intraguild predators on other constrictors remains unknown. To begin addressing these mechanisms, we studied the scaling of muscle cross-sectional area, pulling force, and constriction pressure across the ontogeny of six snake species (*Lampropeltis californiae, L. getula, L. holbrooki, Pantherophis alleghaniensis, P. guttatus,* and *P. obsoletus*). Muscle cross-sectional area is an indicator of potential force production, pulling force is an indicator of escape performance, and constriction pressure is a measure of prey-handling performance. Muscle cross-sectional area scaled similarly for all snakes, and there was no significant difference in maximum pulling force among species. However, kingsnakes exerted significantly higher pressures on their prey than ratsnakes. The similar escape performance among species indicates that kingsnakes win in predatory encounters because of their superior constriction performance, not because ratsnakes have inferiors escape performance. The superior constriction performance by kingsnakes results from their consistent and distinctive coil posture and perhaps from additional aspects of muscle structure and function that need to be tested in future research.

Z. Self and D. Penning. Department of Biology and Environmental Health, Missouri Southern State University. **HUNGRY FOR MORE: TESTING THE EFFECTS OF PREY FREQUENCY ON PREDATION PERFORMANCE IN KINGSNAKES.** Behavioral plasticity is the ability of an organism to modify its behavior in response to differing situations and is an evolutionarily significant trait upon which natural selection can act. Many previous studies have shown that predatory and foraging behaviors tend to show high behavioral plasticity across a phylogenetically diverse number of organisms. Our study seeks to determine how altered prey frequencies affect predation behaviors and performance of kingsnakes (*Lampropeltis getula*). We used 16 kingsnakes of comparable size and subjected each of them randomly to 1, 3, and 6-week fasting periods. At the end of each fasting period, we fed each snake a pre-killed mouse (8-12% snake’s mass) and recorded several variables to measure capture, predation, and ingestion performance. Examination of each performance variable using a repeated measures ANOVA shows that kingsnakes can and do modulate portions of their predation performance in response to hunger. Kingnsakes have significantly shorter latency periods (attack prey faster) and higher maximum constriction pressures (squeeze prey harder) when fasted for six weeks compared to one week. However, there is no significant difference in ingestion time across fasting periods. Kingsnakes are capable of modulating portions of their predation behavior in response to hunger while other aspects of their predation performance appear to remain constant with increasing hunger levels.

M. Kilmer. Department of Biology and Environmental Health, Missouri Southern State University. **EFFECT OF EXPOSURE TO WATERBORNE DISSOLVED LEAD ON PREDATOR-AVOIDANCE BEHAVIORS IN THE FATHEAD MINNOW, *PIMEPHALES PROMELAS.***Aquatic toxicology often measures direct lethality of toxicants on an organism, though from an ecological standpoint, indirect lethality can be just as important. Lead (Pb) is a heavy metal found in many aquatic ecosystems, largely due to anthropogenic activities. While most environmental concentrations of Pb are not directly lethal to aquatic organisms, sub-lethal doses can alter behavior which can in turn lead to increased mortality, particularly if predator-avoidance behaviors are altered. In this study, the effect of relatively low concentrations of Pb (compared to concentrations required to induce direct lethality) on the predator-avoidance behavior of the fathead minnow (*Pimephales promelas*) was examined. When *P. promelas* are exposed to an alarm substance, released by fish physically harmed by a predator, they typically school more closely and reduce overall movement, behaviors which reduce the likelihood of predation. This pilot study showed that predator-avoidance behavior in *P. promelas* exposed to relatively low concentrations of dissolved Pb were significantly reduced. This response indicates that environmentally relevant concentrations of Pb in aquatic systems might have greater impacts on aquatic organisms than suggested by traditional toxicity testing.

K. Kalish and A. Lough. Division of Science, Math and Computer Science, Central Methodist University. **MITOCHONDRIAL AND CHLOROPLAST DNA INSERTIONS IN THE NUCLEAR CHROMOSOMES OF MAIZE INBRED LINE B73.** In many eukaryotes, there are transfers of DNA from mitochondria to the nucleus, and from chloroplasts to the nucleus (Kleine *et al.* 2004). A research project conducted by Lough *et al*., examined mitochondrial DNA (mtDNA) insertions using fluorescence *in situ* hybridization (FISH) in 10 different inbred maize lines (2008). Lough *et al.* found a similar insertion site on the short arm of chromosome 2 in all 10 of the inbred lines (2008). The question I studied in my research was: how do all of these lines have a similar mtDNA insertion site on chromosome 2S? In my research, I looked at the sequence of chromosome 2 in the B73 inbred line, because this line was used by Lough *et al.* (2008) and B73 is the maize nuclear genome that has been sequenced (Schnable *et al.* 2009). I compared the maize organelle genomes to B73 chromosome 2S in order to identify and study the mitochondrial DNA and chloroplast DNA insertion sites. I found 14 mitochondrial DNA insertion sites (NUMTs) and 5 chloroplast DNA insertion sites (NUPTs) on chromosome 2S near the centromere. The NUMTs ranged from 43 bp to 14,256 bp in length, and the NUPTS ranged from 39 bp to 208 bp in length. I also found that transposable elements have broken up what once was a continuous NUMT into three separate pieces. Studying organelle DNA insertion sites such as this one helps us better understand not only maize genetic variation but also genome evolution in all species.

**Poster Presentations:**

H. Bassich and J. McGhee. Department of Natural Sciences, Northwest Missouri State University. **AGE AND SEX STRUCTURE OF TURTLE SPECIES AT SEPARATE POND LOCATIONS IN MARYVILLE, MO.** This is a descriptive study that focuses on comparing the populations of painted and common snapping turtles at the Mozingo Outdoor Education Recreation Area (MOERA) and the Conservation Pond (CP) on the campus of Northwest Missouri State University. We trapped for turtles through the use of hoop nets at each pond. Turtles were aged according to their carapace and plastron lengths, and were classified as either juvenile or adult. Sex was determined by measuring procloacal distance and observing claw length. For the snappers, we found an average sex ratio of 1.62 across MOERA and 2.67 at CP, and an average age ratio of 1.055 across MOERA and 0.1 CP. The painted turtles had an average sex ratio of 0.3 across MOERA and 1.63 at CP, with an average age ratio of 0.04 at MOERA and 0 at CP. We conducted a weighted average t-test using the age and sex ratios of the two turtle species to compare the populations of CP and MOERA. The age and sex ratios of the snapping turtles also produced no significant difference. However, the age ratio of the painted turtles was found to be significantly different. We conclude that the snapping turtles at MOERA and CP are comparable in both sex and age, showing similar ecological factors acting on the populations. The two populations of painted turtles are similar in sex, but not age structures. The majority of caught painted turtles were mature, which may be attributed to disruptions in their reproductive cycle.

J. Bufka. Department of Biological Sciences, Lindenwood University. **GOLDEN-COLLARED MANAKINS LEAF REMOVAL.** Golden-collared manakins (*Manacus vitellines*) perform an intricate courtship behavior in arenas located within a lek. In the arenas, the males will clear out all the leaf litter in an oval shaped arena in order to create a greater contrast between them and the background. During July, 2017, male manakins were studied at the Institute of Tropical Ecology and Conservation on Bocas del Drago in Panama. Their leaf removal behavior was studied to see if it was affected by a supernormal stimulus. In this case, we would expect this instinctual behavior to be exaggerated beyond its original response. Leaves of two different sizes were placed in the arenas to see if the size of the leaves determined the order in which they were removed. In thirteen out of fourteen trials, the males removed the larger leaf first. This produced a chi square value of 5.143 which corresponds with a probability between 0.025 and 0.01. This supports the hypothesis of a heightened response to the larger stimulus.

U. Goswami and M. Haskins. Biology Department, Rockhurst University. **Activity and diversity of urban and prairie pollinators.** During the fall of 2016, pollinator activity was studied at an urban university and at two prairies located in greater metropolitan Kansas City, MO. A transparent plexiglass grid was used to measure the floral display size and pollinators were observed in a series of 15-minute intervals. On campus, the proximity of the flower beds to buildings was more influential on pollinator activity than the size of the flower bed. Overall, flower diversity and pollinator activity was higher on campus than in the prairies. Although some pollinators, e.g., grass skippers, were far more abundant on campus than in the prairies, the insect diversity on campus was lower than in either prairie. We believe the increased pollinator activity on campus may be related to travel time between flowers. Therefore, among the many factors to consider in prairie restoration work would be the impact of random (or non-random) seed dispersal on pollinator activity.

R. Hammann and K. Lane-deGraaf. Department of Biological and Physical Sciences, Fontbonne University. **URBAN LANDSCAPE GENETICS AND RACCOONS (*PROCYON LOTOR*).** Landscape fragmentation can alter wildlife population dynamics. Urban landscapes especially provide many challenges to native wildlife: possible human contact (e.g. animal control encounters, hunting, automotive culling), exposure to pathogens, and limited access to resources and potential mates. However, raccoons (*Procyon lotor*) thrive in urban ecosystems. Urban parks may act as a haven for raccoons and other wildlife populations, providing enough habitat to maintain genetic diversity and population connectivity. Here, we investigate the role of Forest Park, a large urban park with significant human activity, in shaping the gene flow and relative isolation of raccoons, a mammal known for its ability to thrive in urban landscapes. Using both population and landscape genetics techniques, we demonstrate surprisingly low amounts of gene flow and high population structure in the raccoons of Forest Park, suggesting that the human activity in Forest Park and other urban green spaces may have unintended consequences for the wildlife sharing those spaces.

M. Kanan, T. Ritter, C. Englert, and E. Rayhel. Department of Biological and Physical Sciences, Fontbonne University.  **THE EFFECT OF THERMAL STRESS ON GROWTH IN THE TOBACCO HORNWORM.**  Abiotic stress, such as thermal stress, is known to activate glucocortical hormones in animals.  In this study the tobacco hornworm was used as a test animal.  4th and 5th instar larvae were subjected to thermal extremes and the effect on hemolymph trehalose, trehalase, growth (as determined by mass) and % protein were determined.  Initial trials suggest that hemolymph trehalose increases two-fold as a result of acute stress, but this could be the result of stress-induced trehalase activation.

L. Meyer, B. Torres, V. Brown-Kennerly and R. Kodikara. Department of Biological Sciences, Webster University. **Magnetoreception in Western Harvester Ants.** Magnetoreception is the ability of an organism to sense magnetic fields (typically Earth’s magnetic field). Certain species of birds, bees, ants and microorganisms use magnetoreception for foraging, homing or migration. In the case of western harvester ants (*Pogonomyrmex occidentalis*), studies show traces of ferromagnetic compounds in antenna and abdomen areas, indicating possible magnetoreception. However, the phenomenon is still unclear and few experiments have been conducted. In this work, 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 foragers and photo detectors were used to measure activity. Helmholtz coils were used to counter earth’s magnetic field and to apply artificial magnetic fields. Initial results indicate a significant response to magnetic fields in harvester ants.

J. Newhouse1, D.Penning1, B. Moon2 and B. Sawvel2. 1Department of Biology and Environmental Health, Missouri Southern State University. 2Department of Biology, University of Louisiana at Lafayette. **ALWAYS FAST AND FURIOUS? CAN RATSNAKES MODULATE THEIR STRIKE PERFORMANCE?** Organisms constantly face ever changing environments where they encounter both predators and prey. Being able to recognize and discern the differences between potential predators and prey can have substantial fitness consequences for the animals involved. For example, failing to feed oneself will result in prolonged hunger; whereas failing to defend oneself will typically result in death. Therefore, we often observe animals using different behaviors in varying predator-prey scenarios. However, discerning those different behaviors can be quite difficult in animals with a simplified external body shape. For example, snakes are elongate and limbless reptiles that must perform all of life’s requirements with only their head, trunk, and tail. Therefore, many of the behaviors that snakes use may appear qualitatively similar but may actually be quantitatively distinct. The purpose of this study was to measure snake strike performance in varying predator-prey scenarios. Using hatchling ratsnakes (*Pantherophis obsoletus*), we measured the strike kinematics when snakes faced different predator and prey targets.

T. Pashia and D. Penning. Department of Biology and Environmental Health, Missouri Southern State University. **ASSEMBLY OF A COMPLIANT SENSOR CAPABLE OF WITHSTANDING CATASTROPHIC DAMAGE: MEASURING HIGH BITE FORCES IN SNAPPING TURTLES.** Body size plays an integral role in all aspects of an organism’s life. Larger organisms are typically less vulnerable to predation due to their absolute size and performance capacity. Smaller organisms are more vulnerable to predation because a greater range of predators can eat them and their performance is typically less than that seen in adult individuals. Across the diversity of vertebrates, bite force has been shown to have important ecological and evolutionary consequences. For many turtles, strong bites are used both in predation and defense. In the common snapping turtle (*Chelydra serpentina*), high bite forces are associated with defensive behavior. Despite the importance of this behavior, very few studies have quantified the bite performance of turtles. Here, we describe our design for a bite force sensor capable of withstanding catastrophic damage while maintaining sensitivity. Our goal was to build a prototype sensor to be implemented in the summer of 2017 on snapping turtles in order to explore the proximate determinants of bite force during this powerful defensive behavior.

A. Wolk, M. Scrivner, N. Bolagani and G. Colbeck. Natural Sciences, Maryville University.**TESTING PREDICTIONS ABOUT THE EVOLUTIONARY ECOLOGY OF CAPSAICIN: BIRDS MIGHT NOT LIKE IT HOT!** Capsaicin is the compound that gives hot peppers of the *Capsicum* genus their 'heat'. Hypotheses for the evolution of capsaicin include that it facilitates seed dispersal by deterring mammalian herbivores (who would grind and destroy the seeds) but it does not deter avian frugivores who would pass the seeds intact, effectively dispersing them. Over 9 weeks in the summer of 2016, we treated bird feeders with control sprays and 3 levels of capsaicin spray, subsequently monitoring bird and squirrel visits. Our data indicates that most birds (cardinals significantly) decreased visit rates with increased concentrations of capsaicin. Squirrels also did not adjust visit rates based on capsaicin, if anything increasing the amount of time per visit with higher capsaicin levels. Our results do not support the hypothesis of 'avian facilitated dispersal' and suggest that some birds might have better senses of taste than previously suspected.

B. Freel, C. Davis and G. Thurmon. Division of Science, Math and Computer Science, Central Methodist University. **Effect of Bisphenol-A On Olfactory Memory Formation in *Drosophila melanogaster.***Bisphenol-A (BPA) is an endocrine disruptor that has been found in products such as baby bottles, plastic food containers, and re-useable water bottles. In recent years, concern about the potential effects of BPA on the brain has increased. In this work, BPA was dissolved in absolute ethanol to create 0.5 mM and 1.0 mM solutions. The BPA solution was administered via the media. Shock training was used to train the flies against their natural instinct using a 60 V shock in intervals while administering ethyl acetate. The flies were then presented with pyridine, but did not receive a shock. After the training session, the flies were moved to a T-maze to test the effect that BPA had on the olfactory memory formation that occurred during training.

K. Luchini and R. Slama. Division of Science, Math and Computer Science, Central Methodist University. **OMEGA-3 FATTY ACID SUPPLEMENTATION SHOWS TO PROMOTE WHITE BLOOD CELL PRODUCTION THROUGH QUANTITATIVE ANALYSIS IN JUVENILE RATS.** This research project analyzes the effect of Omega-3 supplementation on white blood cell quantification. Twelve rats were put into groups of 4 in each of three different test groups; control/ no dose, high dosage, and human equivalent dosage. Phase I was performed over the duration of two months. Rats were given consistent diets between groups. Omega-3 dosages were calculated and formulated to be comparable to human dosage. Omega-3’s were then measured out and distributed through an oral syringe to eliminate error and to ensure complete consumption. Blood was drawn and analyzed once per week. White blood cell quantification took place on a glass slide under a microscope using hemacytometers.

V. Moser. Department of Biology and Environmental Science, Westminster College. **THE EFFECT OF CARBARYL ON SEA URCHIN EMBRYOGENESIS.** Carbaryl is extensively used in the agricultural field as a pesticide and if it enters the body, it over-stimulates the nervous system by preventing acetylcholinesterase (AChE) from breaking down the signaling chemicals. Sea urchins are used as a model of development due to their similarity of their molecular function to higher vertebrates like ourselves. Sea urchin eggs and early embryos have large quantities of AChE which is used in cell migration and various developmental events allowing us to see the effect of carbaryl on embryogenesis. This project explored the effect of carbaryl on sea urchin embryogenesis with the expectation that the exposure to pesticides containing carbaryl will slow or arrest the rate of development in the early mitotic cell division of sea urchins. We obtained sea urchin gametes and exposed them to 10-2 M, 10-4 M, 10-6 M, and 10-8 M concentrations of Sevin (GardenTech), a pesticide that contains carbaryl. Embryogenesis was observed with a compact microscope. Embryogenesis was completely inhibited at 10-2 M concentration. At 10-4 M and 10-6 M concentration, embryogenesis was reduced. 10-8 M concentration had no apparent effect on the rate of embryogenesis.

H. Wiegmann1, A. Jaouni1, M. Tossick1, K. Reedy1, S. Warren2 and S. Paine-Saunders1. 1Department of Biological and Physical Sciences, 2Department of Math and Computer Science, Fontbonne University. **Predicting the Three-Dimensional Structures of Mutated Glypican-3 Proteins in Zebrafish.** Human mutations in the *Glypican-3* gene cause the Simpson-Golabi-Behmel Syndrome (SGBS) - a pleiotropic syndrome that includes cleft palate and bone overgrowth. We are studying zebrafish that carry mutations in the *Glypican-3* gene to determine whether these mutations cause similar phenotypes to those seen in humans. We compared the amino acid sequences of glypican-3 in humans and zebrafish and found a 42% amino acid similarity. Using the Modeller program to generate three-dimensional protein structures of each, we show that they have comparable overall structures. This is likely due to the conserved di-sulfide linkages between all members of the glypican family. We wish to determine the likely conformation of mutated Gpc-3 proteins in zebrafish. In particular, we predict the structures of mutations that truncate the zebrafish protein near the N-terminus and a mutation that introduces an additional cysteine residue near the N-terminus of the protein. The biological implications of these mutant proteins have yet to be determined.

A. Bailey, A. Buff and K. Keller. Biology Department, William Woods University. **PREVALENCE OF TETRACYCLINE RESISTANCE GENES IN THE ORAL MICROBIOMES OF A POPULATION OF WILLIAM WOODS UNIVERSITY STUDENTS.** Bacterial resistance to antibiotics is a serious threat to domestic and global health, and tetracycline is a common, broad-spectrum antibiotic used to treat a multitude of infections, including urinary tract infections, respiratory infections, and *Helicobacter pylori*. In an effort to identify the incidence of tetracycline resistance in a small university population, 25 residential William Woods University students will be evaluated for the presence of tetracycline resistance genes *tetM*, *tetO*, and *tetA* in their oral microbiota. Microbial DNA will be isolated from 5-mL saliva samples collected from 25 individuals. PCR will be performed on isolated DNA to determine if the resistant genes are present. 16S controls will confirm the presence of microbial DNA, and bacterial plasmids specific to each tetracycline gene will serve as controls.

R. Cheung, R. Cheung and C. Scholes. Biology Department, Rockhurst University. **BEGINNING TO CHARACTERIZE THE PHYLLOSPHERE OF MISSOURI TREES.** Microbes occupy the surfaces of tree leaves. This region which microbes inhabit is called the phyllosphere. Not a lot is known about this microbiome. This was our first attempt to characterize the phyllosphere of Missouri trees. We collected tree leaf samples from around the Kansas City region. Microbes including fungi and bacteria were isolated by using sterile cotton swabs and a sterilized homogenizer. Bacteria cultures were isolated and grown separately on nutrient agar, tryptic-soy agar and brain-heart-infusion agar to maximize the diversity of nutrients available to the different microbes. Molds and other filamentous fungi were acknowledged and photographed, but not isolated. Several yeast cultures were isolated from leaves. We have begun growing bacteria isolates on differential media to help identify them to genus or species.

M. Grosonja, P. DeVore and J. Ory. Department of Basic Sciences, Saint Louis College of Pharmacy. **SURVEY OF COPPER TOLERANT FUNGI FROM MISSOURI SOIL**. Copper is a common broad spectrum fungicide that has been in use in agriculture since the mid-1700’s. Fungi play important roles in soil ecology from carbon cycling to nitrogen fixation. Regular use of copper as a fungicide may have resulted in species of soil fungus that are tolerant to normally fungicidal concentrations of free copper. The objective of this project is to survey local soil for fungi, screening with high concentrations of copper. Soil samples were taken from various locations around the St. Louis College of Pharmacy campus. Exact geographic locations were recorded for reference. Ten percent (w/v) soil solutions in water were made with the samples, which were then diluted and plated onto Yeast Peptone Dextrose (YPD) plates containing 10 mM copper(II) chloride. Samples were selected for isolation based on a yeast-like morphology. After isolating individual species, liquid cultures were grown in YPD and genomic DNA isolated. Intervening spacer sequences of the samples were amplified via PCR and amplicons sequenced to identify the yeast species. Twenty-six phenotypically distinct fungi were isolated from the soil samples. The majority (20/26) isolated fungi were molds. The six yeast were chosen to continue further work based on the relatively comparative ease versus molds when measuring phenotypes and maintaining cultures. The molds were stored and kept for future work. The yeasts isolated were *Goffeauzyma gastrica,* *Candida dosseyi*, *Cystofilobasidium capitatum*, *Sporobolomyces patagonicus*, *Rhodotorula mucilaginosa*, and *Candida pattaniensis.* Based on the preliminary findings of this survey, copper tolerance appears to occur with high prevalence in local soil fungi. Further experiments are necessary to address the abundance of copper tolerance. A review of the literature suggests none of the isolated yeast were previously reported to be copper tolerant.

A. Henry1, J. Poynter2, A. Campbell1 and J. Campbell1. 1Department of Natural Sciences, Northwest Missouri State University. 2Gentle Dental Care, Maryville, MO. **Isolation of Bacteria from the Human Oral Cavity using Environmental Media.** There are many phyla of bacteria that have yet to be cultivated in the lab. Many of these bacteria can have positive or negative effects on human health, making their cultivation important. We enriched and isolated bacterial cultures from oral samples obtained from healthy adults and a patient with periodontitis. Species were isolated from *Proteobacteria, Fermicutes,* and *Actinobacteria.* Poorly described representatives of the families *Planococcaceae* and *Caulobacteraceae* were isolated using media typically employed in environmental cultivations. Novel clades within the phylum *Chloroflexi* have been detected in enrichments from healthy human subjects. Further isolations and isolate characterizations are underway.

M. Hicks1, M. Ruggiero1, K. Willever2, S. Hamilton-Brehm3, D. Moser2 and J. Campbell1. 1Department of Natural Sciences, Northwest Missouri State University. 2Division of Earth and Ecosystems Sciences, Desert Research Institute. 3Department of Microbiology, Southern Illinois University. **CHARACTERIZATION OF POTENTIALLY NOVEL *RHODOBACTERACEAE* FROM WALKER LAKE, NEVADA.** Walker Lake, NV, is a terminal lake which has been rapidly drying in recent years. Next-generation sequencing has revealed a dynamic microbiota as the lake has receded. We have isolated two cultures of potentially novel *Rhodobacteraceae*, MR 15 and MR 16 from samples collected in 2008. The isolates are most closely related to rare (<1%) operational taxonomic units from the lake biosphere. These isolates we collected from this area have been characterized using pH, sodium, phosphate and temperature gradients. It has been found that MR 15 grows optimally at 1% NaCl, at a pH of 7, and at 30 degrees Celsius. MR 16 grows optimally at 2% NaCl, pH of 7, and at 30 degrees Celsius. Molecular cloning and sequencing of 16S rRNA genes have been used for genetic comparisons of closely related species.

I. Hung, M. Qi, G. Jung, J. Campbell and A. Campbell. Department of Natural Sciences, Northwest Missouri State University. **investigation of antibacterial properties found in *brevibacillus* isolates from calcium carbonate-rich soils.** Caliche, or soil that contains mostly hardened calcium carbonate, is a material found in arid or semiarid regions, such as West Texas. In an effort to characterize the bacterial communities associated with these soils, we have isolated two *Brevibacillus* species, CP20 and CP27, and these isolates are being further investigated due to their antibacterial properties. Testing against several Gram-negative and Gram-positive bacterial cultures and fungal cultures revealed a unique inhibitory pattern. Both isolates were inhibitory against several *Bacillus* and *Staphylococcus* species, as well as *Serratia marcescens*, *Aeromonas veronii*, and *Salmonella typhimurium*. In addition, these isolates have been characterized and compared to closely related species using a phylogenetic analysis of 16*S* rRNA genes and over 20 biochemical tests. Finally, scanning electron microscopy will be used to further investigate the mode of inhibition of CP20 and CP27.

H. Shrestha, J. Schultz,D. Beery, M. Bellamy, M. Mottaleb, M. Meziani and J. Campbell. Department of Natural Sciences,Northwest Missouri State University. **USE OF SILVER NANOPARTICLES FOR INHIBITION OF BACTERIAL GROWTH.** As bacteria continually develop resistance to antibiotics, control of their growth is increasingly important. Recent developments in nanotechnologies potentially provide a novel method for addressing this problem. The objective of this study was to determine the effectiveness of silver nanoparticles embedded in resin beads in inhibiting bacterial growth in pure cultures. Silver-resin nanocomposites were characterized using X-ray diffraction (XRD), Fourier transform infra-red (FT-IR), and scanning electron microscope (SEM). The silver coated resin was then used to test the antimicrobial activities *in vitro* against *Escherichia coli, Pseudomonas aeruginosa* and *Staphylococcus epidermidis* over the span of 3 hours. *E. coli* showed a dramatic and rapid decrease in colonies forming units. *S. epidermidis* showed similar but reduced sensitivity to the beads. Preliminary results indicate little effect of the beads on growth of *P. aeruginosa*.

C. King, P. Akitani, C. Graham, B. Macklin, A. Jaouni, H. Weigman, O. Hollander, J. Rujawitz, A. Metzger **and K. Lane-deGraaf. Department of Biological and Physical Sciences, Fontbonne University. SOCIOECONOMIC DRIVERS OF ANTIBIOTIC RESISTANCE IN URBAN PARKS.** Since the 1940s patients with infectious diseases caused by various bacteria have been treated with antibiotics. These drugs are effective in killing infectious organisms preventing prolonged sickness and death. Overuse and improper disposal into the environment has promoted a drastic increase in resistance resulting in a global health crisis. Initiatives have been made to reduce the use of antibiotics on patients and livestock but the reaction of the environment to the presence of antibiotics have not been considered. The socioeconomic status of a neighborhood determines how land is used which alters the environment making it possible for the spread of resistance. Here, we examined the role of socioeconomic factors, including the heavy metals cadmium, copper, and lead, in urban areas on the growth of antibiotic resistant bacteria in soils of urban parks. Concentrations of heavy metals and the amount of antibiotic resistant bacterial growth were measured in twelve urban parks. These parks were chosen based on a socioeconomic divide in St. Louis. Our results demonstrated that socioeconomic factors in the presences of heavy metals, not geographic location, drive antibiotic resistance in urban areas. Specifically, proximity to single family unit vacancies and building permit values were the most important factors determining antibiotic resistant bacteria growth. With higher single family unit vacancies and lower valued building permits being more prevalent in the areas of lower income, we noticed there was more antibiotic resistance. Our results suggest that poverty, through unbalanced housing policies, industrialization, and the presence of soil heavy metals act to shape the levels of antibiotic resistance in the environment.

M. Zhang, A. Pierre and A. Reese. Department of Basic Sciences, St. Louis College of Pharmacy*.* **PHENOTYPIC CHARACTERIZATION OF ENVIRONMENTAL AND CLINICAL STRAINS OF THE PATHOGENIC FUNGUS, *RHODOTORULA*.** Immunocompromised patients and those undergoing medical treatments are often at risk for fungal infections, including those caused by *Rhodotorula* and *Cryptococcus.* These yeast have been isolated from environmental locations and patient samples. We inoculated yeast peptone dextrose (YPD) broth with *Rhodotorula* or *Cryptococcus* strains, incubated at 30 °C, added cultures to various 96-well plates, incubated at various conditions, decanted the cultures, rinsed with water, stained with 1% crystal violet solutions, and determined the dye intensity to approximate biofilm formation. To characterize the tolerance of our strains, a set of strains was streaked on to YPD agar plates, YPD plates containing copper chloride (1 mM, 10 mM, 25 mM, or 50 mM) and YPD plates with 0.05% sodium dodecyl sulfate (SDS); parallel plates were incubated at 30 °C and 37 °C. Preliminary results suggested higher levels of crystal violet dye adhering to *Rhodotorula* strains over *Cryptococcus* strains, although initial methods were to establish basic methods and were not well quantified. All strains tested grew fairly well on 1 mM and 10 mM copper sulfate but not at the higher concentrations. *Rhodotorula* strains grew moderately on SDS at 30 °C, but poorly at 37°C. *Cryptococcus* did not grow well on either SDS plate. Copper has long been used as an anti-microbial agent in agriculture, so it is not surprising that some environmental fungi are tolerant to it. We will further investigate the growth patterns of environmental and clinical strains of these fungi. Our early biofilm work is the foundation for studies to explore how different strains biofilm on different substrates. The results could explain how *Rhodotorula* biofilms occur on medical devices, such as central venous catheters, and how to reduce this for improved hospital safety.

K. Brennan and C. Wills. Biology Department, Rockhurst University. **­­­­­­­­­­­­­­DIETARY SUPPLEMENTS: WORTHWHILE OR A WASTE OF MONEY.** According to the National Institute of Health, the dietary supplement industry generated approximately $37 billion in revenue in 2015. We chose to examine those supplements that were advertised on naturopathic websites to speed healing and easily purchased at local pharmacies. We used Brown Planaria (*Dugesia tigrina*) to examine the effects of these various supplements on regeneration. Planaria seemed to be an ideal study animal since their regeneration rates have been heavily studied. Given Planaria’s high regeneration rate, we hypothesized that if a supplement did indeed speed healing, we would be able to observe differences in regeneration rates. Planaria were severed into two equal pieces. The anterior and posterior sections were randomly assigned to the control (water plus calcium carbonate) or to the experimental solution (a range of solutions of different supplement concentrations). We used different concentrations of the following supplements: CoQ10, vitamin C, milk thistle, zinc picolinate, vitamin B6, omega-3 fish oil, bromelain, arnica, grape seed extract, echinacea, and arnica. None of the supplements increased regeneration time in Planaria and several of the supplements slowed regeneration time or stopped regeneration all together. At this time, we tentatively conclude that theses supplements may not contribute to faster healing in humans.

M. Picciolo, L. Smith, Z. Carel, D. Carroll and K. Lane-deGraaf. Department of Biological and Physical Sciences, Fontbonne University. **P-HACKING IN PRIMATOLOGY.** Statistics are powerful tools which can provide insight into the patterns and relationships in data. However, the cost of research, the pressure to publish, and the bias in publication towards statistically significant results has compelled some to p-hack, or to manipulate data to achieve statistical significance either intentionally or unintentionally. The field of primatology has research that spans several scientific disciplines: animal behavior, anthropology, genetics and population genetics, disease ecology and epidemiology, and often includes biomedical research; often, however, primatology studies have very small sample sizes, limited access to wild individuals, and challenging-to-access remote field sites and so could be vulnerable to p-hacking. To identify if evidence of p-hacking exists in primatology, we examined the research presented in the top three primate specific journals published between 2010 and 2015. We collected data on p value, statistical test, sample size, confidence intervals (if reported), data transformations (if reported), and inclusion of power analyses (if reported) and also categorized each paper as either behavioral, genetics or infectious disease work. In the end, we found a clear pattern of p-hacking overall. However, when parsed by category, we found no evidence of p-hacking in genetics papers, some evidence of p-hacking in infectious disease papers, and overwhelming evidence of p-hacking in behavior papers.

N. Rodriguez, N. McGhee and T. Spudich. College of Arts and Sciences, Maryville University of St. Louis. **THE CHARACTERIZATION AND USE OF MICROSPECTROPHOTOMETER FOR QUANTITATIVE BIO-APPLICATIONS.** Spectroscopy is a widely used and diverse technique that allows the user to measure the concentration of a solution which is represented by grams/liter. The concentration is determined by the absorbance of monochromatic radiation utilizing Beer’s Law. Traditional spectrometers can limit scientists by being very expensive and requiring a lot of desk space, but a spectrophotometer is being developed, will be incorporated into a micropipette and will be a fraction of the cost. Other advantages of the microspectrophotometer include decreasing sample size and waste. Therefore, this instrument will contain a unique set of qualities compared to other processes that require micropipettes and spectrophotometers independently. Data presented will include spectrophotometric characterization of the device in the visible region of the spectrum using the newly designed pipette tips.

**MAS Chemistry Section 2017**

**Oral Presentations:**

M. Jessica, S. Caleb, Division of Science, State Fair Community College. **BIRD IS THE WORD: AN ANALYSIS OF NUTRIENTS IN BIRD SEED.** A report of the quantitative analysis of nutrients available in game bird feed was generated by an interest from biology science majors. Five different commercial bird feeds were tested for the presence of nutrients. Spectroscopy and microbiology assay were used to quantify the nutrients investigated. Among the tests conducted, Benedicts was used for reducing sugars, Lugol’s for complex carbohydrates, biuret for protein, ninhydrin and chromatography for amino acids, and lipids were tested with multiple methods, including dye and solubility. Some of the vitamins tested were B12 and C. The results were compared to the labeled components as available and are included in this presentation.

J. Gray, Chemistry Honor’s Program, Metropolitan Community College Kansas City. **GOETIA: THE EVOLUTION OF ALCHEMY TO CHEMISTRY.** Scientists, engineers, and technologists by their nature always have their eyes locked to the future. This paper is a harkening to science’s humble beginnings, and how those beginnings continue to affect the scientific community to this day. The paper will cover the origins of alchemy, what exactly alchemy is, how it was practiced, how it evolved into modern day chemistry, and aspects that have survived in modern chemical practices.

A. Smith, V. Warsawski, Division of Science, State Fair Community College. **GROW AND GLOW: INVESTIGATING TISSUE BIOLUMINESCENCE.** This investigation was conducted as an attempt to incorporate the expression of bioluminescent features via tissue cultures. African violet (*Saintpaulia)* tissue was cultivated in a growth medium containing luminous jellyfish DNA with the expectation that the rapidly dividing cells of the calluses would incorporate the foreign DNA. Spectrophotometry in the wavelength range of 450-570 nm was used to measure the luminescence of the African violet tissue cultures. This presentation is a report on the results gathered from this investigation.

S. Couch and C. Babayco, Department of Physical and Biological Sciences, Columbia College.

**IDENTIFICATION OF COCAINE AND COCAINE METABOLITES IN EAGLE BLUFFS CONSERVATION AREA.** Cocaine, a widely used illicit drug, has been previously detected in various natural waterways. Due to its physiological activity, it is a potential pollutant of concern in environmental waters, even at low doses. In this study, water samples were collected from within the Eagle Bluffs Conservation Area in McBaine, Missouri and analyzed for the presence of cocaine and its metabolites. Samples were concentrated using solid phase extraction, derivatized using pentafluoropropionic anhydride and pentafluoropropanol, and analyzed by gas chromatography - mass spectroscopy (GC-MS). These samples show highly variable concentrations of cocaine and its metabolite cocaethylene.

K. Smith, A. Tempel, Department of Chemistry, State Fair Community College. **QUANTITATIVE WATER ANALYSIS: A “NU” VARIANT ON WATER TORTURE USING MICROLAB FASTSPEC 528.** Water quality is a topic that is often explored in undergraduate and graduate science curricula.  This project provides a method appropriate for first semester chemistry students to test water using both qualitative and quantitativemethods as a part of a hard water testing lab.  The presence of soluble ions will be identified through ionic precipitation and the measured concentrations of each species will be compared to EPA standard regulations for desired water quality.  This lab tests selected qualities of water samples, such as pH, hardness, soluble ions, and turbidity using all of the ACS suggested guidelines for a first semester chemistry class.

A. Magras and J. Miranda, Department of Chemistry, State Fair Community College. **RAMAN SPECTROSCOPY: THE VERIFICATION OF ACETYLSALICYLIC ACID.** Raman spectroscopy allows undergraduate non-science major students to compare and contrast various spectra to determine the presence of synthesized products while using modern technology to meet the state requirements of higher education. The purpose of this presentation is to describe the development of a protocol for Raman spectroscopy in an introductory level course focusing on acetylsalicylic acid (ASA). To accomplish this objective, student synthesized ASA is confirmed with Raman spectroscopy in addition to phenol and melting point tests. The authors (second semester general chemistry students) generated a protocol and library to allow CHEM 101 students to compare their synthesized product spectra to the library spectra. In conclusion, testing synthesized ASA with Raman spectroscopy enables students to utilize Raman spectroscopy to verify the presence of ASA.

**Poster Presentations:**

L. Lora, J. McDonald, D. Marsh and L. Gilbert-Saunders. Department of Chemical and Physical Sciences, Missouri Southern State University. **AN IMPROVED METHOD FOR REMOVING OLEIC ACID FROM QUANTUM DOTS**. Quantum dots (QDs) are quasi-spherical semiconducting nanoparticles which contain electrons that are bound in discrete quantum energy states and have a particle diameter less than that of its exciton Bohr radius. Lead sulfide and zinc sulfide quantum dots produced using a modified method by Hines and Scholes were examined by Scanning Electron Microscopy and Energy Dispersive X-ray Spectroscopy. Our analysis revealed the particles were still partially covered with oleic acid, the capping agent, and required more thorough cleaning to resolve distinct QDs. Therefore, further washing of the QDs by a modified established procedure was employed to rid samples of contaminants and obtain a proper dilution to accomplish image size and composition.

S. Sbei, College of Arts and Sciences, Biomedical Science, Maryville University. **THE INVESTIGATION OF ANTI-DIABETIC ACTIVITIES OF OLEA EUROPAEA PRODUCTS**. In Mediterranean countries, it is believed that the leaves of Olea europaea have a strong anti-diabetic activity in addition to other multiple activities. Antidiabetic activity is often studied by measuring the absorbance of a sample inhibited by an enzyme such as alpha-glucosidase. This research project aimed to compare four extracts of each of: the leaves, olive oil, and commercial pills made from the leaves. Ultimately, the commercial pills are compared to the leaves to find out whether they share the same anti-diabetic activity. The olive oil, however, is used to learn whether the activity is exclusive to the leaves or if it is inclusive to different products of the Olea europaea tree. The four extracts were harvested by using hexane, ethyl acetate, methanol and water (in that order) as the solvents. Buffer, PNPG and alpha-glucosidase enzyme were added to the extract at different molarities, then the absorbance was measured. It appeared that methanol extracts of both the leaves and the pills had been inhibited the most by the enzyme. Olive oil, on the other hand, showed minimal inhibition in comparison.

J. Raymond, G. Ward, and Dr. Gilbert-Saunders, Division of Science, Chemistry, Missouri Southern State University. **METHOD DEVELOPMENT AND COMPARISON OF NIOSH 2541: FORMALDEHYDE.** Method development is an important process of chemical analysis to ensure accurate and reproducible results. The goal of this project is to develop a method in which formaldehyde concentrations from air samples in university cadaver labs can be analyzed. The NIOSH 2541 method is often employed when analyzing formaldehyde in air samples by utilizing gas chromatography (GC) and an adsorbent bed. In order to improve the resolution of the toluene and oxazolidine derivative peaks, NIOSH 2541 was augmented including changes to the flow rates and pressure for GC analysis. This new methodology was used as a platform to create two calibration curves, one with the pure oxazolidine formaldehyde derivative and the other with diluted formaldehyde solutions over 2-(hydroxymethyl)piperidine on the sorbent bed. Future work is needed to identify any calibration inconsistencies and refine the sampling process before being used in a cadaver laboratory for testing.

C. Corlett, L. Gilbert-Saunders, Division of Chemistry, Missouri Southern State University. **SYNTHESIS OF VARIOUS METAL THIN FILMS BY A SOLUTION PASTE FOR APPLICATIONS IN SOLAR CELLS.** Greenhouse gas emissions have been a growing concern in recent years pushing research efforts into alternative energy sources such as solar energy. There are many varieties of solar cells, one of the newer types being made of thin films. The initial prototype consists of a metal thin film of *Cu2ZnSnS4* (CZTS). The scope of this project is to replace the “Sn” in the prototype with GeS (*CuZnGeS*, CZGS) and PbS (*CuZnPbS*, CZPS). These materials were chosen for their low cost, commonality and similarities to silicon, the most common semiconductor for solar cell applications. These three thin films can be prepared by a solution based process, using metal salts to limit exposure to toxic chemicals. The elemental composition and morphology of the CZTS thin film were confirmed using Electron Dispersive X-ray Spectroscopy and Scanning Electron Microscopy. The surface of the film was determined to be mostly uniform with localities of higher material density and/or voids.

N. Majid, Department of Science and Mathematics, Maryville University. **BIOASSAY GUIDED CHEMICAL INVESTIGATION OF NIGELLA SATIVA SEEDS.** A bioassay guided chemical investigation of N. sativa seeds yielded two major constituents. Nigella sativa seeds were extracted with hexanes, ethyl acetate, and methanol. All three of these extracts were then tested for their antibacterial activity and compared to that of commercially available black seed oil. All these extracts showed better inhibition than commercially available black seed oil.

**MAS Conservation Section 2017**

**Oral Presentations:**

N. Navarette-Tindall and S. Bartelette. College of Agriculture, Environmental and Human Sciences, Lincoln University. **THE FINCA PROJECT IN MISSOURI: FAMILIES INTEGRATING NATURE, CONSERVATION AND AGRICULTURE**.A “finca” refers to a small farm in Latin America where fruits, flowers and vegetables are produced for family consumption and income. The main goal of this project is to promote the use of native edible plants as specialty crops and increase the knowledge of native plants for conservation through outreach and education. Objectives: to establish demonstration FINCAS in Missouri and to evaluate 20 or more Missouri native plants for growth and production during a 5 year period. Two finca models have been established in Missouri, one at LU campus and one in Haywood City, in the Bootheel region. Finca plots are also established at two LU-farms. Missouri fincas consist mostly of native plants, herbaceous and woody. Fincas are 2 acres or less, and can be established in rural or urban areas. Perennial wildflowers and grasses are planted to provide habitat for pollinators, birds and other wildlife. An event called ‘Dining Wild’ has been offered since 2012 to promote native plants in regular dishes. It has brought close to 1000 participants, and 400+ individuals have participated in food tasting assessments. Survey results show that 80% of these people tried native edible plants for their first time and 50% of them have established native edibles in their farms and gardens. The FINCA project is funded by the National Institute of Food and Agriculture (NIFA).

L. Thomas and T. Boman. Department of Biology and Environmental Health, Missouri Southern State University. **CONTINUING ASSESSMENT OF CLEAR CREEK, SPRING RIVER WATERSHED, MO, FOLLOWING FISH KILL IN MAY 2014.** The quality of our water should be maintained and protected, as one person’s wastewater is another’s future drinking water. In May 2014, the chemical ALIMET™ was mishandled by Tyson® factory of Monett, Missouri and as a result discharged to the Monett Municipal Wastewater Treatment Facility (MMWTF). This resulted in a failure of the biological treatment at the plant, which then unknowingly discharged effluent with high ammonia concentrations into Clear Creek, MO. This resulted in the death of 100,000 fish of varying species, as well as invertebrates over a stream reach > 8km. The Missouri Department of Conservation estimated a 5yr recovery window. This study was designed to monitor the chemical, bacteriological and biological conditions at three sites on Clear Creek as it recovers. Three sampling locations, Sites 1, 2 and 3 are approximately 2.3 km, 5.4 km and 10.0 km downstream of MMWTF, respectively. The chemical parameters tested were: dissolved oxygen (mg/L), pH, temperature (ºC), conductivity (µs/cm), turbidity (NTU), ammonia (mg/L), nitrate (mg/L), soluble reactive phosphorous (mg/L), and total suspended solids (mg/L). Bacteriological tests included total fecal coliforms and *Escherichia coli*. A benthic macroinvertebrate collection will occur in late March 2017. Currently, results indicate decreasing concentrations of nutrients, conductivity and bacteriological parameters moving downstream from the MMWTF. In 2016, Site 1 macroinvertebrate scores indicated the poorest water quality. The results indicate that recovery may take longer for stream reaches more greatly impacted by the fish kill.

O. Akinola and J. Adegoke. Department of Geosciences, University of Missouri-Kansas City. **IMPACT OF LAND USE LAND COVER CHANGE ON LAND SURFACE TEMPERATURE: CASE STUDY OF OSOGBO, NIGERIA.** Urban areas are progressively developing to accommodate the demand for residential, commercial and institutional purposes. These circumstances have led to an increase urban temperature arising from deforestation and loss of most vegetated areas in cities. This study examined the impact of land use and land cover change on land surface temperature in Osogbo and environs between 1984 and 2014. Data used include satellite images of 1984 and 2014 with 30 meters resolution. A 1991 topographic map of the study area was also used. Land use land cover dynamic was estimated using supervised classification and field surveying. Land surface temperature was computed using thermal bands and models developed in the literature. Results indicate that natural areas (vegetation, water bodies) are drastically reducing while human-built areas (farmlands, built-up) are all increasing. A rise in land surface temperature is also displayed as more surfaces are built. The study concludes that rapid urban growth and loss of vegetative areas have increased the surface temperature and microclimate of the study area. Some control measures to regulate the depletion of urban vegetation through various land use and anthropogenic activities were highlighted.

T. Masters. Department of Biology and Agriculture, University of Central Missouri. **A SUSTAINABLE BUSINESS MODEL FOR SODA POP MANUFACTURING.** Sustainability is most commonly defined as doing things now that will preserve the environment for the future. Large soda pop companies claim that they are making great strides to maintain environmental and economical sustainability. In reality, little effort has been made to improve sustainability and lessen impact on the environment. They believe that making their plastic bottles recyclable and using energy efficient machinery is more than enough. These large soda manufacturers often fail to even mention efforts of making a switch to ingredients that are more sustainable in agriculture and healthier for individuals. This presentation examines how soda pop manufacturers can make healthier carbonated beverages, while reducing pollution, without breaking the bank. The research is based on a review of sustainable practices in the US and firsthand experiences in soda pop manufacturing. The results of this literature show that soda pop manufacturers need to rework their business models from the ground up. The sustainability opportunities are either being missed or ignored by many manufacturers and an effort on sustainability is not being put out. Many aspects of the current process have potential for improvement, from the packaging to the ingredients in the beverage. Completely restructuring the business model of all soda pop manufacturers can lead to a brighter, cleaner, and healthier tomorrow for Americans, and the rest of the world.

A. Long and J. Willand. Department of Biology and Environmental Health, Missouri Southern State University. **VEGETATION ANALYSIS OF MISSOURI SOUTHERN STATE UNIVERSITY PRAIRIE.** Historically, it is estimated that Missouri had 5.7 million hectares of tallgrass prairie but there has been a 99.9% decrease of those lands. Tallgrass prairie contains a variety of diverse species assemblages that are quickly becoming endangered, threatened, or extinct. This study was conducted on the Missouri Southern State University prairie, an approximately 40-acre remnant prairie in Joplin, Missouri. I quantified plant cover, species richness, diversity, frequency, and ratio of native to exotic plant species in 40 study plots. Vegetation was sampled three times during the growing season to account for the different phenologies of the plant species using a modified Daubenmire cover class system. A total of 117 plant species from 35 families were encountered in the sampling plots. The Shannon Diversity Index for the prairie was 4.03. The five most frequently encountered species in the prairie were *Coreopsis grandiflora*, *Carex meadii*, *Ruellia humilis*, *Erigeron strigosis*, and *Plantago virginica*. The five-plant species contributing the greatest amount of cover were *Diodia teres*, *Schizachyrium scoparium*, *Rhus copallinum*, *Andropogon gerardii*, and *Aristida oligantha*. In comparison to other remnant tallgrass prairies, MSSU prairie had higher species richness and diversity than those seen in Illinois, Iowa, and Texas. Even with the conservative sampling method used during this study, a significant number of plant species were identified, which further supports the fact that remnant plant communities, such as MSSU prairie, harbor significant species richness and diversity at small spatial scales.

**Poster Presentations:**

N. Navarette-Tindall and S. Bartelette. College of Agriculture, Environmental and Human Sciences, Lincoln University. **NATIVE PLANT OUTDOOR LABORATORIES FOR EDUCATION AND OUTREACH AT LINCOLN UNIVERSITY**.Native Plant Outdoor Laboratories exist at LU campus in Jefferson City and in the grounds of the Martin Community Center and Nicholas Beazley Aviation Museum (MCCNBA) in Marshall, MO. Both projects are comprised of plants that found in various natural areas in Missouri. They are approximately 2 acres in size and have more than 125 native species, woody and herbaceous. The main goal is to offer accessible locations where students, faculty, farmers, communities and the public at large learn to identify native plants for landscaping, soil conservation, pollinators and for their potential as specialty crops. Workshops and hands-on activities are offered throughout the year. In both locations, staff of the NPP trained local volunteers to help with maintenance. Short term outcomes include increased interest in using native plants in all aspects described above; medium term goals are to increase the number of people visiting for education and/or enjoyment and develop a native plant curriculum for informal and formal training; longterm goals are to train volunteers to become mentors for those wanting to establish native plant gardens. We expect these projects can be utilized as models for adoption in academic institutions and other public places. Financial support was provided by the National Institute of Food and Agriculture (NIFA). In Marshall, funds were provided also by the Buckner Foundation in collaboration with the MCCNBA.

A. Sharma1, B. Ambrose2, M. Raimund Bayan1, S. Upendram3. 1Department of Agriculture and Environmental Science, Lincoln University, 2Double T. Creek Farm, 3Missouri Department of Natural Resources. **MISSOURI GLADE ECOSYSTEM RESTORATION AND MANAGEMENT: RESPONSES FOLLOWING 8 YEARS OF RESTORATION TREATMENTS IN CENTRAL MISSOURI.** The majority of Missouri’s estimated 81,000 ha glade ecosystems are highly degraded, leading to increased rarity of many floral and faunal species that rely on them. Restoration of these ecosystems typically involves removal of woody vegetation, especially red cedar, from the site and introduction of a fire regime. Seeding with native grasses and forbs is sometimes employed to accelerate process of restoration. In this study, we treated a degraded glade site in central Missouri to restoration treatments including hardwoods removal, prescribed burnings, and seeding with native species. After 8 years of these restoration treatments that included 4 prescribed burns and seed mix application following NRCS guidelines, we re-examined the groundcover community and estimated the measures of species richness, composition, and diversity using six 0.25m2 quadrats along a 20-m transect replicated three times. Overall, we observed 74 species, out of which 52 were native with species richness (mean±sd) of 13.5±5.1/0.25m2 quadrat. 55% of all species were perennial while 38% were annual. Native forbs and grasses were the dominant physiognomic group with Relative Importance Values (RIV) of 34.4 and 25 respectively. Non-native forbs and grasses had RIVs of 22.4 and 8.6, respectively. At species level, *Anagallis arvensis*, *Bouteloua curtipendula*, *Schizachyrium scoparium*, and *Panicum flexile* were the most dominant with RVIs between 7 and 6.3. Floristic Quality Assessment of the vegetation resulted in Native Floristic Quality Index of 8.7±3.6 and Native Mean coefficient of conservatism (C-value) of 2.9±0.7.

K. Ward. Department of Life and Physical Sciences, Lincoln University. **INNOVATION AND IMPLEMENTATION IN CONSERVATION AGRICULTURE TECHNOLOGY: THE NITROGEN INDEX.** Nitrogen fertilizers are used in agriculture throughout the world because their application improves crop yields, farmers’ livelihoods, and global food security. Inefficient application offertilizer, however, can result in higher operational costs for farmers and loss of reactive nitrogen from agricultural systems which is harmful to the environment. The Nitrogen Index, a conservation agriculture tool, allows nutrient managers to quickly determine the most efficient usages of nitrogen in a given situation and assess the risks of nitrogen loss. A free PC® version for use on desktop and laptop computers is available to the public along with a free application (“app”) for smartphones and tablets.This technology is used widely in the United States and has been downloaded by users in 61 countries. Worldwide, the Nitrogen Index has been used for farming, research, education, teaching, and consulting purposes by individuals, businesses, and state and federal agencies. Use of the Nitrogen Index app on small portable devices makes on-site assessments possible wherever wireless connection is available. Increasingly widespread dissemination and utilization of this tool as a result of its accessibility and convenience results in improvements in nutrient management practices globally with greater economic and environmental outcomes.

C. Fisher1, S. Peper2, S. Lanning1, W. Mabee1, M. Combes3. 1Missouri Department of Conservation, Central Region Office and Conservation Research Center, 2Missouri Department of Conservation, St. Louis Region Office, 3Missouri Department of Conservation, Agriculture Systems Field Station. **HABITAT CHARACTERISTICS AND NEW LOCALITY RECORD FOR A VULNERABLE CRAYFISH SPECIES IN MISSOURI.** An adult Form I male specimen of the crayfish species *Cambarus maculatus* (Freckled crayfish) was found in an aquatic macroinvertebrate community sample collected from a reach of an unnamed tributary to James Branch Creek in the Meramec River drainage basin during 2015. Habitat characteristics of the stream reach where *C. maculatus* was found to occur are provided, and sampling techniques and taxonomy used in collection and identification of the specimen are presented. *Cambarus maculatus* is a crayfish species of conservation concern and ranked vulnerable in Missouri where it has a distribution restricted to the Meramec River drainage basin and occurs naturally nowhere else in the world.

**MAS Geography Section 2017**

**Oral Presentations:**

G. Cameron, M. Mathews, N. Naylor, J. Schuyler, T. Vansell and K. Wiesehan. Department of History and Geography, Lindenwood University. **Ferguson/Lindenwood Housing Survey Phase 2.** A sidewalk survey of homes was conducted using the ArcGIS Collector App with the purpose of providing the City of Ferguson with data on their housing stock. Homes were evaluated based on damage to the windows and doors, damage to the roof and siding, presence of overgrown vegetation, and foundation type. The project gave students real world experience in designing and implementing a GIS project using out-of-the-box tools from the ESRI ArcGIS Desktop and Online platforms.

B. Chikuru. School of Environmental, Physical and Applied Sciences, University of Central Missouri. **EATING BUGS TO COMBAT MALNUTRITION IN THE DEMOCRATIC REPUBLIC OF THE CONGO.** The Democratic Republic of the Congo (DRC) is still, after so many years of independence, a paradox that puzzles many. Despite the abundance of resources and tremendous agricultural potential, the Country remains significantly poor; in fact, the World Food Program (WFP) reported in 2013 that more than 70 percent of the population lived below the poverty line. The United Nations’ Human development Index ranked the DRC 176th out of the 188 Countries included in the assessment (HDI Countries and Ranks, 2014). Moreover, the malnutrition rate is alarming, and there is still no concrete solution in sight. At least 6.4 million people are reported to be in food security crisis by the WFP. Since 2013, the United Nations (UN) has urged the consumption of insects as a nutritional source. The goal for this research paper is to look at how insects could be adopted as a food source for the DRC, how other successful countries have achieved this feat, and the major obstacles to this practice. This research relies heavily on official reports from international organizations such as the United Nations, independent research from experts in entomophagy and personal experience as a citizen from the DRC to a much smaller extent.

S. A. Coppersmith. Department of History and Geography, Lindenwood University. **World Regional Geography and Distant Suffering: Student and Faculty Perceptions of Moral Obligation.** The purpose of the research is to examine attitudes, feelings, perceived moral agency beliefs and prosocial actions of undergraduate World Regional Geography students and their professors at two Midwest universities. The context and theoretical framework for this ongoing research is positioned within the study of world regional geography courses at two diverse campuses in order to better understand students’ and professors’ perspectives and expectations for action/agency while learning or teaching about global environmental and human issues as experienced in world regional geography courses. Theoretical backgrounds include living in a globalizing world, being a witness to distant suffering, geography related to moral agency and social justice, and student and instructor perspectives of morality and prosocial behavior in response to human suffering. The cross-case study examines student survey responses, student interviews, and a written reader-response to a global issue taught in undergraduate World Regional Geography courses along with geography professor interviews.

T. Gibson. School of Environmental, Physical and Applied Sciences, University of Central Missouri. **THE ADVANTAGES AND DISADVANTAGES OF WATER PRIVATIZATION AND ITS IMPACT ON GOVERNMENT AND CITIZENS.** According to the World Health Organization and UNICEF Joint Monitoring Programme, 10% of the world, or approximately 663 million individuals, does not have access to safe drinking water. Increasingly, financial institutions such as the World Bank have financed infrastructure projects in many developing countries in Africa, Latin America, and Asia. These economic and infrastructural development projects are considered to be important for improving the quality of life for developing populations and for allowing more individuals access to clean drinking water. This research explores the privatization of water resources in developing countries and contributes to the debate regarding water privatization and the extent to which citizens benefit from such policies. Cases of water privatization done in India and Tanzania by the International Finance Corporation will be analyzed and compared to determine what impact water privatization projects has on both the government and its citizens.

L. Liu. School of Environmental, Physical and Applied Sciences, University of Central Missouri. **ENVIRONMENTAL HEALTH, SAFETY, AND SUSTAINABILITY: A TALE OF TWO CITIES IN CHINA.** Current literature tends to view problems of environmental health, safety, and sustainability separately, which have become increasingly critical. This paper argues that it would be beneficial to take a systems approach to investigate the issues together along with other concerns such as socio-economic inequalities, environmental pollution, and environmental justice. The paper was based on field work on two cases in China. The first case illustrates how relocation of polluting industries from urban to suburban areas in Dalian City caused severe environmental health problems and how environmental socio-economic injustice could be responsible for factory explosions that killed and injured workers. The second case investigates a dust explosion that occurred at a metal polishing factory located in Kunshan City. The explosion killed 146 workers and injured 114 others. In dealing with similar accidents, the government usually focuses on the safety issue by punishing those responsible for the explosions. Issues of socio-economic inequalities, environmental pollution, environmental justice, and sustainability are often ignored, making safety control ineffective.

A. McCarthy. Department of Communication Disorders, University of Central Missouri. **ENVIRONMENTAL FACTORS AFFECTING TELEPRACTICE AMONG THE STATES.**  As a relatively new use of modern day technology, there are many questions still left unanswered about telepractice. Telepractice is the use of video technology to deliver diagnostic and therapy services. In this particular case, it will refer specifically to speech and language pathology and audiology services. The purpose of telepractice is to provide these services over a distance. It can be utilized in many different situations as a way to overcome the challenges of providing services due to multiple different environmental factors. Some such potential factors include, but are not limited to, the lack of trained professionals and/or specialists in the area, hard-to-reach communities due to topography, clients who are unable to travel to receive services, size of the state, population density, and culture/religion/ethnicity. With telepractice being as new as it is, the requirements to provide services in this way vary between the states. This study attempts to discover which states use telepractice the most—using the American Speech-Language-Hearing Association’s 2014 SIG 18 Telepractice Services Survey—and the environmental factors contributing to this use. The survey shows differences among the states, however does not analyze the causes of these differences. Such data could be used to help the spread of telepractice and to assist in forming state and interstate legislation regulating telepractice.

**Poster Presentations:**

A. Koleiny, J. Adegoke, F. Sun. Department of Geosciences, University of Missouri-Kansas City. **CLIMATE VARIABILITY AND ITS IMPACTS ON CORN AND SOYBEANS IN THE MISSOURI RIVER BASIN.** Rainfall and temperature are the primary climatic drivers of agricultural production. The Missouri River Basin (MRB) is a large region that relies on consistent rainfall, as only 13 percent of the land is irrigated. Over the past 30 years, the frequency of billion-dollar weather events related to drought and floods has increased. This climate variability has impacts on not just the economy, but food security as well. As a result of such consequences, there is a desire to better understand the components of climate variability in relation to agricultural production. Principal Component Analysis (PCA) will be performed on daily PRISM datasets to better understand the relationship between climate variability and yields of corn and soybeans between 1985 and 2015. Preliminary results will be presented.

A. Aderonmu, J. Adegoke. Department of Geosciences, University of Missouri Kansas City. **PERCEPTION OF CLIMATE CHANGE BY MISSOURI FARMERS AND ITS RELATIONSHIP TO THE ADOPTION OF RISK MANAGEMENT STRATEGIES.** Projections from future climate models reveal a trend of increase in average global temperatures. This will likely result in the increase in both frequency and intensity of extreme weather events such as flood and drought. The negative feedback from these events will impact on agriculture across different scales- global, regional and local. The Midwest US, often referred to as the cornbelt region, with a farm gate value of about $200 billion, represents one of the most intense regions of agricultural production in the world. Even though farmers have been able to adapt to changing climate and climate variability in the past, in the 21st century, agricultural production will be sustained by the use of new strategies that manage the uncertainty associated with climate change. Since farmers play a major role in on-farm decision making, it is important to understand what their perception of climate change is and how this perception influences the use of various risk management strategies. With the aim to understand how resilient agriculture in Missouri is, this mixed methods study will answer the following questions: What are farmers’ perceptions of climate change? How does their perception influence their attitudes towards adaptation and climate risk management? What risk management strategies are most widely used among farmers in Missouri, on-farm strategies or market-oriented strategies? The hypothesis is that perception of climate change does not influence farmers’ adoption of risk management strategies. This hypothesis will be tested using two measures of perception; the Likert scale analysis and the Heckman two step analysis. Results from this study will contribute to the climate change- agriculture-risk management literature and provide information that will be beneficial to the various stakeholders in the agriculture sector.

T. Evans, L. Liu. School of Environmental, Physical and Applied Sciences, University of Central Missouri. **DOES THE ENVIRONMENTAL KUZENTS CURVE APPLY TO ST. LOUIS?** The environmental Kuznets curve (EKC) assumes that environmental pollution would follow an inverted “U” shape as it rises and then falls again with the increase of income per-capita. The EKC has been applied to many environmental aspects including air pollution. Many publications regard the EKC as a law, a pathway that societies must take on to achieve economic prosperity and environmental sustainability. On the other hand, the validity of those applications has been strongly contested. This research investigates if the EKC applies to St. Louis, Missouri. St. Louis is a major city along the Mississippi River with a population of 317,419. The city has a history of air pollution, including periods of smog which caused environmental health problems. This poster is a visual representation of the research demonstrating air quality changes in the city from 2000 to 2016. Attempts will be made to explore possible causes of such air quality changes and whether the EKC applies.

**List of Authors/Abstracts MAS Geology & Geoscience Section 2017**

**Oral Presentations:**

W. Hu, F. Liu, M. Dolan-Timpe and J. Yang. Department of Agriculture and Environmental Sciences and Cooperative Research Programs, Lincoln University. **base flow separationS BY VARIOUS methods in a claypan wtershed, Central missouri.**  Base flow is the ground water that feeds stream flow between precipitation events. Estimation of base flow is critical in watershed hydrology for water resources management and understanding the controls on water quality, particularly in claypan watersheds where peak flows are flashy and low flows are usually prolonged. Many methods have been developed for base flow separations, but none of them has been tested for suitability to claypan watersheds. A number of existing methods were tested in this study, including constant-slope, graphical filtering, and recursive filtering methods, using stream flow data collected from 2011 to 2014 in Goodwater Creek Experimental Watershed (GCEW). The results of tracer-based end-member mixing analysis (EMMA) were used as a benchmark to evaluate the performances of these methods. It turns out that all methods performed reasonably well for separating base flow, with R2 values ranging from 0.58 to 0.73 and slopes from 0.98 to 1.09 between the results of these methods and EMMA. The Chapman & Maxwell one-parameter recursive filtering method performed the best, with a R2 value of 0.73, a slope of 1.06 and an intercept of 0.06. This study demonstrates that base flow can be separated from stream flow alone in claypan watersheds and the methods could be extended to separate base flow from stream flow measured in the past decades to help understand how climate change affects base flow.

L. Speir and D. Bassett, Geography, Geology and Planning Department, Missouri State University. **HIGH RESOLUTION CONODONT BIOSTRATIGRAPHY OF THE EARLY MISSISSIPPIAN, KINDERHOOKIAN STAGE, CHESTNUT RIDGE SECTION IN SOUTHWEST MISSOURI.** This goal of this project is to establish high-resolution conodont biostratigraphy of the Kinderhookian-Osagean stage boundary (early Mississippian) at the Chestnut Ridge roadcut along U.S. Highway 65, roughly 30 miles south of Springfield, MO. This project is part of a larger project to determine the carbon and oxygen isotope stratigraphy of the early Mississippian of Southwest Missouri. Previous studies at the Chestnut Ridge locality have established low-resolution biostratigraphy of exposed Mississippian strata from the Bachelor Formation to the Elsey Formation. Thirty-six samples were collected at 0.3 meter intervals at the Chestnut Ridge roadcut from the Bachelor Formation through the Pierson Formation. Samples were dissolved using formic acid and separated by density using acetylene tetrabromide. Conodont elements of biostratigraphic importance were isolated and identified to species level and compared with previous studies in the area. High resolution sampling of the lower Mississippian at Chestnut Ridge revealed new first appearance datums for the genus *Bactrognathus* in the Osagean stage. This new FAD for *Bactrognathus* marks a distinct change in placement of the *Bactrognathus*–*Pseudopolygnathus* *multistriatus* Assemblage Zone from previous studies. The updated FAD for *Bactrognathus* places the base of the assemblage zone roughly 12 feet below its previous description. Future work on this project will involve resampling intervals with little to no yield in conodont genera. Additionally, conodont samples will be analyzed to create a δ18O curve in order to better understand climatic changes at the K-O boundary and the resulting implications for regional tectonic processes.

F. Liu, J. Yang, and M. Dolan-Timpe. Department of Agriculture and Environmental Sciences and Cooperative Research Programs, Lincoln University. **STREAMFLOW PATHWAYS IN A CLAYPAN WATERSHED IN CENTRAL MISSOURI.** Claypan is a sub-soil horizon of smectitic mineralogy that impedes percolation and promotes surface runoff. These soils, which encompass 33,000 km2 in portions of Missouri and Illinois, have long been thought to restrict contaminant transport into/from groundwater. However, recent studies have shown that claypan watersheds are vulnerable to the loss of agricultural chemicals, particularly nitrate. The purpose of our study was to understand the role of groundwater in regulating stream water quantity and quality in Goodwater Creek Experimental Watershed (GCEW) in northern central Missouri. Samples have been collected since 2011 from precipitation, stream water at three locations along the main stream, groundwater from twenty five wells with depths ranging from 3 to 15 m, and soil water from seven piezometers above the claypan. Mean nitrate concentrations were 4.1 ppm in stream water at the watershed outlet, 1.0 ppm in precipitation, 3.2 ppm in soil water at piezometers, and 18.9 ppm in groundwater. Using diagnostic tools of mixing model and end-member mixing analysis, three natural tracers were determined to be conservative – electric conductivity (EC), Mg2+ and Na+ and three end-members were identified to control stream water – surface runoff (chemically characterized by precipitation), interflow above the claypan (characterized by soil water in piezometers), and groundwater. Interflow and groundwater contributed, on average, 26% and 12% of stream flow at the watershed outlet, respectively. During low flows, however, the contribution of groundwater increased to 30-40%. Also, the mean contribution of groundwater increased to 16% at middle course and 19% at the headwaters. Nitrate concentrations in stream water were dominated by the contributions from groundwater during low flows, ranging from 50 to 90% at all stream sampling locations. This study highlights the vulnerability of groundwater to nitrate contamination, even in runoff-prone watersheds, and demonstrated its importance in regulating stream water quantity and quality in claypan watersheds.

**MAS Math and Computer Science Section 2017**

Oral Presentations:

D. Dave and S. Singh. School of Computer Science and Mathematics, University of Central Missouri. **Data mining techniques for classification and prediction of Estuary Eutrophication.** Estuaries around the world are home to over 60% of the total population. They have a very diverse eco-system. Eutrophication, leads to an increase in the nutrient content of these estuaries and result in invasive plant growth. This further increases the rate of loss of aquatic life due to depleting oxygen availability. Eutrophication is a threat to the estuaries and the population depending on it for food and water. The process of continuously monitoring estuaries, and eutrophication is expensive and slow. This process involves collection of eutrophic data over a long period of time, getting it evaluated by experts, and deriving conclusions based on it. In this project, we examine the possibility of isolating and identifying some key contributors to eutrophication from available estuary eutrophication data using machine learning techniques. We would then like to test if we can perform classification of eutrophication levels in estuaries based on these attributes. Preliminary evaluations have shown to have over 90% average classification accuracy of overall eutrophic conditions in the estuaries. The positive class under examination was class-eutrophic and the negative class was class-non eutrophic.

M. Dawson, Division of Science. Math and Computer Science, University of Missouri-St. Louis. **Technological Advancements for Intelligence Collection, Analysis, and Dissemination.** Recently some countries have fell victim to attacks from nation-states, cyber criminals, and bad actors resulting in loss of critical data or damage to critical infrastructure. Thus, there is an urgent need to design, implement, and deliver innovative solutions that meet the challenges through advancements in the collection, analysis. This research will provide insights into technological progress for all cyber intelligence. Additionally, technological advancements for subjects such as open source intelligence, human intelligence, geospatial intelligence, social media intelligence, and data science will be explored

D. Redden Jr. Division of Science, Math and Computer Science, University of MO –St. Louis. **BRINGING TECHNOLOGICAL CHANGES TO THE LARGEST AGRICULTURE INSTITUTION IN GUINEA.** Winrock has responsibility for management of the Agriculture Education and Market Improvement Program (AEMIP) in Guinea through funding from the United States Agency for International Development (USAID) Farmers to Farmers (F2F) program. The purpose of the project is to provide technical support for and training to the Institut Supérieur Agronomic et Vétérinaire de Faranah (ISAV/F), Guinea's largest agriculture university.  An open source document management system and propriety database were implemented to aid faculty and staff in becoming paperless.  Additionally, an onsite survey was conducted to determine the cyber security and technical aspects of the current implementation of the information systems.

N. Duncan, M. Tompkins, M. Kellmeyer, E. Bryan, and B. Sulivan. University of Missouri - Columbia. **TECHNICAL STORYTELLING ASPECTS OF CREATING A MOVING 360 DEGREE VIDEO**. Crafting a story using 360 degree video technology is an undefined area of video creation in both workflow and storytelling. Most 360 degree videos are stationary cameras set-ups that do not direct the viewer where to look. Our research concentrates on moving the 360 degree camera rig, made up of six GoPro cameras, to tell a more impactful story while focusing the viewer’s attention in the 360 degree environment. To focus the viewer’s attention to the correct area of the 360 degree environment, we invoked a set of elements to establish specific focal points in our video. These three primary features are: lighting, ambisonic audio, and blurred visual perception. By building emphasis with different forms of lighting, virtual audio, and controlled vision, we were able to assemble a story that allows viewers to feel as if they experienced the story first hand. Furthermore, adding a claustrophobic setting assisted with the goal of creating an encompassing 360 degree video that directs the viewer where to look within the 360 degree environment.

P. Gohil and S. Singh. Department of Mathematics and Computer Science, University of Central Missouri. **RELEVANCE MAPPING AND IMPACT COMPUTATION OF WIKIPEDIA EDITS.** Wikipedia is “Internet’s largest” as well as the “most popular general reference source”. It boasts over 38 million articles and is constantly growing. The open collaborative nature of Wikipedia results in 170,000 edits per day on its articles. Most revisions are minor, like spelling and grammar checks. The others are major, like change of information and addition or deletion of facts. Edits can further be classified as relevant and impactful or otherwise. Due to volume of edits, it is critical to automatically analyze the nature of these changes and help maintain the integrity of Wikipedia articles. This work aims at maintaining an automatically updated repository of links to Wikipedia edits. This real-time repository is then used to automatically calculate the relevance and impact of a major edit on a Wikipedia article. Use of dbpedia ontology, cognitive synonyms or synsets and concept based ranking help in the calculation of relevance and impact of edits. The information on relevance and impact is then used to collect statistics on attempts to vandalize Wikipedia articles. These measures help to increase the accuracy of the information provided by Wikipedia and make it more reliable.

K. Prasad Nandeti, A. Singh, M. Yousef, School of Computer Science and Mathematics, University of Central Missouri. **Randomization-based Block Cipher with Key-Mapped S-Box Selection.** This work presents a new encryption algorithm that expands the 240-bit input using a 16-bit pseudorandom number to resist plaintext-ciphertext correlation analysis. The algorithm uses 16 S-Boxes which are selected randomly based on the sub-key values throughout 64 rounds of substitution steps. Avalanche studies show an average of 128 bits of avalanche in a random sample. CBC mode has been adapted as a mode of operation for this algorithm.

**Poster Presentations:**

N. Duncan, M. Tompkins, M. Kellmeyer, E. Bryan, and B. Sulivan. University of Missouri - Columbia. **TECHNICAL STORYTELLING ASPECTS OF CREATING A MOVING 360 DEGREE VIDEO**. Crafting a story using 360 degree video technology is an undefined area of video creation in both workflow and storytelling. Most 360 degree videos are stationary cameras set-ups that do not direct the viewer where to look. Our research concentrates on moving the 360 degree camera rig, made up of six GoPro cameras, to tell a more impactful story while focusing the viewer’s attention in the 360 degree environment. To focus the viewer’s attention to the correct area of the 360 degree environment, we invoked a set of elements to establish specific focal points in our video. These three primary features are: lighting, ambisonic audio, and blurred visual perception. By building emphasis with different forms of lighting, virtual audio, and controlled vision, we were able to assemble a story that allows viewers to feel as if they experienced the story first hand. Furthermore, adding a claustrophobic setting assisted with the goal of creating an encompassing 360 degree video that directs the viewer where to look within the 360 degree environment.

**MAS Physics & Engineering Section 2017**

**Oral Presentations:**

J. Rodriguez, Basic Sciences Department, St. Louis College of Pharmacy. **Molecular biology oriented labs in introductory physics for the life sciences (ipls) courses.** St. Louis College of Pharmacy recently added IPLS courses to support new undergraduate majors in Biomedical Sciences. To make its labs more relevant to pharmacy-aspiring students, we developed new experiments that are biochemically and molecular-biology oriented. Topics include: Molecular Dynamics, Diffusion, Absorption Spectroscopy, Fluorescence, Quantum Mechanics in biological molecules, Electrophoresis, and Drug Metabolism.

J. Shaw, H. Chakraborty, Northwest Missouri State University, D. Monismith, Software Maintenance Group, Tinker AFB, Oklahoma, USA. **WAVEPACKET DYNAMICS IN THE SCATTERING OF HYDROGEN IONS OFF VICINALLY NANO-STEPPED METAL SURFACES.** We study the electron dynamics in monocrystalline Cu, Au and Pd surfaces with stepped vicinal structures modelled in a Kronig-Penney scheme. The unoccupied bands of the surface are resonantly excited via the charge transfer interaction of the surface with a moving hydrogen ion. The interaction dynamics are simulated in a quantum mechanical wavepacket propagation approach that used parallel computations. The survival probability of the interacting ion is calculated as well as the electron probability density at all times during the interaction. Animated videos are produced of the electron probability density which show that, when the electron is transferred to the metal, the first two image states are the most likely locations of the electron as it evolves through the superlattice. The survival probability shows peaks at those energies that produce standing waves between the steps on the surface when the electron is in the image state subbands.

T. O’Connor, J. Strosnider, C. Dunn, I. Mayr, K. Turner, J. Doran, A. White, N. Keithley, P. Eickhoff, S. Van Ausdal, and V. Hart, Division of Mathematics and Science, William Woods University. **Diffusive optical investigations of cellular structure via Scattering analysis using a near-infrared diode laser.** In the earliest stages of certain cancers, cell nuclei tend to enlarge and elongate. This process occurs at the sub-cellular level, on scales too small to be visible in a CT or MR image, and months before a tumor is visible. The nucleus accounts for a significant amount of the optical scattering which occurs in a cell and recent efforts in diffuse optical tomography have investigated the feasibility of early detection for these sub-cellular changes, “so-called” micro-cancer. However, the ability to distinguish these cells requires sufficient understanding of the involved scattering mechanisms. In this study, we investigated optical scattering patterns for five different cancer cell lines, which were irradiated in vitro by diode lasers at wavelengths of 532, 635, and 850 nm. The resulting patterns were collected with a laser beam profiler and were then analyzed in MATLAB using a 2D Fourier transform. Significant differences were observed in the appearance and spectral distributions for the various cell lines. Spherical WEHI-3 cells were used as a control and compared with MIE scattering simulations for spherical particles. Accurate quantification of these patterns could lead to the detection of cancerous cells at low concentrations in otherwise healthy tissue.

**Poster Presentations:**

J. Weigal, B. Spitznagel, and J. Rodriguez, Basic Sciences Department, St. Louis College of Pharmacy. **Biochemical measurement and physical modeling of drug metabolism in an introductory physics for life sciences (IPLS) lab.** Vision and Change [AAAS, 2011] outlines a blueprint for modernizing biology education that includes a listing of key concepts and competencies students need to succeed in 21st century Biology.  Here we describe an introductory IPLS lab that advances the reports’ recommendations on students’ abilities to tap into the interdisciplinary nature of science and to use modeling/simulation. Specifically, students in this lab activity learn to: (1) assemble a fluidic system that incorporates a 3D printed compartment containing liver microsomes; (2) utilize light absorption spectroscopy to monitor quantitatively how a drug is metabolized in realtime; (3) use modeling based on viscous flow, diffusion, enzymatic activity and decay, to determine what system is consistent with the data.

T. Callaway and S. Mitra, Department of Physics, Astronomy, and Material Science, 901 South National Avenue, Missouri State University, Springfield, MO 65809 **DEVELOPMENT OF SOLID-STATE SUPER IONIC ELECTRODE FOR ELECTROCHROMIC APPLICATIONS.** In this project, we report the development of a lithium ion-based solid-state electrolyte for electrochromic devices. An electrochromic device changes color reversibly and has great potential as an energy saving device. The device consists of two FTO-coated glass, which act as contacts. Tungsten oxide films were also deposited on one of the FTO contacts. We report the deposition of xLi2SO4-(1-x)(Li2O-P2O5) thin films on glass substrates using electron beam evaporation and tungsten oxide films using puled laser deposition. The electrolyte provides the lithium ions for migration into the tungsten oxide films. The performance of these lithium-based electrolytes will be discussed.

**MAS Science Education Section 2017**

**Oral Presentations:**

E. Koballa and P. Hill, Department of Physics and Engineering Physics, Southeast Missouri State University. **The EFFECTS OF TECHNOLOGY INTEGRATED INTO A PHYSICS CLASSROOM.** With technology becoming more prevalent in society, the education systems have begun integrating it into their curriculums. The goal of this research is to evaluate the effect technology has on the students in the course PH218 Physical Science: A Process Approach. Two groups of students covered topics of force and motion with a nontechnological approach. The first (control) group covered the topics of electricity and circuit with a nontechnological approach as well, while the second (experimental) group covered the same topics with a technological approach using the Exploring Physics app. Each group completed pre and post attitude surveys and conceptual tests. Student demographic data was also collected. Data and results will be presented and discussed at the meeting.

G. Ward, L. Gilbert-Saunders, Division of Science, Chemical Education, Missouri Southern State University. **QUANTIFICATION OF FORMALDEHYDE CONCENCTRATION: AN INQUIRY BASED LABORATORY IN GAS CHROMATOGRAPHY.** Formaldehyde has been shown to cause multiple symptoms in individuals who are exposed to high levels. This has proven to be especially problematic in cadaver labs used in universities where faculty and students are exposed to levels higher than federal guidelines dictate. In this research project, the problem of formaldehyde exposure was used as a platform for an inquiry based laboratory to examine gas chromatography. Students completed a laboratory using the National Institute for Occupational Safety and Health (NIOSH) procedure #2541 which tests for formaldehyde concentration in air samples using standardization by an oxazolidine derivative. The students were then given a quiz based on the laboratory with questions ranked according to Bloom’s taxonomy, so the level of learning could be assessed.

**Poster Presentation:**

M. Cooksey, J. Jones, K. Lane-deGraaf, Department of Biological and Physical Sciences, Fontbonne University. **GIRLS-IN-SCIENCE: HANDS ON SCIENCE EDUCATION.** In our ever-changing world, it is more important than ever to challenge societal norms to make a difference in society. The “Girls in Science” summer program aims to help girls, specifically in the 7th-9th grade range, ignite a passion for science. Middle school girls have been shown to develop a negative outlook in science, fed by the lack of visible women mentors and by the belief that science is hard. Targeting this age group with science outreach programming can help girls sustain their excitement for science through high school and encourage them to choose to take more science classes in the future. This is important because, as of 2012, over half (57%) of girls do not consider a career in the science, math, or engineering fields. In 2009, The Harris interactive for the American Society for Quality found that only 10% of girls said their parents have encouraged them to pursue a career in engineering, while 21% said their parents encouraged a career in acting. In order to inspire these young minds, our scientists are trained in experimental design and analysis, genetics and PCR, parasitology techniques, coding and model building, and animal behavior. In addition to those experiments, we also 3D print our own lab equipment and then use it in the labs. This is not only a fun experience for young girls, it is an opportunity for our society to inspire more girls to pursue careers in science. Importantly, our early assessment of young women involved in the program demonstrates a significant impact in their lives, with 100% of participants enrolling in advanced math and science classes in high school and all participants reporting a positive change in their thinking about how science can work in their lives.

**MAS Social and Behavioral Sciences Section 2017**

**Oral Presentations Session I:**

C. D. Session and T. L. Hickerson, Department of Social and Behavioral Sciences, Lincoln University. **THE EFFECTS OF COLORISM AND SELF-PRESENTATION AT AN HBCU.** This study surveyed how HBCU students would select a mentor based on skin color and ethnic identity. Four conditions were created by varying color of skin (light, dark) and description (Black, African American) of a hypothetical person. One of two photos featured the same person edited to be either dark- or light-skinned. Each photo was given with one of two descriptions, either describing the person as “Black” or “African American.” Participants were then given a survey on their likelihood of choosing the hypothetical person as a mentor. We measured their ethnic consciousness along with their trust in the mentor, in addition to the perceived attractiveness, social skills, and intelligence of the mentor. Based on previous research, we expect to find that the person identified as Black and dark-skinned will be seen as a less favorable mentor. Results will indicate the degree of discrimination those labeled as Black and dark-skinned experience on HBCU campuses.

M. Gardner-Brown, Central Methodist University. **GMO’S IN MAINSTREAM MEDIA: A FRAMING ANALUSIS OF MAJOR US NEWSPAPERS**. Even in the face of relatively conclusive scientific consensus, the debate concerning the safety and ethical implications of using Genetically Modified Organisms (GMO’s) in the American public has persevered. Some scientists insist that the harm GMO’s may present comes, not from consumption, but from wide reaching and disruptive ecological effects. While several European countries have worked to phase out the presence of genetically modified crops, in the US they have remained commonplace in the agricultural sector and food industry. This sense of global ambiguity in terms of perceptions towards GMO’s only fuels further controversy in the US. Disparities in attitudes towards GMO’s domestically may be informed, not by scientific data and legislative measures, but by differences in tone and framing techniques on the part of the almost atmospheric presence of American media. A content analysis of 45 newspaper articles was performed to determine how GMO’s were portrayed by three national newspapers. This research aims to answer the question as to whether there is a significant correlation between the type of newspaper, and: 1) tone, 2) sourcing, 3) and frames. Such correlations would further exemplify the communication theory of agenda setting, explaining that complex issues, such as our perception of GMO’s, are actually informed by the prioritization of information on the part of media.

S. Silva, F. Earl, S. Westhoff, and M. Kinsey, Department of Social and Behavioral Sciences, Lincoln University. **ISLAMOPHOBIA IN UNITED STATES: A STATISTICAL PERSPECTIVE OF ANTI-MUSLIM PREJUDICE**. In the present study, we will investigate the participants’ attitudes toward people of Muslim faith. Participants will complete a questionnaire packet which will include basic demographic information, the Racial Prejudice Scale, Akrami, Ekehammar & Araya, 2000, the Social Scale and Social Scenarios Scale, Byrnes & Kiger, 1987. Participants will be divided into groups based on their race and gender. Prejudice will be measured by having the participants complete the Racial Prejudice Scale and the Social Scale using a 7-point scale. Participants will also evaluate scenarios describing conflicts over situations of prejudice or discrimination. Data will be analyzed in a 2 (race: Caucasian vs. African-American) X 2 (gender: male vs. female) ANOVA on prejudice.

D. N. Jordan and T. S. Gray, Department of Social and Behavior Sciences, Lincoln University. **THE IMPACT OF MARIJUANA HEALTH WARNINGS ON STUDENT ATTITUDES.** This study examined whether college students’ attitudes towards marijuana are affected by receiving scientific information about the consequences of marijuana use. One group of students was given information about the health risks and benefits of marijuana. Another group was given no information on the risks and benefits of marijuana. Subsequently, participants were given surveys on their attitudes towards marijuana and if marijuana should be legalized. In addition, we measured perceived availability of marijuana, how often they use marijuana, their academic habits (studying, attendance in class, GPA), and how involved they are at Lincoln University. The results showed that students who were given the information on health risks and benefits responded in a more negative way towards marijuana legalization and use, than the students who did not receive the health risks and benefits of marijuana. The results suggest that classroom based interventions might be helpful in reducing college student use of marijuana.

D. Johnson and J. Rives, Department of Social and Behavior Sciences, Lincoln University. **COLLEGE STUDENTS’ PERCEPTIONS OF SLEEP DEPRIVATION.** This study researched college students’ perception of the harm caused by sleep deprivation. Students received a survey that described either an individual who received an average of eight hours of sleep or an individual who received an average of only five hours of sleep per night. After examining the description of the student, participants completed a survey examining perceptions of social, educational, and physical activity deficits associated with sleep deprivation. We expect that the participants will perceive sleep deprivation in college as unhealthy for the human body and mind. The results will show the extent of college students’ knowledge of sleep deprivation.

**Oral Presentations Session II:**

R. Blair, Department of Psychology, Lindenwood University. **LIFE SATISFACTION THROUGHOUT EMERGING ADULTHOOD.** Emerging adulthood is a period of life characterized by high expectations and new challenges, including attending college, starting a career, establishing financial independence, planning a family, and more. This research looks to examine levels of life satisfaction amongst emerging adults ages 18 to 33 and how childhood trauma, social support, mental illness, and gender may affect levels of life satisfaction. Previous research has shown that one in three young adults report experiencing low satisfaction with life (Leach, 2009). Additionally, cross-sectional research has shown that both males and females feel a significant decrease in life satisfaction during adolescence from age 11 to age 16, with satisfaction being lowest for females (Goldbeck, Schmitz, Besier, Herschback, & Henrich, 2007). It is well known in the mental health community that childhood trauma can have many negative effects on an individual including – but not limited to – depression, PTSD, anxiety, low self-esteem, learning disabilities, and poor physical health. Despite this, little research has studied life satisfaction in emerging adulthood and, with emerging adulthood being a relatively new phase of life, there is a gap in previous research that needs to be filled. All data was collected via an anonymous online survey which was distributed primarily through social media sources and secondarily through fliers hung around a Midwestern four-year university. Participants include faculty, staff, and students from various universities as well as other individuals reached through social media. A few preliminary research questions that will be addressed include: Does childhood trauma result in higher levels of satisfaction later in life? Do emerging adults report increasing levels of life satisfaction as they reach their late twenties and early thirties? How do men and women compare in regards to overall life satisfaction, social support, rates of trauma, and rates of mental illness? It is hypothesized that emerging adults will experience increasing levels of life satisfaction as they mature. The researcher will also discuss how we may use this research to help emerging adults in the future.

T. D. Daniels, Department of Social and Behavioral Sciences, Lincoln University. **FACULTY PERCEPTION OF COLLEGE STUDENTS’ USE OF CELL PHONES IN CLASS.**  This study examined faculty perception of Black and White college students’ use of cell phones. Faculty members were given photographs of college students using cellphones in a classroom setting. The pictures varied by ethnicity (Black or White) of the students. Faculty members were given a descriptive paragraph on the students’ performance in class which remained the same in each condition. After faculty members observed the photograph and descriptive paragraph, they completed a survey measuring the degree to which they thought the student was addicted to cell phones, student competence, academic potential, need for tutoring/remedial work, and estimation of student GPA. I predict that the professors will be more likely evaluate the Black student negatively.

N. Foland, Division of Social Sciences, Central Methodist University. **LOOKING FOR SOCIAL CUES: ANALYZING PROSOCIAL AND ALTRUISTIC BEHAVIOR IN *BLUE’S CLUES*.** Living in an era where television is the best way to learn new information, the decision can be tough figuring out what children should watch to get their dose of educational TV. In this paper, prosocial and altruistic behavior will be defined to get a better understanding of how to spot those actions. A history of *Blue’s Clues* will be provided, including how long the show has aired and what awards it has received. A content analysis will be performed using *Blue’s Clues*. The show will be analyzed for prosocial and altruistic behavior and will be compared to the results of other content analyses of prosocial behavior in children’s programming to show that this educational program is one of the best choices for children’s television shows that portray prosocial behaviors.

D. L. Williams and L. A. Conley, Department of Social and Behavioral Sciences, Lincoln University. **ATTITUDES TOWARDS INTERRACIAL RELATIONSHIPS AMONG COLLEGE STUDENTS**. This study examined college students’ opinions on interracial relationships. Lincoln University students were given a survey about attractiveness to other races, experience with interracial relationships and friendships, and openness to interracial dating as a whole. The survey also included a scenario about an interracial couple that manipulated race through the names of each couple. Half of participants received a paragraph with a Black and White couple (Black man and White woman), and the other half received the same paragraph about an Asian and White couple, but the only distinction was the names. The paragraph described their relationship, and this was followed by different questions about the longevity and health of the relationship. We predict that Black men, White women, and those with prior interracial dating and friendships will express the most acceptance of interracial relationships. The Black and White couple is expected to be the least accepted interracial couple.

P. S. Smith, Association for the Scientific Study of Religion. **THE ROMAN HARBOR BUILT BY HEROD THE GREAT: A MORE COMPLETE RECONSTRUCTION.** Two thousand years ago, (22-10 BC) on the windswept coast of the eastern Mediterranean, with Roman engineering and largesse, Herod the Great accomplished a remarkable feat by constructing a whole metropolis known as Caesarea. But just as remarkable--using formed pozzolana hydraulic concrete, Herod built at the foot of the city a colossal harbor, which would make Caesarea the maritime trading oasis of its day. Starting with geographical and weather conditions lending themselves to overall shape, the basic dimensions and appearance given by Josephus about the harbor is confirmed and expanded on archaeologically. The towers he mentions is also evidentially confirmed. Considering Rome was militarily driven it makes sense the harbor was built in military fashion where towers would play an essential role and would have been a prominent skyline feature. The number and size of towers at the harbor can be approximated by comparing known Roman tower and wall widths and heights with the missile range of the day and correlating that with other known dimensions of similar structures, especially those built by Herod in Jerusalem. Finally, a complete picture could not be made without considering the significant size and purpose of what Josephus referred to as *Procumatia*, or “the breaker of waves”. Its morphology, purpose and defensive possibilities is better known by comparing historical record to archaeological find and modern understanding of hydrodynamic engineering.

**Poster Presentations:**

G. Kozma, Department of Psychology, Missouri Valley College**. THE EFFECTS OF TIME CONSTRAINTS ON INHIBITORY PROCESSES during a semantic identification** **task.** This study examines the effects of time constraints on a lexical identification task in Spanish-English and Portuguese-English bilinguals. The procedure is going to measure the time-lapse of the participants while performing the task, and how adding time-constraints may impact their performance. The procedure used in this study is a replication of the procedure created by Macizo, Bajo and Martin (2010), adding the time-constraint component in order to assess its impact. The procedure will require participants to decide whether a pair of English words are semantically related, and their response will be measured with a yes or no response. Some of the English words will be paired with English-Spanish or English-Portuguese homographs, which are words that share the same orthography but have different semantical meanings. Previous research demonstrates that participants’ responses are slower when these homographs are presented to the participants. This study’s hypothesis is that by adding a time constraint to the procedure, participants’ responses will be slowed further.

A. Garcia and J. L. Livengood, Department of Psychology, Missouri Valley College**. THE IMPACT OF RELIGIOSITY AND SPIRITUALITY ON HOMONEGATIVE ATTITUDES IN COLLEGE STUDENTS.** The acceptance of homosexuality, in the twentieth century, is still a surprisingly controversial topic influenced by many different factors. Religion and spiritualism are important factors to consider as they have been shown to influence homonegativity and other related attitudes. According to Wood & Conley (2014), the LGBT community can be rejected within religious and spiritual identities. The purpose of this study is to analyze homophobic behavior, spirituality (measuring daily spiritual experiences), religiosity (measuring 3 dimensions: intrinsic, extrinsic, and religion as a quest), and the students’ attitudes regarding homosexuality. In this study it is hypothesized that (1) people believing in a Spirit or are members of a religion have a higher homonegativity than the traditional believing in God, and (2) religion and spirituality may impact homonegativity in different ways. In this study, around 100 students from Missouri Valley College will be expected to complete the surveys. Surveys will include questions to measure five categories: the demographic portion of the survey made of nineteen items; the section to measure spirituality with some questions of the Daily Spiritual Experience Scale (Underwood & Teresi, 2002); the section to measure attitudes in regard to homosexuality with some of the questions of the Homosexuality Attitude Scale (Kite & Deaux, 1986); the section to measure homophobic attitudes with the Homophobic Scale (Wrigth, Adams & Bernat, 1999) and to conclude the section to measure religiosity, the Quest Scale (Batson & Schoenrade, 1991) was selected.

K. Thwing, L. Rodriguez, D. Sears and E. Bromstedt, Division of Social Sciences, Department of Psychology, Central Methodist University. **THE EFFECT OF STRESS ON COGNITIVE PERFORMANCE.** Students in college experience several situations which can result in different levels of stress, which in turn can affect how they perform in class. The purpose of this study is to investigate how stress affects the cognitive performance of college students. To test this, we intend to hand out two different tests to 60 college students. In one classroom, half of the students will be randomly assign to take Test A, while the other half of the class will take Test B. Test A will consist of simple questions to answer and should create very little stress, and Test B will consist of impossible questions to answer, which should create high stress. We will give the participants 5 minutes to complete each test. After the time is up, we will hand out a third test, which will serve as the dependent measure of cognitive performance. An independent sample t-test will be used to determine whether there are significant differences between the two groups. We hypothesize that students who take Test B (impossible questions) will perform more poorly on the dependent task than the students who took Test A (simple questions).

B. Lafuente and Livengood, J. L, Department of Psychology, Missouri Valley College**. THE EFFECT OF ADULT ATTACHMENT STYLE ON PARTNER COMPATIBILITY AND RELATIONSHIP SUCESS**. During the past decades, psychological research on the field of romantic relationships has focused its attention on understanding the guidelines that individuals used in the process of mate selection (Tolmacz, 2004). The “attachment theory” was considered a useful framework to explain romantic relationships, because the bonds that individuals shared with parents, peers and romantic partners were seen to exert a powerful influence on health, prosperity and happiness (Caron, Lafontaine, Bureau, Levesque & Johnson, 2012). Given that prior evidence showed that attachment styles were considered to influence mate selection processes and to predict relationship quality in different aspects of the relationship, the goal of the current research study is to study compatibility of different attachment styles in romantic relationships. The main objective of this study is to analyze adult compatibility between attachment styles (secure, anxious-preoccupied, fearful-avoidant and dismissing avoidant) to predict success of relationships. In this study it is hypothesize that (1) secure individuals will succeed on their relationships with secure partners, anxious-preoccupied partners, and fearful-avoidant partners, but not with dismissing-avoidant partners; (2) anxious-ambivalent partners will be compatible in a relationship with both secure partners and anxious-preoccupied partners but not with dismissing or preoccupied avoidant partners; (3) fearful-avoidant partners will be compatible with fearful-avoidant partners and with secure partners; and (4) dismissing-fearful partners will be compatible with dismissing-fearful partners, and particularly incompatible with anxious-preoccupied partners. In this study, an approximate number of 100 Missouri Valley College Students will be surveyed. The survey consists of four parts: eight questions that belong to the demographic section; a measurement of attachment: the Relationships Questionnaire (RQ) (Bartholomew & Horowitz, 1991); an assessment aimed at measuring relationship satisfaction: the Relationship Assessment Scale (Hendrick, 1988); and lastly, twenty seven questions aimed at measuring compatibility between different attachment styles based on on the 4-item questionnaire of the RQ (Bartholomew & Horowitz, 1991).

A. Ebbesmeyer, A. Hutchins and L. Reed, Division of Social Science, Psychology, Central Methodist University. **THE EFFECT OF HAIR COLOR ON PERCEIVED PROFESSIONALISM.** Previous research indicates that women with brunette hair are perceived as being more capable in a professional position (Kyle & Mahler, 1996). The purpose of the current study is to find out if hair color affects the perceived level of professionalism of women. To test this, we intend to ask 45 participants to rate how professional a woman looks based on her hair color. In one condition, participants will be shown a picture of a woman with brunette colored hair and will be asked to rate on a scale of 1-10 how professional they perceive her to be. In the second condition and third conditions, they will be shown a picture of the same person with either blond hair or red hair and will be asked to rate the person on the same scale. A one-way ANOVA will be used to test for differences in ratings between conditions. We hypothesize that the woman with brunette hair will be rated higher than the woman with red hair and that the woman with red hair will receive higher ratings than the woman with blond hair.