

2016 Annual Technical Meeting Abstracts

(sorted by presenter's last name)

Abu-Saleh, Fatima - Tulsa Community College

Isolation and Analysis of GAPDH of Flowering Plants in the Oklahoma Central Plains.

Cytosolic Glyceraldehyde 3-phosphate dehydrogenase (GAPDH) is a key regulator of glycolysis and it is a highly conserved gene that results from an ancient triplication event of three genes (GapA, B, and C). GAPDH genes are considered housekeeping genes that catalyze glycolysis in respiration. The gene once thought to be simple has proven itself to be multidimensional. The objective of the study was to isolate, clone, and analyze a portion of the GAPC gene. The sequencing of the gene in new plants will add to the body of scientific knowledge. The aim of our study was to investigate whether present taxonomic classification schemes match the phylogeny revealed through the GAPC gene study. The GAPDH gene was used to understand the relationships of the organisms through a phylogenetic study. Nineteen plants were identified, and the DNA extracted. Following the amplification and purification of the gene, the target was ligated into a plasmid that exhibits positive selection by proving lethal to the transformed bacterium if the foreign DNA is not successfully inserted. Bioinformatics tools used were FinchTV, CAP3, MEGA Muscle Alignment and Phylogenetic Analysis. In our hands the phylogenetic tree that represents the target gene did not perfectly match the present published taxonomic scheme.

Anderson, Michael - Oklahoma State University Center for Health Sciences

Tissue Clearing with PACT, Fluorescent Immunohistochemistry and 3-Dimensional Reconstruction for the Spatial Evaluation of Protein Interactions.

Though-out the history of immunohistochemistry biomedical scientists have generally processed samples for observation in 2-dimensional (2D) images, taken from cross-sections. This process is effective for qualification and quantification, however, the percentage of the sample that can be microscopically observed is relatively small. For experimental conditions where the differences can be subtle, 2D analysis of tissue can be hit-or-miss. This may result in the need for multiple experiments and sometimes the use of many animals in the testing of any one hypothesis. In recent years, introduction of the passive clarity technique (PACT), use of confocal microscopy, and 3-dimensional (3D) software have opened the doors for fluorescent protein labeling and whole tissue 3D reconstruction (Yang et al, 2014). These techniques further our spatial understanding of how proteins interact in a 3D environment. In the current study, visceral pleura were collected, prepared with PACT, nerves immunohistochemically labeled with protein gene product 9.5 (PGP 9.5), calcitonin gene related peptide (CGRP), and nuclei labeled with 4',6-diamidino-2-phenylindole (DAPI). Images were reconstructed in 3-dimensions for analysis. In this preliminary experiment, full transparency of lung tissue was achieved using PACT. Nerve fibers, identified by PGP9.5 and CGRP, in the visceral sub-pleura were successfully reconstructed in three dimensions. We observed that, compared to 2D analysis of fluorescent immunohistochemistry, 3D reconstruction indeed offers a superior insight for the interaction of proteins that previously have been undetected.

These combined techniques offer immediate and previously unattainable perspectives of labeled proteins with fluorescent immunohistochemistry. Quantification in a 3D environment, however, has been largely unavailable due to limitations in current computer processing power and software. It can be expected that software will be developed that can recognize 3D clusters and categorize them based on fluorescent intensity and distance. These advances would allow for a high through-put and more accurate analysis of experimental data from histological samples.

Bays, Brad - Oklahoma State University

Using Geospatial Technologies to Optimize Rural Field Data Collection for Historic Preservation Planning.

In compliance with the National Historic Preservation Act or 1966, State Historic Preservation Offices (SHPOs) must develop and maintain large information databases on the condition of cultural and historical resources (buildings, structures, objects, sites, and districts) within their states. The cost per resource of data collection, and especially rural data collection, is high, and federal outlays from the National Park Service (NNPS) to the states for data collection (surveys) annually comprise one of the largest shares of every SHPO's budget. Since SHPO activities are typically limited by small staffs and budgets, there is always a need to increase the efficiency of data collection. This paper presents an historic resource field data collection model developed between 2010 and 2014 for a five-year, statewide survey of historic agricultural buildings. The final version of this protocol, which was executed in the counties of southeastern Oklahoma in 2014, used the U.S.G.S.'s newly-digitized historic topographic map collection in conjunction with GIS mapping and GPS routing. Results from the 2014 survey are compared with those of more traditional protocols used for western Oklahoma counties between 2010-13 in order to assess the utility of incorporating geospatial techniques in the process of conducting historic preservation fieldwork.

Becker, Jonathan - University of Oklahoma

Finding Flow for Free: The Flow Experience in Volunteerism.

This study examined flow experiences in professional work and volunteer activities. Flow experiences were expected to be more frequent the higher the perceived importance of the task and the higher the level of social interaction of the activity involved. Participants for this study were recruited from local non-profit organizations and the researcher's personal and professional networks. The online survey that was used assess flow and other relevant variables. Results of this study showed that people experience more flow in volunteer activities than in paid professional activities when age was controlled. Additionally, there was some evidence that people perceived volunteer activities as somewhat more important than work activities, although the results were not statistically significant. With a more robust measure of perceived importance, this may be an opportunity for future research. Finally, there was a statistically significant correlation between the level social interaction in volunteer activity and the level of flow experience in volunteer activity which suggests individuals experience more flow in volunteer work and that the level of flow experienced may be positively influenced by social interaction.

Beckham, Jacob - Tulsa Community College

A Survey of the Rhizosphere Microbial Community of Grasses and Legumes Using 16S rRNA Amplification.

The variability of the bacterial community in the rhizosphere of nitrogen fixing plants and grasses could be elucidated in the complex niche surrounding the roots. Symbiotic bacteria within nodules of legume root systems produce nitrogen compounds that help the plant to grow and compete. Understanding the rhizosphere could inform the production of an inexpensive, organic source of fertilizer. The mutualistic relationship between the plant and bacteria hold promise in bioremediation and crop production techniques. To assess the microorganisms, soil was collected in fields of alfalfa and grasses. In this study, the bacterial community organisms were investigated using 16S rRNA gene amplification. Culture independent (pyrosequencing of total soil DNA) and culture-dependent (using specialized growth media) techniques yielded a variety of genomic DNAs of the extracted isolates. The resulting 16S rRNA gene sequences were compared with the NCBI public database. Using the software package MEGA after a multiple sequence alignment through MUSCLE sequence products were analyzed with

evolutional phylogenetic tree production. The results identified members of five genera (Acinetobacter, Pseudomonas, Kocuria, Anthrobacter, and Streptomyces).

Bellcock, Lauren - Oklahoma Christian University

Regulation of PDGF-induced phenotypic switching in vascular smooth muscle cells.

Vascular smooth muscle cells (VSMCs) switch from a contractile, non-proliferative phenotype to a migratory phenotype in the presence of growth factors such as platelet-derived growth factor (PDGF). This is important for normal vascular development and vascular pathologies. We hypothesize that PDGF regulates two important processes during this transition: 1) activation of p190-RhoGAP through the actions of the small G-protein Rnd3, and 2) activation of Rap1B, which also antagonizes Rho activity. Rat VSMCs were transduced with lentivirus carrying shRNA against proteins of interest. The effects of PDGF and forskolin on cellular morphology, proliferation, migration, and gene/protein expression levels were assessed in control and knockdown cells. We found PDGF decreased the expression of contractile proteins and increased the expression of pro-migratory markers such as MMP-2. PDGF also induced migration; the mean percent area occupied by stimulated VSMCs was 29.5% when treated with PDGF and only 11.5% when untreated. This migration was accompanied by proliferation peaking at 24 hours, both near and far from the migrating edge. PDGF also induced morphological changes including the disassembly of actin stress fibers, loss of focal adhesions, and changes in cell shape. Knockdown of Rnd3 blocked these changes. Treatment with forskolin, a known activator of Rap1, altered cell adhesion and migration. These findings support the overall hypothesis that Rnd3-mediated p190-RhoGAP activation, along with activated Rap1, decrease Rho activity, resulting in loss of contractility and the transition to a migratory state.

Bercaw, Ronald - Oklahoma City University

Characterizing the Interdomain Conformations of the cpSRP43 - cpSRP54 Complex through Ensemble FRET Measurements.

The complex formed by chloroplast signal recognition particle 43 (cpSRP43) and chloroplast signal recognition particle 54 (cpSRP54) is important in the transport of light harvesting chlorophyll proteins (LHCP) to the thylakoid membrane. cpSRP43 is a protein consisting of 3 chromodomains and 4 anykrin repeats, and the structure of cpSRP54 is not known. One cysteine and two anykrin mutants of cpSRP43 were expressed. An N and G mutant of cpSRP54 was expressed. Ensemble Förster Resonance Energy Transfer and KD values for the six pairs of mutants were determined by titration with fluorometry. The KD values for labeled and unlabeled cpSRP43 mutants show that labeling does not significantly affect binding affinity.

Bergey, Liz - University of Oklahoma

Invasion biology: the dispersal of a non-native land snail in an urban landscape.

The brown garden snail, *Cornu aspersum*, is a large Mediterranean-native snail that has recently expanded its range into Oklahoma. This project inventoried the snail's spread in a Norman neighborhood by surveying 47 yards during summer 2016. Snails showed a slow diffusion pattern of dispersal from the presumed point of introduction but this pattern was affected by human-snail interactions in the form of water availability (positive impacts) and direct control of snails (negative impacts). Roads may be barriers to snail movement and only one of two roads was crossed by snails. This road crossing was likely human-assisted. The study demonstrates the localized, patchy distribution that can result from point introductions of slow moving organisms in urban landscapes.

Blackwood, Kevin - East Central University

Ecological Assessment of Nutrient Availability in Subterranean Streams to Determine Habitat Suitability for Cavefish in the Arbuckle Mountains, Oklahoma.

The Arbuckle Mountains ecoregion is underlain by thick sequences of carbonate rock, which has undergone significant karstification and cave development. The anisotropy of the karst groundwater flows is largely controlled by fracture networks and cave systems with a dominating lateral component near the water table. Surface derived nutrients are carried by flowing water into the cave systems primarily through inputs such as ponors and sinkholes, but also from leaching through discrete fractures. Nutrient availability is dependent on many factors such as basin characteristics, season, precipitation and discharge, as well as anthropogenic activities. Cavefish are rare in Arbuckle Mountain caves, known only from the largest and most studied cave systems. However, lesser known cave systems, discovered more recently, may have the potential to host a suitable habitat with sufficient nutrient availability to constitute a food web that may sustain populations of cavefish. This investigation uses cave streams with known cavefish populations as analogs to assess various parameters, such as nutrient availability and discharge, as well as abundance of prey in determining the conditions most suitable for cavefish habitat. These results may be used as a baseline to determine whether other Arbuckle Mountain cave systems might host cavefish populations, which may then be further investigated using environmental DNA sampling.

Bobo, Meagan - Oklahoma Christian University

Time Resolved UV-VIS Spectroscopy for Monitoring Peroxide Vapors.

The reaction of dark blue nanometric suspension of molybdenum or tungsten hydrogen bronze particles with nitrobenzene, hydrogen peroxide, or triacetone triperoxide results in a dramatic color change. Bronzes are formed from the trioxides by the incorporation of hydrogen into open channels present in WO₃ or between the sheets of MoO₃. Hydrogen ions are attached to oxygen atoms in the channels. The electrons are delocalized giving an electrically conductive and highly colored material. In this project, spectroscopy was used to further confirm the mechanism of color change. Reflectance spectra were taken over a period of time at regular intervals to confirm the reaction is first order. The absorbance at each of the designated time intervals was recorded and plotted versus time to determine the rate of the reaction.

Bratcher, Tristan - University of Central Oklahoma

#WorthIt: Conflict Resolution Changes by Relationship Distance and Attachment.

Though intimate relationships can provide difficult challenges for both parties, long distance relationships create unique situations that are difficult to navigate. Previous studies have focused on how those in long-distance relationships (LDRs) combat complications with maintaining intimacy, adequate communication, and whether or not technology has truly lessened the perceived distance between those that are close. This study will investigate the problem solving strategies employed by those in both LDRs and typical distance relationships. Additionally, the participants of the study will be given personality and attachment assessments, which will allow for inferences to be made in regards to whether or not certain personality types and attachment styles will exhibit particular conflict resolution behaviors, which can be used to predict the success of a long distance relationship. Expected findings include that those with avoidant attachment styles will withdraw from conflict more often than others, and those with preoccupied attachment styles will exhibit more engaged, and perhaps hostile responses when presented with relational conflict. Essentially, the effects of distance will be amplified as distance increases. Additionally, it is expected that those with lower levels of neuroticism will be more likely to engage in healthy conflict resolution styles (i.e., willing to speak openly about points of conflict with partners) than those with high levels of neuroticism. Distance is expected to be the mediating factor in determining how those with

certain characteristics (i.e., specific attachment styles and personality characteristics) will respond to conflict in relationships.

Broge, Matthew - East Central University

Characterization of Plant Pathogenic *Diaporthe* Species Infecting Melons Imported From Central America.

Interior rot of melon fruit (*Cucumis melo* L. var. *cantalupensis* Naudin) is caused by fungi of the *Diaporthe* species. Plant pathogens such as *Diaporthe* spp. enter the surface of the melon fruit early in development and remain latent until fruit maturity. While ripe fruit is harvested and imported with no external evidence of *Diaporthe* spp., internal fruit rot from *Diaporthe* spp. becomes evident as the fruit matures. The objective of this study was to characterize melon-infecting *Diaporthe* spp. in melon imported from Central America. Isolates were cultured from sunken surface lesions from melons imported from Costa Rica, Honduras, and Guatemala. Four *Diaporthe* spp. were isolated from melons imported from Guatemala, six *Diaporthe* spp. isolates were found in melons imported from Costa Rica and none were isolated from melons imported from Honduras. The majority of the Costa Rican isolates were similar in spore type to *D. melonis* and *D. ueckerae*, whereas the Guatemalan isolates were similar to *D. sojae* and *D. curcubitae*. Deoxyribonucleic acid (DNA) was extracted from fungal hyphae and purified polymerase chain reactions (PCR) products were sent for Sanger DNA Sequencing. Sequencing analysis demonstrated that our isolates were a 100% match of 509 base pairs for *Phomopsis* sp. ENS505 (Sequence ID: KM977662.1), a *Diaporthe* species native to Panama. Our finding of pathogenic *Diaporthe* spp. from Panama in melons imported from other Central American countries suggest that plant pathogens are carried across international borders and imported into the United States.

Caddell, Gloria - University of Central Oklahoma

Vascular flora of Hafer Park, an urban park in Edmond, OK.

E.C. Hafer Park is a 49-hectare urban park located in the Cross Timbers of central Oklahoma, within the City of Edmond. Although a recreational park, it contains post-oak-blackjack oak forest, grassland, and riparian communities. A vascular plant inventory conducted from 2013 through 2016 has to date yielded over 245 species in 63 families. Hafer Park is a biodiversity “hotspot” within the rapidly developing City of Edmond, but over 20% of the vascular plant species are non-natives, some of which are rapidly spreading invasives that threaten the preservation of the native flora.

Camarena, Yanet - East Central University

Metabolic changes of *Chaetomium globosum* grown on low levels of NSAID amended media.

Fungi are becoming a greater health concern in home and hospital settings. Some fungi can cause serious systemic infection and all fungal spores and hyphal segments are allergenic. The purpose of this research is to further understand the possible inhibitory mechanisms of non-steroidal anti-inflammatory drugs (NSAIDs) on fungal growth, germination, and reproduction. Previous research has shown that NSAIDs are inhibitory to yeasts, but very little work has been conducted on filamentous fungi. Common indoor molds indoor molds (fungi) are included in the genera *Aspergillus*, *Fusarium*, *Stachybotrys*, and *Chaetomium*. These fungi were grown in broth media amended with various NSAIDs. The fungi were separated from the broth after 7 days of growth. Proteins were extracted from the proteins. Results indicated that very low levels of various NSAIDs (0.1 mM) reduced the growth of *C. globosum*. Several Native-PAGE gels were run with fungal protein extracts and stained for general proteins and specific isozymes associated with the glycolytic, tricarboxylic acid, anaerobic, and secondary metabolic pathways in fungi. Differential glucose -6-phosphate dehydrogenase bands were elicited by *C.*

globosum when comparing the controls and ibuprofen (0.1 and 0.5 mM). The controls and acetaminophen were similar. Differential banding patterns were also observed on gels stained for shikimate dehydrogenase (DH), lactate DH, alcohol DH, and esterases. Differential bands were not observed on gels stained for phosphoglucose isomerase and isocitrate DH. XTT colorimetric assay also detected a reduction in APT production when the fungus was grown in broth with NSAIDs. These results suggest that NSAIDs affect gels several metabolic pathways in fungi.

Carley, Clay

Fast Algorithm for Determining if an Integer is a Highly Composite Number.

There are specific characteristics of highly composite numbers that lend themselves to implementing a fast algorithm to determine if a given positive integer is highly composite. A description of the fast algorithm will be presented with a comparison of timed results of test data between the fast algorithm and brute force method.

Carlile, Matthew - Northeastern State University Broken Arrow

Human TH2 Cells Experience Decreased Levels of IL-5 and IL-13 When Treated with 4μ8c Inhibitor.

TH2 cells play an important role in immune system regulation and are responsible for secreting many cytokines such as IL-5 and IL-13. Many cell signaling pathways influence TH2 cytokine effector functions, including the Unfolded Protein Response pathway. This pathway is crucial for resolving the accumulation of misfolded proteins in the ER. A previous showed that activated T cells treated with the inhibitor 4μ8c, a molecule that blocks activation of IRE1α-an activator of UPR, produce less IL-4, IL-5, and IL-13, while none TH2 cytokines are expressed at normal levels. Recently we have discovered established mouse TH2 cell lines treated with 4μ8c produce IL-4, while IL-5 and IL-13 are inhibited. This lead us to ask if this discrepancy is due to differences in the regulation of cytokines in memory/effector T cells vs. naïve cells. We differentiated human CD4+ T cells for 10 days and then treated the TH2 cells with 4μ8c. We designed specific primers in order to measure IL-5 and IL-13 expression by quantitative PCR. We also measure protein expression by ELISA. These results show that as the concentration of inhibitor 4μ8c increases the expression of both IL-5 and IL-13 decreases, while IL-4 expression remained at normal levels. We can conclude from our results that both Human and Mouse TH2 cells treated with 4μ8c inhibitor experience decreased production of cytokines IL-5 and IL-13, while IL-4 is unaffected. In the future we will explore the signaling pathways influencing IL-5 and IL-13. This work is supported by OK-INBRE and the NSU faculty research council.

Carr, Branden - Oklahoma State University Center for Health Sciences

Evaluation of the Presence and Location of Glutamate Receptor Subunits in the Rat Cornea.

Upon high threshold stimulation, nociceptive sensory afferents release glutamate from peripheral nerve terminals to cause autocrine and/or paracrine activation and sensitization via glutamate receptors (Miller et al, 2011a). In previous immunohistochemical studies from our lab, glutamate receptor subunits for NMDA, AMPA, and Kainate (KA) have been observed to be present in the cornea. 6,7-dinitroquinoxaline-2,3-dione (DNQX), an antagonist of the AMPA and KA receptors, also was effective in antagonizing glutamate-induced nocifensive behavior from the rat cornea. In the current study, we aim to identify all remaining glutamate receptor subunits presence or absence in the rat cornea. Aim: To determine the presence or absence of the sixteen currently recognized Glutamate receptor subunits in the rat cornea. Twelve naïve rats were euthanized for cornea retrieval and analyzed to determine the presence or absence of the sixteen currently recognized glutamate receptor subunits using Western Blotting techniques. Twelve rats were also used for immunofluorescence along with a confocal

microscope to verify the presence of the subunits along with location of the subunits within the rat cornea. A variety of Glutamate receptor subunits were found to be present in the rat cornea in nerve fibers and epithelial cells. Further investigation should be to immunohistochemically co-localize the Glutamate receptor subunits. Knowledge of which glutamate receptor subunits are present in the rat cornea will lead to a better understanding of corneal function. As observed in this study, specific glutamate subunits are on the primary sensory afferents as well as the corneal epithelial cells. Further studies need to be conducted to identify the purpose of each of glutamate receptor on either the primary sensory afferent and the corneal epithelial cells.

Castellanos, Kristian

Determining Phase and Group Velocities Through Various Media.

The phase and group velocities using ultrasound will be studied at multiple frequencies in different media. By using the phase difference obtained on an oscilloscope between the ultrasound wave and a sine pulse wave, the phase velocity is obtained. The phase velocity in water at a certain temperature can be compared with an empirical formula by Mackenzie. By using the time of flight and the distance between the transducer and the hydrophone, the group velocity can be obtained. The dispersion in different media will be examined.

Chaliawala, Kruti - University of Central Oklahoma

Physiological Measures of Anti-social Behavior within Psychopathy.

Historically speaking, psychopathy was categorized as a personality disorder strictly associated with criminal behavior (Cleckley, 1941). Instead of simply examining criminal behavior, current theories state that psychopathy refers to the affective (reduced empathy and remorse/guilt), interpersonal (manipulation of others for personal gain), and antisocial (aggressive and impulsive behavior) aspects (Hare, Hart, & Harpur, 1991; Hare, 2003). Psychophysiological research has found that psychopaths show less skin conductance, potentiated startle responses (lessened fear), and contraction of corrugator muscle under the eyebrows responses (Lykken, 1957; Aniskiewicz, 1979; Birbaumer et al., 2005; Rothmund et al., 2012; Patrick et al., 1993; Levenston et al., 2000; Herpertz et al., 2001). In regards to heart rate, researchers are unable to understand fully the mechanism that underlies the relationship of low heart rate and antisocial behavior. In the current study, we examined the relationship between heart rate response and psychopathy within a normal population. We predicted that individuals who score higher in psychopathic traits would show lower heart rate while viewing crime photos. Participants completed the Comprehensive Misconduct Inventory and the Dark Triad to examine levels of criminal behavior and psychopathy, respectively. Participants then gave arousal ratings to images that either depicted criminal behavior or images of neutral content. Logistical regression analysis showed that heart rate predicted participants rated arousal in crime photos, general criminality, and psychopathy. These findings demonstrate that heart rate can predict individuals criminal behavior and psychopathy.

Cheek, Connor - University of Science and Arts of Oklahoma

Groundwater: Impacted or not Impacted.

Groundwater is an important natural resource, and the need to identify the severity of groundwater contamination that results from human activities cannot be overstated. But determining whether the source of impurities in groundwater is naturally occurring or due to human activity can be difficult. Neptune and Company, Inc. provided us with sample data from 270 locations each with 40 parameter measurements. Our team developed a statistical algorithm to classify each site from the region as non-impacted, potentially impacted, or impacted sites.

Clymer, Maranda - East Central University

Hermite Polynomials.

I investigate the n-dimensional Hermite polynomials. Beginning with the general multivariate normal, I will build the most general Hermite Polynomials. This process starts by taking partial derivatives. Once we have taken partial derivatives, we are able to define the Hermite polynomials. Then, I am able to calculate for different values of n. If I take n partial derivatives, I then get one entry for an n-tensor. I examine multiple properties of the polynomials, such as their orthogonality and symmetry. Finally, I restrict the Hermite polynomials to one-dimension. With the assumption of mean zero and standard deviation one, I recover the traditional Hermite Polynomials. With this information, I was able to help build the foundation of the Edgeworth Expansion.

Core, Sheri - Oklahoma State University Center for Health Sciences

Glia immunolabeling in female rats after short-term vs. long-term furosemide treatment.

Glia located near circumventricular organs (CVOs), the central sites at which changes in circulating hormones and osmolytes are detected, may affect neural signaling during osmotic challenges and the modulatory effects of estradiol are unknown. Furosemide, a natriuretic-diuretic, increases urinary sodium loss within an hour after treatment but an 18-24 hour delay transpires before rats consume sodium. We hypothesized that sodium loss and/or volume loss is detected by glial cells which, in turn, influence central signaling, and that this effect may be altered by estradiol. Our objectives were to compare glial immunolabeling after Na⁺ depletion and determine whether any differences in abundance depend upon the presence of estradiol. Adult female rats were OVX, allowed 7 days recovery, then given estradiol benzoate (EB; 10 µg/0.1 ml sesame oil, s.c.) or sesame oil vehicle (OIL; 0.1 ml, s.c.). Rats were given two furosemide (5 mg/kg, s.c.) injections 1 hour apart by one of two protocols. For the short-term protocol, rats were anesthetized and perfused with paraformaldehyde two hours after the 2nd injection. Brains were removed and cut in 40 µ sections. For the long-term protocol, rats were returned to their cages for 18 hours after the 2nd injection, and then processed as described. Free-floating sections were immunolabeled for GFAP (Millipore; 1:6,000). GFAP immunolabeling after furosemide appeared to be most abundant in the CVOs of rats from the long-term protocol, but did not appear to be different between EB- and OIL- treated rats. Supported by OCAST HR12-196.

Crittell, Charles - East Central University

You are What You Eat: A Summer Academy for rising Eighth and Ninth Graders.

The week long residential “You Are What You Eat Summer Academy”, as the whimsically abbreviated name implies, provided rising eighth and ninth graders with fun, stimulating learning opportunities that helped them to apply science and technology to their daily lives. Focused and motivating learning activities in science and technology were designed to pique participants’ interest in science by engaging them in hands-on activities in the biochemistry laboratory. Specifically, participants isolated and analyzed the main nutritional elements, proteins, carbohydrates, and lipids, found in common foods. Highlights of this summer academy will be presented.

Czaplewski, Nick - University of Oklahoma

The Apache local fauna from a Pleistocene karstic filling in southwestern Oklahoma, with the first Oklahoma fossil record of Helodermatidae.

Karstic fissure fillings in Ordovician limestones are well known in southwestern Oklahoma for producing the best fossil record of early tetrapods of Permian age in the world. Until this study, however, no karstic fillings of another age have been reported from the area. Herein, we present

the first evidence of a new karstic filling containing Neogene or Quaternary fossils of a diversity of vertebrates, named the Apache local fauna, from an active limestone mine in the Slick Hills northwest of Apache, Oklahoma. The Apache local fauna is dominated by microvertebrates including pit vipers, nonvenomous snakes, a lizard (?Crotaphytus), woodrats, prairie dogs, and other rodents, with less common members including frog/toad, lizards, perching bird, turtle, rabbits, bat, shrew, and skunk. Large mammal fossils currently available are extremely fragmentary teeth and bones; they include canid, bear, horse, possible dwarf and normal-sized pronghorns, and camel. To date, a single osteoderm has been recovered that is diagnostic of the Helodermatidae (beaded lizards), probably genus *Heloderma*. This is the first fossil record of Helodermatidae in Oklahoma. Age-diagnostic fossils are rare and poorly preserved, limiting our ability to constrain the age of the fauna; however, it is tentatively assigned to the Pleistocene pending radiometric dating and/or recovery of age-limited fossil taxa. The fauna appears to reflect an interstadial or relatively warm period, and a relatively open habitat, with an unusual mix of prairie and subtropical elements, some of which could potentially return to the region with continuing climate change.

Day, Floyd - University of Central Oklahoma

Vehicle Localization Using Resilient Networks and Infrastructure.

Our research involves the utilization of roadside infrastructure, called Road Side Units (RSUs), along with on-board integrated navigation systems (GPS/INS), with the goal of creating resilient vehicular ad-hoc networks (VANETs). We hope to use these networks to provide highly accurate and precise localization information on the road. We are using Network Simulator to perform various computer simulations using existing IEEE protocol. We are also developing an on-board navigation system and road side unit to perform physical simulations. We are developing both of these using Arduino microcontrollers. We have recently began working with the Department of Transportation with the ultimate goal of developing a system which can be easily implemented into pre existing infrastructure.

Dugger, Karissa - University of Central Oklahoma

Confession Rates: Does Persuasion Resistance Time Reduce Them?

Confessions are given every day in criminal investigations across the country; countless are true confessions, but there are many false confessions, as well. This study will evaluate participants on their confession rates, whether innocent or guilty, during an experiment that challenges their persuasive resistance when time is given to collect their self-control resources. Resistance to persuasive acts can reduce the rate of true and false confessions. The results from this study will help courts and law enforcement understand how providing a little time to the accused to clear their thoughts will avoid incarcerating the wrong person.

Durham, Justin - University of Central Oklahoma

Dynamic Mu Wave Desynchronization in Response to Vicarious Pain.

Experiencing empathy, the effortless natural ability to understand the intentions and mental states of others, relies on complex neural networks like the mirror neuron systems (Gustello, 2016). Pain is a subjective, sensory, and emotional experience heavily related to the motor system. Mirror system activation defined by mu wave suppression or increased sensorimotor activity. It was hypothesized high empathizers would exhibit greater mu desynchronization while observing painful sports injury clips than low empathizers. Twelve undergraduates completed the Short Dark Triad and Toronto Empathy Questionnaires and contributed EEG data from two active electrodes embedded in the F3 and F4 regions using a BIOPAC MP150 System. Mu frequency (8-13 Hz) desynchronization was determined using the Fast Fourier Transform (FFT) algorithm which changes time series data into a frequency domain. Results determined mu desynchronization did not occur for each participant in the pain condition. Individual differences in desynchronization will be compared to subjective ratings.

Eddington, Casey - Northeastern State University Broken Arrow

Mcm10: A Target for Possible Cancer Treatment.

Minichromosome maintenance 10 (Mcm10) and DNA Polymerase Epsilon (Pol ϵ) are essential proteins required for DNA replication. Mutations in either have been shown to cause genomic instability, a hallmark of cancer cells. Mcm10 is required to facilitate both replication initiation and elongation. Pol ϵ is largely responsible for DNA synthesis on the leading strand during replication, and functions in the S phase checkpoint pathway during replication stress. Previous results from our lab have indicated a strong interaction between Mcm10 and Pol2, the catalytic subunit of Pol ϵ . Interestingly, this interaction is cell-cycle regulated and occurs only during S and G2 phases. Our goal is to further elucidate this interaction by locating the exact region on Pol2 that binds to Mcm10. As of now, we have narrowed this interaction down to a 200 amino acid region on the C-terminus of Pol2 via the yeast-two-hybrid method. This is interesting because it is the C-terminus of Pol2 that is essential for cell viability, and harbors the checkpoint domain of Pol ϵ . Currently, we are performing mutagenesis on approximately 12 highly conserved amino acids within the Pol2 C-terminus region to determine the exact binding site of this interaction. Preliminary data indicates that amino acids G1442 and E1448 of Pol2 may be important for the Mcm10:Pol ϵ interaction. Eventually, we want to study this interaction under replicative stress and DNA damaging conditions, which will give us insight into how mutations in these proteins cause genomic instability. Ultimately, a better understanding of their interactions will provide a possible target for cancer screening and treatment.

Engelhard, Margaret - University of Central Oklahoma

Attachment to God by Religious Affiliation.

Research in the field of attachment theory in relation to religion supports the idea that attachment to God is predicted by attachment to parent. Depending on the particular religious sect, this prediction is mother or father specific, such that religions that are patriarchal-centered predict attachment to father and those with matriarchal influences predict attachment to mother. Building on previous studies, this project will investigate another world religion — Buddhism — and compare with previous data to examine attachment to God in a religion that is non-theistic and practices non-attachment. Participants in the present study will include adults who follow Buddhism. These individuals will complete 6 questionnaires. The questionnaires will request information about their formative family structure, participants' retrospective bonding with parents, their attachment to their fathers, their attachment to God, and their perception of their religion. A Demographics Questionnaire (DQ) will be used to assess information such as level of education, annual income, gender, and marital status; the Experiences in Parental Relationships Scale – Father Version (EPR; Limke & Mayfield, 2011) will be used to assess participants' attachment to fathers and mothers; the Attachment to God Inventory (AGI; Beck & McDonald, 2004) will be utilized to measure participants' attachment to God; and the Defensive Theology Scale (DTS; Beck, 2006) will be used to assess the extent to which participants demonstrate religious defensiveness. Noting the focus on autonomy and on non-attachment emphasized in the Buddhist community, researchers predict that attachment to both father and mother will be used as predictors for attachment to God and religion in individuals who follow Buddhism.

Fischer, Hayley - Northeastern State University

Validation Of Proteomic Hits From DNMT1 Pulldown Data.

The presentation will focus on research done at New England Biolabs during the summer of 2016 in Sriharsa Pradhan's Research Lab.

Fischer, Hayley - Northeastern State University

Kill Curve Experiment Comparing Different Doses From Two Blasticidin Batches on 293-F Human Embryonic Kidney Cells.

Human Embryonic Kidney cells (HEK 293) are specific fibroblast cell lines grown in tissue culture. The 293-F strain is a suspension cell line that's easy to grow and used in experiments such as a kill curve. A kill curve is an experiment in which cells are exposed to increasing doses of antibiotic to determine the minimal concentration needed to kill all cells over a span of one to two weeks. Blasticidin is an antibiotic that prevents growth of both eukaryotic and prokaryotic cells by inhibiting termination step of translocation and peptide bond formation by the ribosome. Therefore cells can no longer produce proteins through translation. The two aims of this project determine the lowest concentration at which 293-F cells succumb to blasticidin and stability of stored blasticidin. Blasticidin kill curves were set up exposing 293-F cells to 0µg/ml, 2.5µg/ml, 5µg/ml and 10µg/ml concentrations over a 10-14 day period. The two batches of blasticidin used were a batch purchased in 2014 and a new batch purchased in 2016. The results demonstrated both batches of blasticidin killed all cells in 2.5µg/ml, 5µg/ml and 10µg/ml by day 11. The results indicated that the 2016 blasticidin helped the cells succumb at a faster rate than the 2014 batch but ultimately both batches of cells die on day 11. Therefore, the lowest dose of blasticidin needed to kill cells is 2.5µg/ml over 11 days and storage of blasticidin over two years does not adversely affect its potency.

Fishbein, Mark - Oklahoma State University

The Subspecies of Antelope-horn Milkweed (*Asclepias asperula*, Apocynaceae) Merit Taxonomic Recognition.

Antelope-horn milkweed is a familiar spring wildflower across the southwestern United States. In the southern plains, it is a crucial host plant for the monarch butterfly. Taxonomists have recognized that the southern plains populations are morphologically distinct from those of the intermountain region, and these populations are currently recognized as subspecies. Using morphometric data, I show that recognition of these taxa is warranted, based on differences in floral corona color, peduncle length and leaf shape, though considerable overlap exists at the contact zone near the Texas-New Mexico border.

Flores, Rita - Oklahoma State University

Unique Transposon Genome Rearrangements Identified in *Elizabethkingia anophelis* Outbreak Strains in the Midwest US.

Bacteria of the genus *Elizabethkingia* are comprised of aerobic, non-fermenting, non-motile and non-spore-forming gram-negative rods that are widely distributed in nature. *Elizabethkingia* is known to have multiple genes coding for antibiotic resistance, but rarely causes infections in humans. Only a few isolated *Elizabethkingia* infections are reported each year typically confined to healthcare facilities. Recently, an unusual outbreak of an *Elizabethkingia* strain (sp. *anophelis*) occurred in Wisconsin (with additional single infections in Michigan and Illinois) with high morbidity (20 deaths in 65 cases) [1]. Patients diagnosed with this strain of *Elizabethkingia anophelis* and were present in different health facilities across the state. Unfortunately the CDC and other Midwest Health Departments have yet to identify the source or cause of this deadly outbreak (Sep. 2016). Remarkably, antibiotic-resistance is not the driving mechanism of this unusual outbreak. All patients affected have been seriously immune-suppressed with most infections occurring in the blood, leading to

sepsis. While studying the genomes of all *Elizabethkingia*, we identified multiple mobile genetic elements (MGEs) and lineage-specific genomic rearrangements. Using various genomic comparison software one MGE resembles a double or triple intra-transposon (transposons-within-transposons) conserved in only a few strains of *Elizabethkingia* suggesting a recent conjugative event. Further, the genome position of this intra-transposon (termed "TnpX2") changes specifically in the "outbreak" strains.

Forrer, Maegen - University of Central Oklahoma

Development of a New Automated System to Produce Electrospun Nanofiber.

The goal of this research is to design and develop a new automated and integrated system to produce electrospun nanofiber that will have competing performance with the currently available commercial nanofibers. This novel system will use the electrospin process. Electrospinning is a process by which electrostatic polymer fibers with micron to nanometer size diameters can be deposited on a grounded electrode. The authors will present the detailed aspects in the new system and the proposed applications.

Francis, Amie - Oklahoma State University

Differentiating Between Partner Preferences and Lasting Pair Bonds.

Social bonds are important for reproduction in monogamous mammalian species. These bonds allow for additional care to offspring and may protect groups from predators. Prairie voles are social mammals known for monogamous pairings. Partner preference tests are commonly used to measure both basic affiliative behavior and longer-lasting pair bonds, but there has not been a clear delineation between these two phenomena. To begin addressing this gap, we used partner preference tests to make a comparison within animals paired for 48 hours and again at 14 days. Our results suggest that among animals for which we would expect to see a pair bond based on pregnancy status, a partner preference may be found at both 48 hours and 14 days. Since timely and successful mating is necessary for a true pair-bond to develop, we will apply this testing method to pairs which have not mated to test whether the initial affiliative preference (48 hours) fails to consolidate into a permanent pair-bond (2 weeks) absent successful mating.

Godfrey, Micah - East Central University

Binomial Transformations in the Complex Plane.

A transformation, in reference to mathematics, is a general way to describe a change in a point, a line or a shape. Transformations among the set of real numbers can be explained rather easily, both algebraically and visually, but transformations among the set of complex numbers can become quite complicated. Using complex numbers, we will investigate the changes that take place to a straight line under a binomial transformation. In this investigation, we will explore loops, changes in direction, intercepts, and points of intersection that are created by these transformations.

Goelzer, Matthew - Oral Roberts University

Modulation of Angiomin expression through CRISPR Endonuclease and Transcription Activators.

Breast Cancer is the second most diagnosed cancer in the United States. An estimated number of 40,000 women died of breast cancer in 2015 (Breast cancer). Twenty percent of all breast cancers are diagnosed as triple negative breast cancers. Triple negative tumors are classified by their lack of Her2/neu, progesterone, and estrogen receptors (Ismail-Khan and Mi, 2010). Concentrations of these receptors tend to correlate with cancer grade due to lack of available targeted therapy (Britta et al., 2005). Angiomin, (AMOT) is an apical polarity adapter protein that has been shown to correlate with breast cancer progression. Amot has been shown to disrupt apical polarity, induce dedifferentiation, and promote aberrant cell growth (Ranahan,

2012). In this study, CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats), an RNA guided endonuclease protein complex, will be used to downregulate Angiotin expression. Additionally, a nuclease-dead CRISPR complex will be coupled to a transcription activator to attempt upregulation of Angiotin. This study's aim is to demonstrate that CRISPR technology can be used to silence Angiotin expression, which could be used as a triple negative breast tumor treatment. Furthermore, this study also aims to demonstrate the use of CRISPR technology in mediating upregulation of Amot80 expression in non-tumorigenic mammary cells, providing a novel tool to study the role of Angiotin expression during tumorigenesis.

Gujar, Vikram - Oklahoma State University Center for Health Sciences

Determining the Expression of Nerve Growth factor in rat Antigen Induced Arthritis model.

Nerve growth factor (NGF) is a molecule which regulates the maturation of developing sensory neurons in the peripheral nervous system (PNS) and acts as neurotrophin for a subset of nociceptive (pain-producing) sensory neurons. NGF has two known receptors, TrkA and p75NTR. The peripheral terminals of the primary afferents keep constant communication with their cell bodies in the dorsal root ganglion (DRG) via retrograde transport of the NGF-TrkA complex. During inflammation, increased retrograde transport of NGF-TrkA appraises the DRG neuronal cell bodies to undergo a phenotypic switch, i.e., altered protein expression. Little is known, however, about the temporal pattern of NGF expression in the skin during inflammation. We hypothesized that there would be increased NGF expression in the epidermis during acute phase of inflammation. After the inflammatory, noxious stimuli there is a change in the expression of NGF by the peripheral tissue cells. NGF then binds to the TrkA receptors on the nerve endings and relays the message via retrograde transport to the cell body. In the cell body it modulates the expression of the proteins and hence acts as a phenotypic switch. In order to better understand the role of NGF, we studied its expression pattern in the acute phase of inflammation via AIA model. Our findings show significant increase in the levels of NGF in the epidermis following the noxious insult suggesting its contribution in the regulation and development of chronic inflammatory pain.

Guo, Yina

Microstructure and texture characterisation of linear friction welded Titanium alloys.

Linear friction welding (LFW) is a solid state welding process in which the heat is generated by the relative motion of two components, one is stationary and the other oscillates linearly. Throughout welding, an axial compressive force is applied to both parts to expel the softened metal from the interface to obtain a certain axial-shortening, and to consolidate the joint. It is found to be a promising way to join numerous components in aerospace application, where it has been used to attach blades to discs, to form an integrally bladed disc. It is worth mentioning that the whole welding process is completed within a few seconds. The high heating and cooling rates, as well as the extensive thermomechanical deformation, produce significant changes in microstructure, texture in the weld region, which lead to dramatic changes in mechanical properties. Over the last few decades process-microstructure-property relationships of linear friction welded titanium alloys have been investigated. However, the detailed relationship between microstructural features and mechanical properties is rarely reported and the mechanism is not clear due to the complexity of microstructural features in friction welds. This presentation will focus on the microstructure and texture of friction welded joints of between Ti64 and Ti64, Ti6246 and Ti6246, and Ti64 and Ti6246 alloys, by analysing the nature, orientation and distribution of the microstructural features and comparing the differences obtained from different welding processes and original materials.

Hagan, Richard - University of Oklahoma

Methodological Improvements in Recovering Ancient DNA from Coprolites for Metagenomics.

The microbial ecology of the human gut is an area of intense study for biologists from many backgrounds, and there is growing interest amongst archaeogeneticists and paleomicrobiologists in extending the study of this unique and complex system into the human past. Previous studies have identified coprolites as a viable reservoir of ancient microbial DNA, and therefore as a suitable proxy for the ancient human gut microbiome. However, little is known about the effect of extraction and purification methods on the recovery of aDNA from this material. In this study we compared the DNA extraction protocol from the Human Microbiome Project (HMP) with four additional methods that modify various components of DNA extraction and purification to determine their effect on aDNA recovery from coprolites. Our results show that the silica column purification of the HMP protocol significantly reduces the yield of aDNA from coprolites, and thus the number of fragments from which DNA sequencing libraries may be built. Additionally, our data suggest that differential preservation of samples is the leading contributor to successful aDNA recovery and subsequent sequencing and data analysis. Our findings suggest that the HMP protocol is sufficient for accurately reconstructing the ancient gut microbiome, but that it is not the optimal strategy when sample preservation is poor or starting material is very limited. These results highlight the importance of carefully considering extraction methods when working with limited materials such as coprolites to reconstruct ancient microbiomes. Ancient metagenomics offers an exciting, interdisciplinary research program, and methodological studies such as the one presented here are critical to ensure that best practices are used as the field moves forward.

Hall, Colton - East Central University

Chickasaw Land Patents in Mississippi.

The project completed over the summer was creating polygons with 1830's Chickasaw Mississippi Land Patents. This was so that the Department of Historic Preservation within the Chickasaw Nation can use this as a reference tool when responding to Section 106 letters or performing repatriation/reburial ceremonies.

Hardage, Joshua - East Central University

HTLV-1 promoter complex Tax/pCREB interaction with mediator subunit MED15 via the "KIX-like" binding domain.

Human T-Cell Leukemia Virus type 1 (HTLV-1), is a retrovirus that has been shown to cause adult T-Cell leukemia/lymphoma (ATLL) or HTLV-1-associated myelopathy (HAM) in approximately 5% of infected individuals. Tax, an HTLV-1 encoded transcription factor, recruits host CREB to the viral promoter. CREB, a transcription factor found to activate a large number of genes, becomes active when phosphorylated at serine 133 (pCREB). Tax promotes recruitment of pCREB to the HTLV integrated promoter at enhancer sites known as viral CREs. Together the Tax/pCREB/promoter DNA complex then recruit the ubiquitous host coactivator paralogs p300/CBP to the HTLV-1 promoter, leading to high transcriptional activation of the provirus. The KIX domain of CBP/p300 has been identified to interact with Tax and pCREB through two separate binding pockets. This interaction is believed to be the main interaction tethering the coactivator to the viral promoter. Interestingly, several so called "KIX-like" domains have been recently identified through structural and functional analysis. One such KIX-like domain has been proposed to reside in a mediator subunit known as MED15 or ARC105. We are investigating possible interaction between the Tax/CREB activator complex and the KIX-like domain of MED15 in order to determine whether Tax may recruit other transcriptional coactivators, such as the mediator complex, to the HTLV promoter.

Harrington, Patrick - Northeastern State University

Optimization of Quantum Cellular Automata: Reinforcement Learning.

Quantum Cellular Automata (QCA) are vulnerable to manufacturing errors that change circuit polarization. Analysis and correction of these errors has been done using Bayesian, Markovian, or neural network methodologies. Our work uses intelligent agents to improve evaluation and correction of Gaussian error using partially observable Markov Decision Processes in a multi-objective environment.

Harris, Maxton - University of Central Oklahoma

Oklahoma City Planning Department Internship.

The presentation covers the course of my internship with the Oklahoma City Planning Department. The focus is on a working project called BikeWalkOKC, which will serve as the city's master plan for bicyclists and pedestrians as it continues to see more urban development and population growth into the future. I will also discuss WatchForMeOKC, an outreach campaign intended to provide safety tips and information that educates the community about consciously driving, cycling and walking on city streets. The presentation will go into detail about using Geographic Information Systems (GIS), spatial data and analyses to create new and improved networks of bike and pedestrian facilities throughout the city.

Harvey, Kody - University of Central Oklahoma

Characterizing Cardiovascular Defects in an Avian Model of Maternal PKU.

Maternal phenylketonuria [MPKU] is a syndrome of multiple congenital anomalies including cardiovascular malformations [CVMs], microcephaly, intellectual impairment, and small size for gestational age caused when a mother with Phenylketonuria [PKU] does not control her dietary intake of Phenylalanine [Phe]. Unmonitored Phe intake results in high maternal serum Phe which becomes teratogenic to the fetus. In this study, we aim to establish and characterize an avian model of MPKU. Based on previous studies in mouse, we exposed developing chick embryos to Phe and sought to determine the types of defects observed at E8/HH34. We investigated the effect on embryonic heart development with exposure to a dosage of 2500 µM Phe. The Phe delivery route was by in-ovo yolk injection at HH3-5. Following the injection, the embryos underwent further development for seven days until dissection was performed. The skin and rib cage were dissected revealing the heart. The left ventricle was injected with India ink dye for contrast to visualize the outflow tract vessels. The Phe treated embryos, when compared to the control embryos, displayed malformations of the outflow tract such as abnormal septation and wedging. More specifically, double outlet right ventricle (DORV), Persistent truncus arteriosus (PTA) over right ventricle, torsional defects, and narrowing of aortic outflow vessels were observed. Chick embryos exposed to Phe via in-ovo injection, serves as a good model for MPKU. We have observed similar defects to those found in the MPKU mouse model. Histological analysis is underway to confirm gross defects and discover internal defects such as ventricular septal defects (VSDs). Currently there is no data interrogating the mechanism by which Phe causes heart defects. We plan to utilize this model to define the mechanism of Phe cardiac teratogenicity which is critical for improving MPKU treatments and outcomes.

Heck, Christian - Oklahoma State University Center for Health Sciences

Polyester or Epoxy: Assessing product efficacy in paleohistological methods..

Histological examination of bone microstructure provides insight into the physiology of modern and extinct vertebrates. Specimens sampled for histological examination are first embedded in a plastic resin which is then cut into thin sections, mounted on slides, and polished for viewing. Standard embedding procedure of fossil material involves embedding specimens in relatively inexpensive polyester resin. Small fossil material and modern tissue is embedded

in a higher priced epoxy resin. Modern tissue and small fossil material often require thin sections near or below 100 micrometers thick. Anecdotal evidence suggests polyester resin thinner than 100 micrometers causes increased likelihood of sample peeling, material loss, and is unsuitable for modern tissue and small fossil material embedding. To test this assumption, three fossil bones and two modern bones were embedded in epoxy resin, while five fossil bones and four modern bones were embedded in a polyester resin. Embedded specimens were processed following standard protocol. Slides were then ground on a lapidary wheel until bone microstructure was completely discernable. Additionally, two slides, one with a polyester resin embedded specimen and one with an epoxy resin embedded specimen, were continuously ground on 600 grit paper until peeling occurred. Slide thickness at the point of peeling was measured for direct comparison of resin types and timing of specimen loss. Finished slide thickness ranged from 23-230 micrometers. We found no appreciable difference in bone microstructure visibility between polyester embedded material and epoxy embedded material, and none of the 35 finished slides exhibited signs of peeling. The specimen that was embedded in epoxy resin began peeling at 77 microns while the specimen in polyester resin peeled at 55 microns. Counter to previous assumptions, our results suggest that expensive epoxy resins can be replaced by polyester resins in histological preparation of modern bone tissue and small fossil material.

Hernández-Estrada, Zorba J. - Oklahoma State University

Effect of Salt (NaCl) and Salt Substitutions in Dough Rheology and Breadmaking.

Bread is a staple food worldwide and is responsible of 30% of the daily salt (NaCl) intake. High daily sodium intake has been widely associated with hypertension as well as numerous cardio-vascular diseases and other health problems. The effect of salt content and salt substitution using a potassium chloride based salt (NTS 24510) on mixing and absorption properties, shelf-life (1, 3, and 7 days after baking), sensory evaluation of white pan bread were investigated. The treatments included no salt (negative control), 0.5, 1.0 to 2.0% salt and substitutions of 33% and 40% salt with NTS 24510. Consumer acceptance was performed with 100 untrained panelists. Significant effects (Tukey; P=0.05) were found in water absorption, development time and stability, wet gluten and elastic recovery of gluten (0%-2% salt). Salt substitutions and 2% salt treatments were similar (P>0.05) suggesting that salt can be reduced up to 40% and have similar rheological properties. Crumb firmness evaluated with a Texture Analyzer TA.XT revealed softer crumb in the substituted treatments (9 to 30% softer, P

Hester, Landon - Oklahoma Christian University

Clinical Implications of TRIM65 Amplification and Mutation.

A recent study demonstrated that TRIM65 ubiquitinates p53 for degradation. Separately, the Coiled Coil (CC) region of TRIM65 has been shown to bind and lead to the ubiquitination of TNRC6 proteins. Since the CC region binds to TNRC6 for ubiquitination, we proposed that it is also the binding site for p53 ubiquitination. Using clinical data from cBioPortal, p53 levels in patients with increased TRIM65 expression were analyzed to determine the types of cancer where TRIM65 was most active in ubiquitinating p53. The CC region of TRIM65 was tested for an increase in missense mutation frequency. TRIM65 amplifications and mutations were found to co-occur with decreased p53 levels in skin cutaneous melanoma patients at a statistically significant rate. Skin cutaneous melanoma patients with TRIM65 mutations or copy number alterations had an estimated survival time that was less than two-thirds as long as other skin cutaneous melanoma patients. The CC region exhibited twice the rate of expected missense mutation, supporting the hypothesis that CC mutations lead to cell proliferation and that the CC region binds to p53. The combined results support the hypothesis that TRIM65 has oncogenic properties with prognostic significance. The decreased survival time in skin cutaneous melanoma patients highlights the need for quantification of TRIM65's effects on cell proliferation.

Higginbottom, Jackson - Oklahoma Christian University

CRISPR-Cas9 Mediated Gene Edit of Holocentric Binding Protein-2 in *Caenorhabditis elegans*.

The human Cancer Associated Gene CAGE-1 is normally expressed in the testes and over-expressed in cervical, melanoma, hepatic, renal, myeloma, and breast cancers. In *Caenorhabditis elegans*, the gene *hcp-2* has been hypothesized to be the ortholog to CAGE-1 in humans. Three strains of *C. elegans* containing a deletion of *hcp-1*, a deletion of *hcp-2*, or an overexpression of *hcp-2* were proposed. A strain of *C. elegans* containing a deletion of *hcp-2* was designed, and RT-PCR was used to verify the deletion of the gene. In this experiment, the CRISPR/Cas9 system and other molecular techniques were used to determine whether the overexpression or deletion of CAGE-1 (*hcp-2*) gene in *C. elegans* will cause developmental deficiencies and cell proliferation similar to what is found in human cancer.

Hosford, Alanah - Oklahoma City University

Habitat Selection, Nest Box Usage, and Reproductive Success of Secondary Cavity Nesting Birds in a Semirural Setting.

As urban areas continue to grow and erode rural landscapes, it is critical to characterize essential habitats for all wildlife in order to set aside protected areas in an attempt to maintain diversity. We constructed and monitored 30 nest boxes for usage by secondary cavity-nesting birds each year from 2014-2016 at the John Nichols Scout Ranch located in southeast Canadian County, Oklahoma. At each of six sites, five nest boxes were situated along a transect at 15m intervals with a central box located at an abrupt edge between a wooded habitat and a grassland habitat. We measured 77 habitat variables around each nest box at 2 sampling scales, 1m² and 10m². We used these habitat variables and sites in which nesting occurred in a principal components analysis. Results at both spatial scales were similar. Eastern Bluebirds and Carolina Chickadees nested in grassland habitats with little to no overhead canopy cover. Carolina Wrens nested in woodland areas with high amounts of litter ground cover and overhead canopy cover. We used the simplified Morisita index to calculate niche overlap at both spatial scales. Overlap varied substantially depending on sampling scale.

Hotson, Mitchell - Tulsa Community College

CHO Cell Viability When Exposed To *Ginkgo biloba*.

Many people living in the United States take dietary supplements. However, supplements are regulated as food rather than drugs, leading to less testing overall of dietary supplements. Hence, the present study aims to determine the toxicity of *Ginkgo biloba*. Toxicity was determined by performing an MTT viability assay on Chinese Hamster Ovary (CHO) cells. An ANOVA showed that there was a statistically significant decrease in the viability of the cells grown in media containing 0.5% *G. biloba*. Overall, at low concentrations, *G. biloba* has very little toxic effect on CHO cells.

Isingizwe, Zitha - Oklahoma Christian University

12-HETrE Exerts Its Antithrombotic Effects Through The Prostacyclin Receptor.

Thrombotic diseases such as myocardial infarction and stroke remain the major contributor of cardiovascular related deaths. Our lab recently discovered that the antithrombotic effects of dihomog- γ -linolenic acid (DGLA) are predominantly mediated by the 12-lipoxygenase (12-LOX) derived metabolite 12-hydroxyeicosatetraenoic acid (12-HETrE). 12-HETrE was shown to inhibit platelets activation by stimulating a yet to be identified G α s-coupled receptor. We hypothesize that 12-HETrE functions through one of the known prostanoid receptors (IP, DP1, EP2 or EP4). To determine whether 12-HETrE inhibits platelets through the known prostanoid receptors, platelets were incubated with a pharmacological inhibitor to one of the prostanoid receptors prior to treating platelets with 12-HETrE. The IP receptor antagonist partially blocked

the inhibitory effects of 12-HETrE, suggesting that 12-HETrE signals at least in part through the IP receptor. IP receptor deficient mice were utilized to further characterize the role of the IP receptor in 12-HETrE-mediated platelet inhibition. 12-HETrE was unable to inhibit platelet aggregation in the IP receptor deficient mice, which further supports that 12-HETrE exerts its antiplatelet effects predominantly through the IP receptor. The understanding of DGLA-mediated platelet inhibition in this study will help to identify new therapeutic targets to control aberrant platelet activation, hence limiting the risk of unwanted clotting.

Jackson, Derrick - East Central University

Indian Allotment Project: Establishing Chickasaw Boundaries.

During the summer of 2016, the GeoSpatial Information interns were given three volumes of Hastains Index books that contained historical allotments of all Chickasaws located within the Chickasaw Nation boundary prior to 1910. Each intern was assigned the job of creating polygons and filling out the attribute table of each legal description.

Jacob, Nicholas - East Central University

Measure Theoretic Approach to Reynolds' Averaging.

A velocity, $u(x,t)$, solving incompressible Navier-Stokes cannot be the full velocity at x and t due to dissipation. Reynolds claims $u(x,t)$ is a space average. Taking the limit of Hamiltonian equations of motion with assumptions on standard physical quantities leads to a measure. This measure and disintegration will be used to construct an abstract Reynolds' average which is indeed a space average in the natural sense providing a further justification for space averages.

Jacobson, David - University of Oklahoma

Progression of the oral microbiome from infancy to adulthood.

The human oral microbiome is implicated as an etiological agent in a number of periodontal and systemic diseases, such as gingivitis, cardiovascular disease, and pre-term birth. While many researchers have investigated signatures of microbial communities that are associated with various maladies, the factors that structure the healthy human oral microbiome are not well understood. Elucidating the components that drive microbial diversity and structure in healthy individuals can help researchers better discern the changes that occur when a microbial community shifts from a healthy community to a disease-causing state. Here, we collected dental swabs from residents of the Pacific Island nation of Vanuatu ($n=296$) which were stored in a lysis buffer to preserve the microbial community. DNA was extracted from these swabs using the MoBio PowerSoil kit following the Human Microbiome Project protocol, and the microbial community was characterized using targeted amplification of the 16S rRNA gene (V4 region), followed by Illumina high-throughput sequencing. Resulting reads were quality filtered, clustered into Operational Taxonomic Units (OTUs, 97% sequence similarity) to generate microbial community profiles, and compared with collected metadata including age, sex, BMI, and diet (24-hour recall). In terms of overall community structure, OTU richness was lowest in children under five and then increases with age into adulthood ($p < 0.001$). Further, we observed age associated trends at the phylum level (FDR adjusted p

Jamadagni, Harsha - University of Central Oklahoma

Enhancement of strain energy of poly(methylmethacrylate) using polycaprolactone nanofiber mesh.

Electrospin fiber has many applications in the biomedical field. Fiber has been reported to be used in bone cement for increasing mechanical properties. The application of electro spin fiber on the bone cement is not known, therefore, the goals of this project are the fabrication and mechanical testing of electrospun fiber reinforced bone cement. American Society of Testing Materials (ASTM) three-point bend flexural, three-point bend fracture and fatigue tests will be conducted on the fiber reinforced cement and compared with the non-reinforced

cement. We have observed significant increase of strain energy of poly(methyl methacrylate) using polycaprolactone nanofiber mesh.

Jardine, Laura - Oklahoma City University

Effects of fire intensity on small mammal communities— 5 years post fire.

We assessed the recovery and current status of small mammal populations in 3 mixed grass prairie habitats 5 years post burn in the Wichita Mountains Wildlife Refuge, Indianhomia, Oklahoma. These sites represent 3 burn treatments: moderate burn, intense burn, and unburned. We sampled the small mammal fauna at each site using a Y-shaped array of Sherman and pitfall traps for a total of 800 trap nights/site. We used a modified point-intercept method to sample 80 habitat variables at 280 points at each site. These abundance-weighted data were subjected to principal components analysis to assess mammal affinities for habitat structure among the 3 sites. We also calculated mammal species diversity for each treatment. Component I represents a gradient from short, low density forbs and grasses, lichen covered cobble and boulders, and water disturbance to areas of taller grasses and forbs with herbaceous litter ground cover. Component II represents a gradient from short forbs, tall herbaceous litter, and no disturbance to areas with tall forbs and grasses, short herbaceous litter, bare ground cover, and ungulate and human disturbance. Four species, *Peromyscus maniculatus*, *Cryptotis parva*, *Sigmodon hispidus*, and *Chaetodipus hispidus* clustered tightly on the positive loadings of PC I. *Neotoma floridana* occurred on the extreme opposite (negative) end of PC I and *P. leucopus* intermediate to these 2 groups. PC I explained 59.58% of the variation in the dataset. *Neotoma floridana*, *P. maniculatus*, *P. leucopus*, and *S. hispidus* clustered closely near the center of PC II while *Chaetodipus hispidus* was projected onto the negative end of PC II and *Cryptotis parva* onto the extreme positive end. Using the Shannon-Wiener Diversity Index, we determined that the moderate burn site had the greatest species diversity, the intense burn site had the second highest species diversity, and the unburned site had the lowest species diversity.

Jardine, Laura - Oklahoma City University

Effects of fire intensity on habitat recovery in a mixed grass prairie ecosystem.

We assessed the recovery and current status of 3 mixed grass prairie habitats 5 years post burn in the Wichita Mountains Wildlife Refuge, Indianhomia, Oklahoma. These sites represent 3 burn treatments: moderate burn, intense burn, and unburned. We used a modified point-intercept method to sample 80 habitat variables at 280 points at each site. These data were subjected to principal components analysis to assess trends in habitat structure among the 3 sites. The first 2 components explained 100% of the variation in the dataset. Component I represents a gradient from short, low density forbs and grasses, herbaceous litter vertical cover, lichen covered cobble, and low disturbance to areas of tall, dense forbs and grasses, and animal disturbance. Component II represents a gradient from bare soil, moss, algae, gravel, shrubs, and graminoid crowns to areas with tall forbs, water disturbance cover, and boulders. Projections of the burn treatment sites onto principal components I and II indicate that the moderate and unburned sites cluster closely on component I (negative loadings) but are widely distinct along component II. The intense burn had the highest positive loadings along component I and is intermediate with respect to component II. High intensity fire results in more complete nutrient cycling from accumulated litter. This leads initially post fire to dense grass cover then increasing forb cover in the following years. Such an increase in forage density attracts large herbivores which inflict higher levels of disturbance to ground cover.

Jarrell, Jared - Oral Roberts University

Mitigated Creek Turnpike Wetlands: Success or Succession? A comparison of vegetative surveys from 1992-97, 2011-12, and 2016..

The Creek Turnpike Wetlands were created in the early 1990's as a response to the construction of the turnpike that destroyed natural wetlands. Federal law states that there can be no net loss

of wetlands in the U.S (Clean Water Act Section 404). A wetlands can be defined as an area of land where water saturation determines the substrate development and the types of plants and animals that live there. The only feature all wetlands share is a substrate that is at least periodically covered or saturated by water (Federal Geographic Data Committee, 2013). A mitigation involves the creation or restoration of a wetland to compensate for the loss of a naturally occurring wetland due to human development. This study will reassess the mitigated Creek turnpike wetlands sites A, and C using the Braun-Blanquet vegetative coverage scale and comparing them to the previous surveys. The relative abundance of facultative wetland (FAC) and obligate wetland (OBL) plant species is an indicator of a functioning wetland (USDA, NRCS.2011). This study will be conducted during the 2016 growing season that follows a year of abundant rainfall that filled the wetland sites. The 2016 data will be compared to the 2011-12 vegetation surveys conducted during the drought years of 2011-12 and to the original surveys conducted after wetland construction. The aim of this study is to see a resilience in the FAC and OBL plant species and coverage abundance in a wet year from the data during the drought years.

Jencks, Cody - University of Central Oklahoma

Design of a Thermoacoustic Refrigerator.

This project deals with the design and optimization of a thermoacoustic refrigerator. Thermoacoustic refrigerators, also known as TAR, use high-amplitude sound waves from a speaker to create oscillations in pressure, temperature and displacement. These different variations pump heat which will be used to cool a compartment that will be used as a refrigerator. These types of designs are more environmentally friendly due to lack of moving parts. After extensive research in this area, a cheap proof-of-concept model will be built. After this, studies can be done to find the most efficient dimensions of the cold compartment, size of speakers, and other details included in the design which may include the length of the resonator tubes. Optimal voltages and frequencies will also be investigated with tests. With the minimum desired dimensions being 7.5 inches deep by 6 inches wide by 5 inches tall, the objective is to cool the cold compartment at least 10 degrees Fahrenheit in reference to ambient temperature. Data from all test will be recorded as well as each change that is made to the model before the trials. Better understanding what changes affect the system, will help obtain optimal results.

Jones, Ryan - Oklahoma Christian University

Roads not taken: Gold nanoparticles illuminate cancer's occult secrets by unraveling new molecular targets via corona approach..

In July 2016 alone, there will be 250,000 deaths from cancer (cancer.org). Though continued research of old targets is fruitful, finding new targets for cancer treatment is imperative. One way to identify new targets is using gold nanoparticles (GNPs). GNPs are known to be biologically active, significantly reducing cancer cell growth. One mechanism for this activity is the formation of a protein corona, in which the GNPs bind cellular proteins that are central to growth and functionally inhibit these proteins. We hypothesize identifying the content of this protein corona could lead to discovering a novel therapeutic target. Two ovarian adenocarcinoma cell lines, TYK-nu and its cisplatin-resistant derivative TYK-nu-Cis, were grown and treated with varying concentrations of citrate-stabilized GNPs, then the CyQUANT proliferation assay was performed. Next, cell lysates from each line were interacted with citrate-stabilized GNPs for 20 h. Following dynamic light scattering and zeta potential measurement, the protein corona was separated by centrifugation. SDS-PAGE and LC-MS/MS analyses were then performed. The proliferation assay showed significant, concentration-based inhibition of growth. Dynamic light scattering and zeta potential measurement showed an increase in particle size from the GNP only to the GNP with protein corona and a decrease in magnitude of particle charge. SDS-PAGE exemplified GNPs' selective binding, with many proteins more concentrated in the corona than in the cell lysate. LC-MS/MS protein sequencing

will identify these proteins of interest. GNPs allow focused searching for new therapeutic targets, which will be identified by LC-MS/MS.

Kamali, Shaida - Oklahoma Christian University

First Line Chemotherapy Induces Stemness and Multidrug Resistance in Major Types of Cancer.

A significant burden is imposed on human health by the rising numbers of lung, pancreatic and ovarian cancer. Together these malignancies will account for 299,740 new cases in the U.S alone in 2016. Despite an initial response to first line therapy, patients often acquire resistance and develop a more aggressive form of recurrent disease with a poor response to second line chemotherapy. We hypothesized that cross resistance to chemotherapeutic drugs are associated with molecular markers of stemness like BMI1 and MDR1, and utilizing anti-BMI1 strategies might alleviate acquired resistance to chemotherapy. Cell viability assays were used to determine drug sensitivity. Quantitative PCR and immunoblotting were performed to determine relative mRNA and protein expression of stem markers and drug transporters. Efficacy of PTC-028, a BMI1 inhibitor was evaluated in the preclinical orthotopic mouse model of ovarian cancer. Treatment of ovarian, lung and pancreatic cancer cells with Paclitaxel, Carboplatin and Gemcitabine, respectively, induced resistance to second line drugs as indicated by a shift in IC50 values. Frontline drugs led to the upregulation of BMI1 and MDR1 both at the transcriptional and protein levels. In vivo pre-clinical studies, confirmed that single agent PTC-028 reduced expression of BMI1 and was as effective as standard carboplatin/taxol in reducing tumor weight. Frontline therapy induces cross chemo resistance. Accordingly, cross-chemo resistance was observed in cancer cells pre-treated with first line drugs. Interestingly, anti-BMI1 therapy was both feasible and showed significant single agent activity. Thus, anti-BMI1 strategies might attenuate cross chemo resistance.

Karki, Keshav - East Central University

Plant Pathogenic Diaporthe Species Infecting

Melons in Oklahoma.

Plant pathogenic fungi are the leading cause of plant diseases in the world. Variation in the population of a specific pathogen species determines how widespread the disease may progress in a certain crop. In 2015, Udayanga et al. published a phylogenetic re-assessment of the Diaporthe sojae species complex associated with field crops. They found that Diaporthe Nitschke (syn. Phomopsis (sacc.)) species that attack melons (*Cucumis melo* L. var. *cantalupensis* Naudin) separated into four distinct species; *D. melonis*, *D. ueckeriae*, *D. sojae*, and *D. curcubitaebased* on morphology and DNA analysis. All four originate from different locations. *D. ueckeriae* isolates were from Colbert, Oklahoma. The purpose of this study was to further investigate the variation in Diaporthe species on melons in Oklahoma. Melon fruit from the Atoka and Colbert areas were collected and stored for 4-15 days. As Diaporthe symptoms developed, the melons were cut and the pathogen isolated from the mesocarp tissue. The tissue was placed on either potato dextrose agar or malt extract agar. Approximately 65 Diaporthe isolates have been identified based on spore and colony morphology. Morphological and microscopic examination of indicate that approximately 50% are similar to *D. melonis* and *D. ueckeriae* and the other 50% are similar to *D. cucurbitae* and *D. sojae*. This is a strong indication that Oklahoma has at least 2 Diaporthe species. Further work is underway to determine DNA sequences of the isolates. .

Khanam, Sharmily - Oklahoma State University

Intracellular Calcium Homeostasis Regulates Several Physiological Events in a Human Pathogen *Pseudomonas aeruginosa*.

Calcium (Ca²⁺) is a major signaling ion regulating essential processes in a human body. Imbalances in Ca²⁺ homeostasis are commonly associated with diseases, as exemplified by accumulation of Ca²⁺ in the pulmonary and nasal fluids of cystic fibrosis patients. Earlier, we established that *P. aeruginosa* maintains low intracellular Ca²⁺ level, which is transiently increased in response to extracellular Ca²⁺, and identified several transporters responsible for this. Also, disruption in Ca²⁺ homeostasis disrupted several Ca²⁺-regulated traits such as antibiotic resistance, swarming motility, pyocyanin production. The maintenance of the intracellular Ca²⁺ level ([Ca²⁺]_{in}) is strictly regulated by flux mechanisms, and the generation of the Ca²⁺_{in} transients is essential for Ca²⁺ signaling. A putative Ca²⁺ channel, PA2604, was shown to play a major role in the development of the transient increase in [Ca²⁺]_{in} in *P. aeruginosa*. We hypothesize that PA2604 is involved in regulating bacterial responses to Ca²⁺. A transposon mutant with disrupted PA2604 showed abolished Ca²⁺ induction of *P. aeruginosa* pyocyanin production, swarming motility, and tobramycin resistance. Previously, we identified six multidrug efflux pumps of RND superfamily that are involved in Ca²⁺ regulated tobramycin resistance and whose transcription is regulated by Ca²⁺. The PA2604 mutant showed a decreased promoter activity for one of these efflux pumps, mexAB-oprM, thus supporting the role of [Ca²⁺]_{in} transients in Ca²⁺ regulation of tobramycin resistance. Currently, we are characterizing the temporal response of PA2604 transcription to Ca²⁺ by using both promoter activity and RT-qPCR. To elucidate the role of PA2604 in Ca²⁺ regulation of gene expression, we have performed a genome-wide RNA-Seq analysis of PA2604 mutant and WT. This will reveal the genes and pathways regulated by PA2604-mediated changes in [Ca²⁺]_{in} and identify the scale of Ca²⁺ regulation in *P. aeruginosa*. This will also provide the first experimental prove of the intracellular Ca²⁺ signaling in bacteria.

King, Michelle - Oklahoma State University

A β Propeller Protein, CarP, Plays Role in *Pseudomonas aeruginosa* Response to Calcium.

Pseudomonas aeruginosa is an opportunistic pathogen that causes severe acute and chronic infections in humans, particularly, in cystic fibrosis (CF) patients. Our group has shown that calcium (Ca²⁺) induces virulence and antibiotic resistance in *P. aeruginosa*. Earlier we identified a Ca²⁺-regulated protein, CarP, which was predicted to form a 5 bladed β -propeller structure with a putative Ca²⁺ binding site in the center of the propeller. We characterized its role in several virulence-related Ca²⁺-dependent phenotypes and cell tolerance to high Ca²⁺. We also showed that the expression of carP is regulated by a Ca²⁺ induced two-component system, CarSR. To further characterize the role of CarP in Ca²⁺-regulated virulence and adaptation to host, we aim to identify the host factors that control the expression of carP. For this, we constructed a reporter with carP promoter cloned upstream of the lux operon, which allows measuring the promoter activity based on the luminescence produced by the lux system. In addition to elevated Ca²⁺, CO₂ and oxidative stressor, H₂O₂, we will test the effect of antibiotics used to treat *Pseudomonas* infections. Furthermore, we investigated the role of CarP in virulence by using *Galleria mellonella* and mouse virulence models. Disruption of carP reduced worm killing by 60% and decreased survival of *P. aeruginosa* in mice by 30%. This data reveals that CarP plays an important role in the pathogen's virulence and survival within a host. Further studies aim to characterize Ca²⁺-binding capabilities of CarP and advance our knowledge on the molecular mechanisms of Ca²⁺ regulation of *P. aeruginosa* virulence and fitness in response to host environment.

Kramer, Amanda - East Central University

Modeling Measles with Random Forcing.

Measles is a highly contagious virus that is characterized by its recognizable rash and occurs in outbreaks. Although a highly effective vaccine has been available for over fifty years, vaccination rates still hover below the required percentage for complete eradication. To combat these outbreaks, we attempt to understand the spread of the disease using CDC vaccination rates and known spreading factors. Using a Monte Carlo simulation to deal with the uncertainty, we apply an SEIR model. We are able to predict length and day of outbreaks along with a prescription to eliminate outbreaks in the future.

LaMascus, Hadley - Oklahoma Christian University

CRISPR-Cas9 Mediated Gene Edit of Holocentric Binding Protein-1 in *Caenorhabditis elegans*.

HCP-1, paralog of HCP-2 (the ortholog of CAGE-1), has redundancy in viability with HCP-2. There exists evidence, though, that HCP1 and 2 have different functions, specifically in spermatogenesis. Thus, three strains of model organism *C. elegans* were proposed: a deletion of HCP-1, a deletion of HCP-2, and the over-expression of HCP2. This summer, the strains lacking HCP-1 and HCP-2 were attempted using the methods of CRISPR-Cas9 and PCR of primers to verify gene replacement.

Lieber, Stephanie - University of Central Oklahoma

Expressions of Threat: Micro-Expressions in Response to Immanent Aggression Facial Expressions.

The ability to determine what is a potential threat in our environment is even more important in the current world with terrorist attacks, killer clowns, and overall civil unrest. Humans have developed an evolutionary threat management system that allows for the prevention of harm. Threat management system is a biological, social and cognitive defense mechanism that allows for self-protection via the ability to detect a potential threat from the environment, whether that threat be a person, disease or animal. Facial expressions of imminent aggression or premeditated aggression, disgust and loss of control of aggression illicit a threat response. This response is predicted to be a facial reaction in the form of a micro expression according to the guidelines of Facial Action Coding System created by Dr. Paul Ekman. Participants will be shown a series of pictures that fall under the three classifications of immanent aggression: premeditated, disgust and loss of control. In order to correctly establish threat, participants will receive a cold water pain induction treatment. By inducing mild pain, the threat management system is activated and micro expressions of threat detection will be shown to correspond to given threatening images. It is hypothesized that blended micro expressions of fear, surprise and possibly anger will be primary response to threat. The ability to detect potential threats with facial expression can add to the prevention of terrorist attacks, and other violent crimes.

Lipka, Melvin - Cameron University

Identification of time dependent control parameter through finite difference method in parabolic partial differential equation..

Inverse problems are the oldest most important problems in science and engineering. Because of their applications in medical imaging, underground prospecting, nondestructive testing, astronomical imaging, image processing, remote sensing, and data mining, Business, Industry, and Government (BIG) sectors are very interested in computational inverse problems. Because of massive increase in computing power and development of powerful numerical techniques, the field of inverse problems has undergone rapid development recently. In this work, we consider a parabolic partial differential equation with time dependent control parameter. Forward Time Central Space, Backward Time Central Space, and Crank-Nicolson method are

used to identify the control parameter. Numerical experiments are presented and the stability of the solution is discussed.

Litt, Pushpinder Kaur - Oklahoma State University

Genomic and Physiological Characterization of Novel Bacteriophages Infecting Shiga-toxigenic *Escherichia coli*.

Shiga-toxin-producing *Escherichia coli* (STEC) are critically important foodborne pathogens that are commonly associated with cattle. They have been responsible for a number of foodborne outbreaks associated with meat and fresh produce. It is therefore crucial to devise effective control strategies. Use of target-specific and ubiquitous bacteriophages can be an attractive alternative to control STECs in the food industry. The objective of the current study was to conduct characterize novel STEC-infecting bacteriophages isolated from beef cattle operations in Oklahoma. Bacteriophages specifically targeting STEC (O157:H7, O121, O111, O103, O26, O145, O45) were isolated from environmental samples. Morphological features of isolated phages were examined under transmission electron microscope (TEM). In-vitro inhibition assays were performed to measure the degree of STEC-lysis caused by phages. Viability of selected bacteriophages was tested at various pH and temperature ranges. One-step growth-kinetics assays were performed to measure the eclipse-period, latent-period, and burst-size of each phage. Phage adsorption-rate and optimal lysis time was also determined. Bacteriophage DNA was extracted using phenol-chloroform method and digested using restriction enzyme. The digested fragment was cloned and transformed into *E. coli* XO-1-Blue and sequenced subsequently. Several phages (n=52) were isolated, showing inhibition towards the 7 STEC serotypes. Phages were classified as either Myoviridae, Siphoviridae, or Tectiviridae family, using TEM. All phages were resistant to a temperature of up to 60°C and survived the acidic (2, 5) and alkaline (7, 9, 11) pH ranges. All phages had a short latent-period (~20 mins), with large burst-size (41-67 virions/infecting cell), indicating high lytic activity. Genome sequencing revealed that the tail proteins of isolated phages were closely related to enteric phages specific to *Salmonella*, *Vibrio*, *Shigella*, and *Yersinia*. Characterization of selected bacteriophages, targeting diverse strains of biofilm-forming STECs, would help with the development of effective bio-control strategies with potential uses in the food industry.

Long, Qi - Southeastern Oklahoma State University

Bioinformatical analysis of corticosterone-induced neuronal cell neurotransmitter degradation.

Glucocorticoid is a major member of hypothalamic-pituitary-adrenal-axis (HPA axis) hormones. Previous studies have confirmed that the clinical use of synthetic glucocorticoids in long term treatment for immune suppression increase the risk of neuronal cell damage and may cause the depression, but the underlying genomic information and the potential mechanism remains unclear. This study is to investigate the relationships between extracellular corticosterone concentration and neurotransmitter metabolic processes on PC12 cells by applying next-generation RNA-Seq technology. As a result, canonical pathway analysis demonstrated that corticosterone increased ADHFE1, ALDH2, ALDH4A1, and Sult1a1 genes' expression levels, therefore directly affected the pathways of serotonin, dopamine, and noradrenaline degradations thus cause depression.

Lowe, Matthew - East Central University

Agricultural Land Tax Assessment in Oklahoma.

Land valuation for tax purposes is usually assessed by the selling value, however for agricultural land in Oklahoma, the value is assessed according to a formula based on the production or use of the land rather than the current market value. This project shows how GIS can take a time consuming process and automate multiple formulas in a model and calculate directly from the created map for greatly reduced time consumption and improved accuracy.

Mackey, Morgan - East Central University

Uptake of arsenic by iron hydroxy carbonate (chukanovite): Implications for groundwater treatment using granular iron reactive barriers..

Chukanovite ($\text{Fe}_2(\text{OH})_2\text{CO}_3$), an iron hydroxy carbonate mineral, is a prevalent secondary mineral precipitate in granular iron permeable reactive barriers (PRB) used to treat contaminated groundwater. The buildup of secondary precipitates in PRBs, like chukanovite, can change the rate and efficiency of contaminant removal. Our goal is to determine what role chukanovite plays in controlling the efficiency and lifespan of PRBs. Chukanovite was synthesized based on previously developed methods, and confirmed through X-ray diffraction analysis. Batch sorption experiments were performed to determine how chukanovite controlled arsenic levels (arsenite and arsenate) in water samples. Experiments show that chukanovite can rapidly (<1 h) reduce arsenic levels in water and arsenic remains bound to chukanovite for extended periods of time. Equilibrium concentrations of arsenic were typically below 10 $\mu\text{g/L}$ at loadings of 2.3 g/L and initial arsenic concentrations of 1000 $\mu\text{g/L}$. Studying different concentrations of arsenite under varying pH conditions shows chukanovite can incorporate up to 0.049 mol As/kg, and uptake is optimal at higher pH. Future studies will further characterize chukanovite using Fourier Transform-Infrared (FTIR) Spectroscopy, Scanning Electron Microscopy (SEM), and will test arsenate interactions with chukanovite under variable conditions.

Marsh, Jimmy - East Central University

Establishing Property Descriptions in Washington and Osage Counties.

While working for Buckland surveying company for my summer internship (2016), I was a land surveyor's assistant. My duties were to collect archival data (e.g. historic surveyor notes, figure 1) and establish new data (e.g. using a GPS, figure 2) while in the field. This data is used draft a property description using AutoCAD program (Figure 3). Ultimately, this data will be used by homeowners, municipalities, real estate agencies, construction companies, etc.

McCallum, Malcolm - Langston University

Response of public interest in the environment to the papal environmental encyclical, Laudato Si.

Public interest is defined as the proportion of the public interested in a topic. Internet search behavior, attention paid in books, and decades of student surveys demonstrate that public interest in the environment has precipitously decline since the 1960s. In May 2014, Pope Francis released Laudato Si to the constituency of one of the five largest religions, comprising roughly 50% of Christians and 16% of the world's population. Laudato Si, colloquially referred to as the environmental encyclical addressed environmental problems of climate, biodiversity and how these issues will likely impact people, the poor and society as a whole. The release was further endorsed by leadership of religious figures in most of the major religions and denominations. I asked if public interest in the environment changed in response to this release, and if so were these transient or potentially sustained changes.

McDonnell, Angela - Oklahoma State University

A new spinypod from Northeast Texas, *Matelea hirtelliflora* and a synopsis of it's relatives.

A new species of spinypod milkweed vine, *Matelea hirtelliflora*, has been described recently from Northeastern Texas. We distinguish this new species from it's closest relatives in Oklahoma and the Southeastern United States. A synopsis of the species, comparison to relatives, phylogenetic placement, and distribution are discussed.

McDonough, Austin - University of Central Oklahoma

Characterizing Early Developmental Defects in an Avian Model of Maternal PKU.

Maternal phenylketonuria [MPKU] is a syndrome of multiple congenital anomalies including cardiovascular malformations [CVMs], brain and growth restriction when a mother with Phenylketonuria [PKU] does not control her dietary intake of Phenylalanine [Phe]. In this study, we aim to establish and characterize an avian model of MPKU. We focused on early developmental defects. METHODS: We investigated the effect of 2500 μM Phe exposure by in-ovo yolk injection. Following the injection, the embryos underwent further development for 48 hours until dissection was performed. At HH14-17, India ink was injected into the yolk as a contrast dye. Images were taken of embryos and they were scored based on Drake et. al (2006.) RESULTS: Embryos exposed to high Phe displayed gross morphological changes including developmental and growth delays, anterior and posterior abnormalities, and torsion defects. FUTURE STUDIES: Histological analysis is underway to determine changes in heart development. Currently there is no data interrogating the mechanism by which Phe causes heart defects. We plan to utilize this model to define the mechanism of Phe cardiac teratogenicity which is critical for improving MPKU treatments and outcomes.

McInnes, Daniel - East Central University

A Computational Study of the Stability of substituted 2-silapyridines.

Replacing a carbon with a row 3 heteroatom in a benzene ring affects the aromaticity of the molecule. Building upon this, we decided to determine the effects of replacing the 2-carbon in pyridine with a silicon. Bond lengths and partial charges were calculated for 2-silopyridine. The molecule is aromatic, but to a lesser extent than pyridine itself because of poor orbital overlap of the p orbital on carbon with that on silicon. We also calculated the effects of adding an electron donating group (-NH₂) and an electron withdrawing group (-Cl) to carbons 3,4,5, and 6 in 2-silopyridine.

McLeod, Daniel - Oklahoma State University

Generating mutations for functional studies of the putative Ca²⁺-binding protein CarP.

Pseudomonas aeruginosa is an opportunistic pathogen that infects the lungs of cystic fibrosis patients and burns or surgery wounds. Previously, we found that several virulence factors of *P. aeruginosa* are induced by calcium (Ca²⁺). We identified a hypothetical periplasmic protein, CarP, which has been shown to play a role in several Ca²⁺-induced virulence factors such as swarming motility and pyocyanin production. The mutant with disrupted carP (carP::Tn5) is unable to maintain the intracellular Ca²⁺ homeostasis and shows growth defect at 10 mM Ca²⁺. Therefore, we hypothesize that this protein plays a role in *P. aeruginosa* Ca²⁺ regulatory network. To study the role of CarP in Ca²⁺-dependent phenotypes we used a complementation strain carP::Tn5/carP, where carP is cloned under an arabinose inducible promoter. However, we discovered that addition of arabinose affects several Ca²⁺-dependent phenotypes of interest. Our goal is to generate an alternative complemented strain that would not require addition of arabinose or any other inducers. Therefore, we are cloning carP under a modified pLac promoter. We also hypothesize that CarP binds Ca²⁺. To study Ca²⁺ binding, we aim to identify the amino acids that are responsible for Ca²⁺ binding. Since CarP does not contain any characterized Ca²⁺-binding domains, to predict the potentially involved residues, we used bioinformatics analyses. Based on i-TASSER structural modeling, 12 amino acid residues were predicted to aid in Ca²⁺ binding. To test this prediction, we will make point mutations replacing each amino acid predicted to bind Ca²⁺ with alanine, purify the protein and measure its ability to bind Ca²⁺. Considering the lack of similarity of CarP with characterized Ca²⁺-binding proteins, we anticipate to identify a novel Ca²⁺ binding motif. Obtaining these mutants will also enable future functional studies, characterizing the role of CarP in *P. aeruginosa* virulence and its ability to interact with host cells.

McNamar, Rachel - University of Central Oklahoma

Phenformin Inhibits Myofibroblast Phenotype in Dupuytren's Contracture Cells.

Phenformin could be utilized to help treat Dupuytren's contracture by inhibiting the differentiation of myofibroblasts. Myofibroblasts are characterized by an abundance of alpha smooth muscle actin (α SMA) within stress fibers in the cytoplasm of the cell. This study examines the inhibitory effects of myofibroblast differentiation and proliferation that phenformin has on DC cells treated with TGF- β 1. Three lines of Dupuytren's Contracture cells (DP141a, 146, and 139) were used in each assay. Collagen lattices were prepared, incubated for an hour, and were either treated with TGF- β (1 ng/mL), phenformin (1mM) plus TGF- β , or acted as a control. The lattices incubated for 5 days. The lattice height was measured on each day. On day 5, the lattices were either measured for contraction or fixed for staining. Lattices were stained for differentiation and proliferation. Proliferation was determined using a click-EdU culturing and staining procedure; differentiation was determined by visualizing α SMA using immunocytochemistry. A group of control lattices was prepared for an embedded matrix migration assay. Prior to embedding the released lattices into a cell free matrix, the lattices were treated as above. After 2 days, pictures were taken using light microscopy. Coverslips were prepared, treated as above, and incubated for 2 days. On day 2, they were stained as above. For each cell type phenformin caused a decrease in proliferating cells and myofibroblasts when compared to both the control and TGF- β groups. Contraction in phenformin treated lattices decreased and the height increased. Phenformin inhibited migration. Migration was restored by removing the phenformin treatment and adding 1% media. The increase in height and decrease in contraction demonstrate that there is a decrease in tension. The results from the migration assay show that phenformin inhibits migration without causing cell death. Overall, phenformin inhibited proliferation and myofibroblast differentiation which could help treat fibroproliferative diseases.

Miller, Kayla - University of Oklahoma

Chloride and Sulfate Exchange in Short-Term, Low Temperature Brine + Jarosite Experiments.

Chlorine and other halogens in high salinity brines may readily exchange with sulfate and other ionically bonded anions available in other secondary phases observed on the surface of Mars, leading to diverse mineral assemblages. We conducted short-term, low-temperature flow-through and batch reactor experiments investigating jarosite ($KFe_3+3(OH)_6(SO_4)_2$) dissolution and reaction products in 50, 20 and 5 weight % $CaCl_2$ brines. Akaganeite (Fe_3+OOH,Cl) and antarcticite ($CaCl_2 \cdot 6H_2O$) were observed via powder X-ray diffraction (XRD) in all experiments alongside Ca-sulfate minerals. Antarcticite is likely present due to excess $CaCl_2$ brine in the samples prior to analysis. However, the presence of akaganeite and Ca sulfate minerals indicate that Cl- and SO_4^{2-} exchange readily in both flow-through dissolution and batch reactor experiments despite short durations and low temperature. Akaganeite has been observed in association with sulfate and sulfide minerals (Peretyazhko et al., 2016) by the CheMin-XRD at Yellowknife Bay, Gale Crater, Mars (Vaniman et al., 2014) and at other locations on Mars via orbital imaging spectroscopy (CRISM) (Carter et al., 2015). Our results suggest that low temperature diagenesis in chloride brines may have produced these mineral assemblages observed on Mars. Ongoing research aims to further characterize these chloride- and sulfate-bearing reaction products using Visible and Near Infrared and Raman Spectroscopy to better understand the spectral signatures of mixed sulfate-chloride assemblages, as well as Transmission Electron Microscopy to investigate the textural relationships between the reaction products.

Miller, Kenneth - Oklahoma State University Center for Health Sciences

Glutaminase and aspartate aminotransferase levels in primary sensory neurons during rat models of arthritis and colitis.

Neuronal glutamate synthesis occurs by two enzymes, glutaminase (GLS) and aspartate aminotransferase (AST). Alterations in GLS and AST expression in rat dorsal root ganglion (DRG), primary sensory neurons have been evaluated during several somatic and visceral injury/inflammation models, including unilateral adjuvant-induced arthritis (AIA) and TNBS-induced colitis. Similar alterations in GLS and AST expression in the DRG appeared to occur with these two models. The purpose of the current study, therefore, was to compare the temporal alterations of GLS and AST in the AIA and colitis models. The L4 DRG was examined for the AIA model, whereas the S1 DRG was studied for the colitis model. Temporally, there is a biphasic expression pattern observed in both models that occurs over a 2-4 week period. Increased production of GLS and AST (25-50%) in the DRG occurs within 24-hr of AIA or colitis and is sustained for 48-hr. By day 4, GLS and AST return to near baseline levels, but increase (20-40%) again in small diameter DRG neurons by 6-8 days of AIA or colitis. By day 16 of AIA, GLS and AST levels return to baseline, but remain elevated (5-15%) in small diameter neurons for more than 30 days in the colitis model. Our study illustrates a common pattern of expression for GLS and AST in DRG neurons during somatic and visceral inflammation. A shared blueprint of neurogenic inflammation, multiple inflammatory mediators, and neurotrophic factors may be responsible for the similarities in expression patterns. Elevated AST and GLS levels in DRG neuronal perikarya leads to increased glutamate production in peripheral and central terminals. The hypersensitivity observed in both models, therefore, may have similar mechanisms involving altered glutamate synthesis and release. Interventional therapies for diminishing altered glutamate synthesis may hold promise for pain relief in both somatic and visceral injury and inflammation.

Muhimpundu, Sylvie - Oklahoma Christian University

A Mechanistically Unique Approach to Ketone Synthesis: Dual Catalytic Ni/Ti Cross-Couplings of Nitriles with Organo-Halides.

Transition metal catalyzed cross-coupling reactions have significantly advanced our ability to construct C-C bonds, exemplified by the 2010 Nobel Prize being awarded to the founders of this powerful technology. This approach has typically used a palladium catalyst to form a bond between an aryl halide and a pre-functionalized organometallic reagent. Drawbacks of which are the additional step required to prepare the reagent, stoichiometric metal waste, limited functional group compatibility depending on the metal, toxicity issues, non-atom economical, sensitivity to air and/or moisture, and a limited shelf life. To address these issues we are developing new strategies that can employ alternative coupling partners to the organometallic reagents. Specifically, we are developing a reliable, robust, and widely applicable approach to dual catalytic radical cross-couplings. The objective of this study is to catalytically generate a carbon radical and cross-couple it with an organohalide under nickel catalysis. This approach enables bond formation between two abundant functional groups that cannot be coupled through traditional cross-coupling methods. Advantages of dual catalytic radical cross-couplings to classical palladium catalyzed cross-couplings are fewer overall steps to prepare compounds under milder reaction conditions with expanded substrate scope and chemoselectivity. The utility of this approach will be demonstrated through the coupling of nitriles with organo halides to access ketones.

Newton, Ashley - Langston University

Quantitative and Qualitative Improvements in DNA Extraction Procedures Using a Bronopol™ Tablet in Alpine Goat Milk.

Preservation of milk is important as it relates to *Capra aegagrus hircus* (Alpine goat) milk DNA extraction. We examined the difference in concentration and quality of DNA resulting from the use of a preservation tablet (Bronopol™) versus a Preservation Solution. When examining the concentration and quality of DNA in goat milk for any study that intends to use somatic cells contained in goat milk, it is best to use a substance that helps preserve the solution for long-term studies. The comparison of the concentrations and quality of DNA obtained from goat milk was made. Initially, two separate samples of Alpine goat milk were obtained from the same goats. The preservation tablet commonly known as B-14 or Bronopol™ was dissolved into one sample of milk. Another sample of goat milk was obtained without a tablet, rather it was supplemented with a Preservation Solution from a commercial product. The methods for DNA extraction followed the Norgen Biotek Corp. manufacturer's protocol. DNA quantity and quality were analyzed using a Thermo Scientific Nanodrop Lite spectrophotometer. The study showed that the traditional Bronopol™ was the best method of preserving and maintaining the integrity of DNA in the somatic cells that are present in Alpine goat milk. This is based on the results obtained following determination of quantity and A260/A280 readings for quality assessment. Thus, the Bronopol™ is the preferred method of preserving goat milk for DNA extraction.

Nicastro, Daniela - UT Southwestern Medical Center

Probing the Molecular Organization of Cells and Organelles using Cryo-Electron Microscopy.

Rapid freezing of cells can provide outstanding structure preservation and time resolution of dynamic cellular processes. Electron tomography of rapidly frozen specimens (cryo-ET) is a powerful technique for imaging biological structures in their native state and in an unperturbed cellular environment. We integrate high resolution imaging by either cryo-ET and sub-tomogram averaging or TYGRESS (Tomography-Guided 3D Reconstruction of Subcellular Structures), with comparative genetics, biochemical methods and EM-visible labeling to deconstruct the in situ 3D structure and functional organization of macromolecular complexes. Among different model systems, we use e.g. cilia and flagella to advance techniques and approaches for high-resolution imaging of complex cellular structures. Cilia and flagella are conserved and ubiquitous eukaryotic organelles that are composed of more than 600 different proteins and have important biological roles in motility and sensation; defects in their assembly or function cause severe human diseases. Our cryo-ET studies visualize the three-dimensional structures of intact wild-type and mutant flagella, and dissect the organization of key macromolecular complexes in different functional states. Such information can provide detailed insights into the structural basis and ultimately the function of many cellular processes.

Noble, Tyler - Northeastern State University Broken Arrow

Investigating DNA Polymerase Subunit Interactions In *Saccharomyces cerevisiae*.

Malfunction of DNA damage checkpoint pathways is associated with uncontrolled cell growth that defines cancer. Polymerase ϵ (Pol ϵ) has been implicated to have roles in these checkpoint pathways in addition to polymerizing function. Mutation in any of these functions results in tumor formation. Pol ϵ consists of four subunits: Pol2, Dpb2, Dpb3, and Dpb4. The catalytic subunit Pol2 is essential for cell viability and its C-terminus is required to activate damage checkpoint pathways. This project aims to understand subunit interactions within Pol ϵ complex. We are specifically investigating the Pol2 domains where Dpb2, Dpb3 and Dpb4 interact. Open reading frame of Pol2 C-terminus, Dpb2, Dpb3, and Dpb4 were amplified by polymerase chain reaction using a high-fidelity Pfx polymerase. The amplified products were

ligated into two-hybrid vectors. Pol2 C-terminus was cloned into the vector carrying Gal4 activation domain while Dpb2, Dpb3, and Dpb4 were cloned into the vector carrying Gal4 binding domain. Correct ligation was verified by DNA sequencing or colony PCR and protein expression by Western blot. Interaction between Pol2 C-terminus and Dpb2, Dpb3, and Dpb4 was analyzed by yeast-two hybrid. DNA sequencing revealed the successful ligation of Pol2 C-terminus, Dpb3, and Dpb4 into their respective vectors. Western blot confirmed the expression of the proteins in yeast. Yeast-two hybrid results will be discussed at the meeting. Mapping the subunit interactions within the Pol ϵ complex will help us understand the function of this complex at a molecular level which will help us to understand the events that lead to tumor formation and progression.

O'Brien, Valerie - Tulsa Community College

Classroom-based research experiences in a non-majors core course: a successful strategy.

Undergraduate students who participate in research improve their critical thinking skills and confidence. However, engaging students with diverse interests and backgrounds in semester-long research presents challenges for faculty, such as scheduling and assessment of student performance. I will demonstrate how a low/no cost research project in a non-majors, freshman-level course can provide students with the experience of critically analyzing a question of societal relevance, and results in participants' personal and professional development. I have applied these methods over six semesters in a general education course in an urban college with high minority and first-generation enrollment. I describe the classroom methods used to institute, ensure progress, and evaluate a semester-long project, and also discuss the impact of these courses, which includes increases in student self-confidence, college recognition and leadership opportunities, participation in regional conferences, and national recognition as winners in an undergraduate research challenge competition.

Onstine, Tanner - Oklahoma State University

Identification of the Mechanisms of Ca²⁺- induced Polymyxin-B Resistance in a Human Pathogen *Pseudomonas aeruginosa*.

Calcium (Ca²⁺) is an essential nutrient and is ubiquitous among many organisms. Ca²⁺ can function as a signaling ion to regulate essential cellular functions in both prokaryotes and eukaryotes. In *P. aeruginosa* it is known that Ca²⁺ regulates motility, biofilm formation, and the production of several secreted virulence factors. In our study Ca²⁺ has been observed to increase polymyxin-B resistance approximately 30 fold during growth in an environment containing 5 mM Ca²⁺ in comparison to an environment with 0 mM Ca²⁺. By using random mutagenesis followed by polymyxin-B susceptibility assay, we have identified 5 genes, PA2802, PA2803, PA2804 PA3237, PA3238, PA5317, and PA2590, to be involved in Ca²⁺-induced polymyxin-B resistance. To confirm the role of these genes in the process, a series of mutants with each of the genes disrupted by a Tn5 transposon, were tested for polymyxin-B susceptibility when grown at elevated Ca²⁺. Based on the decreased resistance of the mutants, we concluded that PA2803, PA3237, and PA5317 play a role in Ca²⁺ induced polymyxin B resistance. This difference was not due to growth defects in the mutants. Currently our goal is to confirm the role of these proteins by testing the complemented mutants for polymyxin B resistance. We are also employing bioinformatics tools to predict the functions of these genes products. The results will enable further functional studies of these proteins and their role in Ca²⁺ induced polymyxin-B resistance. We anticipate that this advancement will help identify new targets for developing novel therapeutics against *P. aeruginosa* infections.

Pande, Radhika

The role of miR23b and let-7a in glutamatergic myenteric innervation in trinitro-benzene-sulphonic acid-induced colitis in rats.

Chronic inflammatory bowel disease such as colitis is characterized by abdominal pain and pharmacological therapies are very limited. At the same time, the excessive and exacerbated immune response within the gastrointestinal tract makes the underlying mechanisms of colitis more complex to understand. Our previous finding showed elevated levels of glutaminase (GLS) in dorsal root ganglion (DRG) neurons in TNBS-induced colitis in WT rats. The incomplete understanding of mechanisms of gene expression led us to investigate the interaction between the inflammatory and neuronal responses affecting GLS in WT and GLS+/- rats. Experimentally, we induced colitis in Sprague-Dawley WT and GLS+/- rats by infusing TNBS into the colon. We collected the colon and DRG (S1 and L6) at different time points. Immune hyperactivity in colon was evident in TNBS induced colitis rats with very inflamed colons. We examined miRNAs miR23b and miR-Let7a, which target GLS and nerve growth factor (NGF)- β respectively. TNBS-induced colitis decreased the expression of miR23b 5p as well as 3p in both WT and GLS+/- rats at day2. This decrease in miRNA levels corresponded with increase in GLS protein expression in TNBS-induced colitis. The expression of Let7a-5p on the other hand increased in this colitis model. We are investigating NGF β protein expression levels to correlate with Let7a results. Further, we investigated if the change in miRNA profile in colon affected the myenteric ganglia. Immunohistochemical analysis showed that during TNBS-induced colitis there were visibly lower concentration and number of ganglia in WT animals and the ganglia were not as defined and structured as they were in control animals. GLS inhibitor, 6-diazo-5-oxo-L-norleucine (DON), pretreatment rescued the effect of colitis on these ganglia. Nevertheless, in GLS+/- animals, TNBS-induced colitis had very minimal effect on these myenteric ganglia. Their number and intensity did not change and the DON pretreatment had no effect at all on these myenteric ganglia in TNBS-induced colitis. Based on these results, it appears that GLS plays a very crucial role in TNBS-induced colitis and further investigation using different miRNAs as biomarkers for colitis may be crucial for its potential role in pathogenesis, diagnosis and treatment.

Patton, Christopher - University of Central Oklahoma

Isolation and Characterization of a Mycobacteriophage from Oklahoma Soil.

Mycobacteriophages are viruses that infect mycobacteria. The genus Mycobacterium includes both pathogenic and nonpathogenic bacteria. Some of the important human pathogens that cause tuberculosis and leprosy are in this group. This group also includes ubiquitous non-pathogenic soil bacteria such as Mycobacterium smegmatis. Thousands of mycobacteriophages have been isolated from the different soils around the world. Over eighteen hundred of these viruses have been sequenced, and none were from Oklahoma soil. Mycobacteriophage "OKCentral2016" was isolated from the soil collected from South-West corner of the University of Central Oklahoma campus in front of Coyner Health Science building. We used agar overlay method for isolation of this virus using host bacterium Mycobacterium smegmatis mc2115. The virus was subjected to several rounds of purification, amplification, and was precipitated using polyethylene glycol and sodium chloride. DNA was extracted using PCL method. Morphology, nucleic acid composition, genome size, pH stability and thermal stability was determined in this study. OKCentral2016 is a tailed phage containing DNA genome with an isometric head and a long tail. The virus showed a significant decrease in viability at 60°C, and is most stable between pH 6 to 8. This viral genome is currently being sequenced. Our future studies will involve further characterization of this virus and understand its genetic diversity.

Paulissen, Mark - Northeastern State University

Dominance relationships in juvenile five-lined skinks (*Plestiodon fasciatus*): does small size matter?

I studied aggressive behavior of neonate Common Five-Lined Skinks (*Plestiodon fasciatus*). Two neonates of differing sizes were placed on opposite sides of a divided observation chamber for 48 hours. Then the partition was removed and a single retreat was placed in the center of the observation chamber, and the behaviors of the two neonates were recorded for 60 min. During an encounter, one lizard typically displayed aggressive behavior (lunging at or biting the other lizard) while the other lizard displayed submissive behavior (avoidance/fleeing/tail-wiggling); though in 24% of encounters the two lizards showed no reaction to each other. Scoring of behaviors made it possible to determine which lizard was dominant and which was subordinate in each trial. The larger of the two lizards was dominant in 75% of the trials, and the smaller of the two lizards was dominant in 25% of trials. In trials in which the smaller lizard was dominant, the dominant lizard "won" barely over 50% of encounters compared to over 70% in trials in which the dominant was larger. In all trials, the two lizards spent significantly more time on opposite sides of the observation chamber than on the same side because the subordinate almost always fled from the dominant, often to the opposite side of the chamber. Nonetheless, the two lizards often used the retreat simultaneously.

Poe, Nicole - University of Oklahoma

Small mammal herbivores or soil nitrogen: What controls grasslands?

Human activity has shifted grazing and nitrogen (N) altering plant community structure worldwide. Plant community changes are expected to alter associated ecosystem functions (e.g., plant litter decomposition). Few studies address the concurrent effects of grazing and nitrogen inputs on community structure and ecosystem function. To better understand how herbivory and soil N availability can alter grassland structure and function, we first manipulated soil N (soil N addition vs. control) within an established rodent herbivore manipulation (rodents present vs. reduced). We measured plant community structure (productivity, diversity, and composition). Secondly, we collected plant litter and soil samples from grazing and soil N manipulated plots. We created microcosms similar to field plots by creating soil and litter laboratory incubations. From the microcosms, we measured soil CO2 evolution as a proxy for plant litter decomposition. Rodents reduced evenness by approximately 15% yet promoted diversity by 13%. Soil N addition did not significantly alter plant community structure. In addition, rodent herbivory shifted species composition such that rodent herbivory promoted C3 relative to C4 plant species abundance. Further, shifts in plant community composition led to rodent herbivory led to greater plant litter decomposition rates. Specifically, microcosms representative of rodent access plots had a 15% higher decomposition rate than rodent enclosure microcosms. Overall, we found productivity (carbon input) increased and decomposition (carbon output) decreased with herbivore decline. Therefore, we expect grassland ecosystem carbon dynamics to decelerate with a decline in grazing but may be unaffected by changes in soil N.

Rana, Jashmon - Cameron University

On the Numerical Solution of the Advection-Reaction-Dispersion Model.

Advection-Reaction-Dispersion model is instrumental to study transportation of chemical or biological contaminants through subsurface aquifer systems. To better understand the movements of contaminants in porous media, we develop an Initial Boundary Value Problem (IBVP) and solve numerically. In particular, solutions from Forward Time Central Space scheme, Backward Time Central Space scheme, Crank-Nicolson scheme are implemented. Numerical experiments are presented and error analyses are carried out.

Regmi, Samundra - Cameron University

Diffie-Hellman Key Exchange Protocol.

In 1976, Whitfield Diffie and Martin Hellman introduced the first practical method for establishing a common key between two parties over an unsecured communication channel, which is also known as Diffie-Hellman key exchange protocol. This is one of the widely used protocols in different cryptographic algorithms. In this presentation we are going to talk about this key exchange protocol and its importance in cryptography.

Rice, Stanley - Southeastern Oklahoma State University

An Economic Approach to Teaching Biological Sciences.

We can study the adaptations of organisms from different perspectives, including ecology and evolution. An approach that has not been extensively used is an economic one. Every adaptation has costs (including opportunity costs as well as energetic costs) and benefits, which can vary from one situation to the next. An instructor could teach an entire botany course from this perspective. For example, the synthesis of chlorophyll b costs more than chlorophyll a but confers a light-absorption benefit under shaded conditions; dense leaf hairs are costly to produce and reduce a leaf's photosynthesis, but may keep the leaves of a desert plant from overheating; and large-diameter xylem vessels allow rapid water transport, conferring a benefit in mesic environments, but entail the risk of cavitation in dry environments. These three examples could be included in a typical overview of photosynthesis, leaf structure, and secondary growth in a typical botany class. A similar approach could be taken with animals as well. In some cases it is nearly impossible to discuss biological concepts without using some economic terms such as "allocation" and "efficiency." In this session we will generate ideas for how to use this approach in the classrooms of the participants.

Richardson, Nick - Tulsa Community College

Purification of Beta-galactosidase from *E. coli*.

The purpose of our study was to isolate and purify the enzyme Beta-Galactosidase. In doing this, we were able to explore and understand the different processes involved in protein purification. *E. coli* 15224, a mutant strain that produces B-gal constitutively, was grown in nutrient broth and centrifuged to a pellet. The pelleted cells were then lysed by sonication and centrifuged to pellet out cell debris while the majority of proteins remained in the crude lysate. Bradford assays were performed to determine protein concentration and ONPG assays were used to detect b-gal activity. In order to perform ammonium sulfate precipitation, we had to determine a suitable percentage of saturation that would precipitate B-gal. After the proper $(\text{NH}_4)_2\text{SO}_4$ was determined, we performed dialysis which desalted our sample. The samples were then purified by Ion-Exchange Chromatography. After Ion-Exchange, the samples were then further purified by Affinity Chromatography. Archived samples from each purification step were then run on an SDS-PAGE for analysis.

Roeder, Diane - Cameron University

Flooding mediates homogenization of above and belowground invertebrate communities.

Natural disturbances occur randomly with profound impacts on fauna and flora. We quantified the impact of one type of disturbance, flooding, on terrestrial invertebrate communities during the summer of 2015. Record levels of rainfall during May and June raised water levels ~10 m at the Oklahoma University Biological Station on the northern border of Lake Texoma, causing substantial flooding that persisted for about a month. Two months prior to the flood, we surveyed above and belowground invertebrate communities in an old field using pitfall traps. The subsequent flood allowed us to quantify the effects of a severe disturbance on invertebrate community composition. Before the flood, we observed 4082 individuals (total of 18.61 g) from 92 species that belonged to compositionally different above or belowground

communities. Post flood, we found a 14-fold decrease in abundance, a 2.5-fold decrease in species richness, and a 2.8-fold decrease in biomass. Most species disappeared during the flood and many had not recolonized a year later, including important decomposers such as millipedes and isopods. Above and belowground invertebrate community composition was distinct prior to the flood in March 2015, but were compositionally similar 10 months post-disturbance. This was primarily due to the increased occurrence of field crickets belonging to order Orthoptera in both above and belowground traps. These well-known colonizers of disturbed and flooded areas comprised much of the belowground mass that was previously distributed across a number of smaller body size taxa. Our study highlights how disturbances such as flooding change not only patterns of abundance and species richness, but also community composition. While most invertebrates go unnoticed due to their small size, their loss has potential ramifications for a diversity of assemblages, communities, and even ecosystems.

Rucci, Gabriel - University of Central Oklahoma

Analysis of Migration in Phenylalanine Treated Cells.

Maternal phenylketonuria [MPKU] is a syndrome of multiple congenital anomalies including cardiovascular malformations [CVMs], brain and growth restriction when a mother with Phenylketonuria [PKU] does not control her dietary intake of Phenylalanine [Phe]. However, the mechanisms responsible for Phe-induced CVMs are poorly understood. Previous studies have shown that cardiac neural crest cells are important in formation of the outflow tract (OFT) and aortic arch arteries (AAA). Cell migration of the neural crest cells is a central process in the development of the heart. Study Objective: Since congenital CVM of the OFT and AAA are often observed in maternal PKU, in this study we aimed to determine if exposure to high Phe levels perturbs cell migration Methods: We conducted in vitro migration assays on several cell types to determine if migration was affected by Phe exposure. Results: Phe exposure causes a significant increase in migration of cells. Immunohistochemistry (IHC) is underway to determine the effect of Phe on proliferation and apoptosis. Discussion: If Phenylalanine increases cell migration like the data suggests, neural crest cells could have altered guidance and targeting to the heart and OFT. This could contribute to the CVMs observed in MPKU.

Scott, Magnus - Langston University

Validation of Multiplex Quantitative PCR Assay for Detection of Seven Major *Escherichia coli* Serogroups and Associated Virulence Genes in Goat Milk and Feces.

From the comprehension of dairy goat production inside goats has been a noteworthy custom worldwide and is a vital area of the national economy in numerous nations. Goats can give an extraordinary plenitude of nourishment to an extensive portion of the populace on this planet. In the most recent decade the quality of milk has been very much controlled in America for the identification and evaluation of foodborne pathogens. Therefore, the objectives of this SRT project were to apply a newly developed mPCR assay for the detection of *E. coli* serogroups and associated virulence genes in goat milk, feces, and their prevalence on goat farms. Milk and fecal swab samples from individual goats were aseptically gathered from three dairy ranches in Kansas and Oklahoma. Our samples were transported promptly to the lab in ice, and enriched in *E. coli* broth overnight. DNA was extricated, concentration was measured, and PCR was performed to identify *E. coli* strains. In any case, every single fecal specimen had one or more *E. coli* strains of O157, O26, O45, O145, and stx1, stx2, eae, and ehxA virulence genes with different prevalence's that indicated lactating goats is a natural reservoir of *E. coli*. Therefore, great practices in milking, ranch administrations and the well being of all animals must be upheld to dispose contamination of *E. coli* from goat milk for human consumption.

Shahan, Justin - Southeastern Oklahoma State University

Bioinformatical analysis of corticosterone-induced neuronal cell gene expression profile changes.

Major depressive disorder (MDD) is a highly prevalent psychiatric disorder which is becoming a leading cause of disease burden worldwide. Past clinical and laboratory evidence has confirmed that the abnormalities of hypothalamic-pituitary-adrenal (HPA)-axis hormones are involved in MDD development. This study applied next-generation RNA-Seq technology to explore the differential expressed gene profile between control and corticosterone treated PC12 cells to identify and functionally analyze the effects of corticosterone induced cellular function and genomic changes. The results demonstrated that 1,274 genes had at least a twofold expression level change in response to increased extracellular corticosterone levels. Among them, the top three biological functions being affected were “response to stimulus”, “cellular component organization”, and “signaling”, which were the same rank in both up- and down-regulated gene groups. In addition, those identified genes were involved in 18 body systems with the top three being affected in the nervous system, alimentary system, and urinary system. The results of this study not only provided solid evidence for potential molecular mechanisms of MDD, but also can be used as clues for future target-oriented specific functional studies.

Sharp, Olivia - University of Central Oklahoma

Perceptions of Multi-Level Marketing with MBA Students.

Multi-level marketing organizations (MLMs) are rapidly growing and is the business practice of selling products or services through independent agents who are financially compensated for their sales. These organizations account for 75 percent of goods and services sold via direct channels (the Direct Selling Association 2003). The ethics of such marketing and Ponzi schemes have been the topic of recent discussion. However, there is no empirical research regarding the social cognitive factors that affect the receptiveness of a multi-level marketing target to a persuasive message. Testing MBA students will give a unique vantage point on the receptiveness of schemes, compared to previous studies (Mather et al., 2016). Attitudes will be measured by individual difference measures. Participants will then read a scenario in which they are at a career fair and are solicited to arrange a meeting to discuss a multi-level marketing opportunity. MBA students may be found to be more or less receptive to multi-level marketing. The findings from this study will contribute to the limited knowledge on multi-level marketing and reward mechanisms (Emek et al., 2011) of multi-level marketing.

Sherman, Julianna - Oral Roberts University

Positive Regulation of Yes-Associated Proteins (Yap) Nuclear Activity via Amot Expression.

Breast cancer is the second most frequently diagnosed cancer in the world, yet its cause is not well understood. Unlike many organs, the mammary ductal system is not fully developed and static, instead it reaches full maturity during the lactation cycle following pregnancy. This cycle is full of reorganization and growth of the primitive epithelial ductal network. Upon completion of the lactation cycle, these same ductal epithelial cells undergo extensive involution and apoptosis. This particular organ is hypersensitive to pro-growth and pro-apoptotic signals, and therefore it is no surprise that it shows inclination to develop cancers. In order for this transition to occur, epithelial cells lining the mammary duct must lose their intracellular organizational structures. This loss of polarity results in dedifferentiation of the epithelial tissue and triggers aberrant growth. The intrinsic capacity of epithelial cells to repurpose their polarity constituents and promote growth results in the mesenchymal transition and metastasis. One of the key players in organ size control, Yes-Associated Protein (Yap), an apical junction associated protein that is found in the nucleus, has been shown to function in the role of a transcriptional co-activator that promotes both growth and dedifferentiation. This project is

designed to combine cutting edge technology (3D Matrix organogenesis modeling) with traditional biochemical techniques to investigate the role of Amot in promoting Yap nuclear activity within the context of mammary cancer initiation and progression. This project focuses on a type of breast cancer, “triple negative,” which has no current drug therapy. As we gain resolution of the roles played by polarity adaptors in promoting growth new therapeutic targets are likely to be discovered.

Sherwood, Heather - University of Central Oklahoma

Children’s Vulnerability to Homicide, Abduction, or Infanticide Correlates with the Seasons.

Routine Activities Theory has documented that perpetrators use an organized and meticulous thinking process when selecting a victim. Likewise, majority of perpetrators know their victims, and crime scenes can look dramatically different depending on the age of the children. These criminal events are a major sociological issue that needs to be understood and combated against. Archival data from Lexis-Nexis may provide media trends that take place as well as the seasons that children are more vulnerable. Results from the previous Google archival research show that fall tends to be when children are most vulnerable and winter is when children are least vulnerable. If societies can recognize who are likely victims, who the typical perpetrators are, and when these awful crimes tend to occur, crime rates will decrease.

Shihab, Aaqil - Talented and Gifted Magnet

Adherence to Pediatric Guidelines for the Diagnosis and Management of Acute Otitis Media.

Acute otitis media (AOM), or ear infection, is one of the most common reasons for children to be prescribed antibiotics. Doctors may tend to overprescribe antibiotics for AOM, and there has been much debate over whether steps are being taken to address this issue. Overprescribing antibiotics is a problem because after a certain period of time the targeted bacteria strain can become resistant to the antibiotic, rendering it useless. In June 2004, the American Academy of Pediatrics released AOM treatment guidelines that included a recommended observation period of 48-72 hours for children with non-severe AOM or uncertain diagnosis. Our objective was to determine if the establishment of clinical quality standards had an impact on the prescribing rates of antibiotics for AOM treatment among children from infancy to age 12. Using data from the Cerner Health Facts data warehouse of electronic medical records, we conducted chi-square analyses on over 200,000 patient encounters to compare antibiotic prescription rates before and after guidelines for teaching/non-teaching hospitals and for urban/rural hospitals. We found teaching hospitals to be half as likely as non-teaching hospitals to prescribe antibiotics after guideline implementation. Although antibiotic prescribing rates decreased for urban hospitals post guidelines, rates increased for rural hospitals. These findings suggest that efforts targeting non-teaching and rural hospitals may be needed to increase awareness of AOM treatment guidelines and the risks of overprescribing antibiotics. Further research is needed to more fully understand the factors contributing to differential antibiotic prescribing patterns for children suffering from AOM.

Shrestha, Nirjal - Cameron University

Convergence of Iterative Methods Under Weak Conditions.

The convergence order of iterative methods defined on the real line is usually determined using higher order derivatives and Taylor expansions although these derivatives do not appear in the methods. In the present study, we show convergence of some popular iterative methods using only hypotheses on the first derivative. This way we expand the applicability of these methods. We use the computational order of convergence as well as the approximate computational order of convergence to determine the order of convergence of the method. Numerical examples are

also presented to show that our results can be used to solve equations in cases that the results in earlier studies cannot be used.

Small, Mariah - University of Central Oklahoma

Tick Borne Pathogens in Urban and Rural Parks of Edmond, Oklahoma.

According to the Oklahoma State Department of Health (OSDH), in recent years, the number of people infected with tick borne illnesses has increased in Oklahoma. The OSDH provides annual summaries of infectious diseases that occur in individuals treated in a medical facility. In addition, the summaries include five tick-borne infectious diseases. Ticks will be collected from urban and rural parks in Edmond, Oklahoma. Each tick will be dissected and undergo DNA extraction. The prevalence of tick borne pathogens will be determined using polymerase chain reaction (PCR).

Smith, Kent - Oklahoma State University Center for Health Sciences

Preliminary Study: Applying Osteopathic Manipulative Techniques in Reducing Soft Tissue Abuse in Vocalists.

Osteopathic Manipulative Medicine may prevent vocal abuse and contribute to the overall health of the soft tissues associated with singing. Many singers are treated by physicians for ailments they develop over the course of their singing career (i.e. polyps, cysts, nodules, ulcers). These conditions can be mild to severe and create difficulties in a singer's life that may lead to phonosurgery and post-surgery vocal therapy. Although this is a successful treatment, less invasive and preventive methods, such as osteopathic manipulation, would benefit the singer and produce a longer and more productive singing career. Singing improperly or for long durations can result in straining of the vocal folds and tension near the hyoid bone in the neck. Thus, select osteopathic manual manipulations may be advantageous in diagnosing and treating patients suffering from muscle tightness or joint strain. Herein, we will study the effects of select osteopathic manual manipulation techniques that decrease tension in the neck and shoulders and their effectiveness in contributing the overall health and performance of vocalists.

Sparks, Sawyer - Northeastern State University

Expression and Purification of Nattokinase and Lumbrokinase.

At great financial expense, tissue plasminogen activator is the only Food and Drug Administration approved medication available pharmaceutically to counter strokes. Lumbrokinase, located in earthworms, and Nattokinase, derived from *Bacillus subtilis* in soybean fermentation, both expresses medicinal fibrinolytic activities, without excessive bleeding side effects, to combat thrombotic associated diseases. Purified codon optimized Lumbrokinase (PI239) and Nattokinase (Genbank: AF368283.1) are cloned and expressed as both inclusion body proteins and as periplasmic space proteins utilizing a leader sequence (peIB), both featuring a C-terminal 6x His Tag residue. Polymerase chain reaction was used to amplify genes PI239 and NATTO, synthesized by Genscript Co. The genes were isolated and inserted into a single vector DNA replicon system, pET-22b(+) (Novagene Inc.), for expression of the recombinant proteins in *Escherichia coli*. The plasmid constructs were chemically transformed into the *E. coli* cells (NEB 5-alpha) for cloning and chemically transformed into new *E. coli* cells (NEB BL21) for protein expression through Magic Media (Invitrogen). The inclusion body protein was extracted during a lengthy step-down urea concentration strategy and the periplasmic space protein extracted through osmotic shock. The proteins were refolded via dialysis and purified through nickel column chromatography. The purified protein is to be subjected to future fibrinolytic assays and coagulation assays.

Staton, Ote - Oklahoma State University Center for Health Sciences

Effects of Chronic β -FNA in the Cell Signaling Pathway of Normal Human Astrocytes.

Several neurological diseases and disorders found in the world today, such as bipolar disorder and Alzheimer's disease, are linked together through the element of neuroinflammation. β -funaltrexamine (β -FNA) has been observed to be an effective inhibitor of neuroinflammation. In normal human astrocytes (NHA), β -FNA impedes the expression of interleukin-1 β (IL-1 β)-induced chemokines such as CXCL10. Previous studies with β -FNA characterized the effects of this drug in acute settings. This study's objectives were to examine the effects of chronic β -FNA on NHA and discover where the drug is having its impact in the cell signaling pathway. NHA were cultured with 10 μ M β -FNA for 3 days. Treatment the final day included exposure to IL-1 β (3ng/ml). ELISA measured the amounts of CXCL10 expressed and MTT Assays revealed cell viability. Western blots quantified the expression of phosphorylated IRAK-1, IRAK-1, and β -tubulin in whole cell lysates. β -FNA significantly decreased the amount of CXCL10 expressed in cells treated with IL-1 β , but increased levels of phosphorylated IRAK-1. Neuroinflammation in NHA is inhibited by chronic exposure to β -FNA, but the involvement of modulated IRAK-1 remains to be fully determined.

Stewart, Danielle - Redlands Community College

Spatial Variability of Reservoir Sediment Physical Properties As Affected by Land Use and Climate Variability.

Through the years' erosion and sediment has changed in both Oklahoma and all over the world. The main objective for this study was to determine why certain plants can and cannot grow in certain soils. The goal was to determine the effects of land use change and climate change on reservoir sedimentation. The study area was the Little Washita Reservoir Experimentation Watershed (LWREW). Little Washita has many different types of land including shrub land and forest. There was a total of forty-four reservoirs of which twelve of them were used in this study. The samples were taken and analyzed to determine the different results in soil properties such as the bulk density and soil textures. The focus of this research was on reservoir fourteen. Reservoir fourteen was determined to fit into the silt and silt-loam field, after analyzing the results from the hydrometer test. This research supports the proper management of soil erosion, flooding, and water quality in order to increase agricultural production and environmental health.

Tillar, Chase - East Central University

A Mathematical Model of Passive Flux Meter Performance.

The Passive Flux Meter (PFM) is a technology, designed and patented by the University of Florida, to measure groundwater flux and contaminant mass flux. The current PFM design consists of an enclosed mesh casing filled with activated carbon (AC) that is placed into a monitoring well. Groundwater then flows through the device horizontally. The AC is pre-sorbed with fluid-soluble tracers – typically a suite of short-chain alcohol tracers. As groundwater flows through the PFM, the tracer is desorbed from the sorbent (AC) at a rate proportional to the Darcy Flux. At the same time, dissolved organic contaminants in the groundwater are sorbed onto the carbon. After some time of deployment, the PFM is removed from the well and sampled. Under Freundlich partitioning processes – non-linear sorption – the retardation factor of the tracer becomes a function of concentration. Using previously published analytical solutions to the advective transport equation, a MATLAB script is developed to simulate the performance of tracer desorption from the PFM. It is then possible to create a theoretical model of the PFM elution curve, representing the dimensionless mass remaining in the PFM as a function of time. The script will be used to explore the behavior of alternative sorbent-tracer systems, and help guide their selection by comparing performance to ideal

conditions. Furthermore, the script will be used to explore the behavior of contaminant partitioning on the sorbent, and evaluate potential errors in contaminant flux measurements.

Torgerson, Trevor - Oral Roberts University

Gene Expression in *Staphylococcus aureus* and Methicillin-Resistant *Staphylococcus aureus* Biofilms.

Nosocomial (hospital acquired) infections are among the leading causes of death in the United States. Approximately 2 million patients are affected each year; leading to more than 100,000 deaths. A large number of those nosocomial infections are caused by staphylococcal bacteria and their biofilms. Biofilms are an assembly of microbial cells that irreversibly bind to a surface and adhere to one another in a medium of polysaccharide material. Biofilms are known for their extracellular polymeric substance (EPS) matrix, antibiotic resistance, and the expression of certain genes within each bacterial DNA. *Staphylococcus aureus* and Methicillin-Resistant *Staphylococcus aureus* (MRSA) are gram-positive bacterium with the ability to form biofilms. Recent studies have suggested there are certain genes in the *agr* locus that are expressed when *S. aureus* biofilms form. The aim of this study was to determine the expression of *agr* locus associated genes following inhibition of biofilm formation in *S. aureus*. The minimum inhibitory concentration of carvacrol needed to inhibit the biofilm was determined through a “live/dead” assay. Following carvacrol treatment mRNA was extracted from the biofilms and amplified using PCR to determine the expression of genes within the *agr* locus. The *agr* locus contains specific genes *agrA*, *agrB*, *agrC*, and *agrD*. It was observed that there was an increase in expression in the *agrD* gene following carvacrol treatment. This treatment showed a greater effect on *S. aureus* compared to MRSA. *agrD* facilitates the synthesis of surface proteins on *S. aureus* and was directly effected by the presence of carvacrol. In conclusion, carvacrol seems to be a potential agent in controlling biofilm formation in *S. aureus* and MRSA.

Torres, Nathaniel - Oklahoma State University

Proteomics Analysis of a *Staphylococcus aureus* Tea Tree Oil-Selected Small Colony Variant.

Staphylococcus aureus is a Gram-positive pathogen that has the ability to display a small colony variant (SCV) phenotype that is associated with chronic and recurring infections. SCVs demonstrate: slower growth rates; defective metabolism and electron transport; and reduced antimicrobial susceptibility. Tea tree oil (TTO) is a popular antiseptic that kills bacteria by denaturing proteins and disrupting membrane structure. We previously reported on the isolation and characterization of TTO reduced-susceptibility (TTORS) *S. aureus* mutants which exhibited a unique SCV phenotype. One TTORS SCV mutant (TTORS-1) harbored numerous chromosomal mutations, including a mutation within the gene (*acpP*) encoding the acyl carrier protein ACP, which is essential for fatty acid biosynthesis. Comparative proteomics revealed that compared to parent strain SH1000, TTORS-1 demonstrated 113 significant alterations in protein expression levels. Alterations in proteins that play roles in: glycolysis; citric acid cycle; DNA synthesis; ATP synthesis; and fatty acid biosynthesis; indicate that the overall cell metabolism in TTORS-1 has been altered. In addition, we note that factors associated with the cold shock and stringent responses were also altered in this TTO-selected mutant. Furthermore, RT-PCR revealed that the *fapR* operon which is composed of fatty acid biosynthetic genes was also up-regulated in TTORS-1. We also report that TTORS-1 demonstrated reduced-susceptibility to the cell wall targeting antibiotics vancomycin and oxacillin. Our data suggests that the altered cellular metabolism in TTORS-1 probably contributes to the SCV phenotype observed in this mutant. Overall our work adds to our understanding of SCV's selected by common off the counter antiseptics.

Truelock, Mandy - Oklahoma State University

The effect of calcium on the production of rhamnolipids in *Pseudomonas aeruginosa*.

Pseudomonas aeruginosa is a gram-negative, opportunistic pathogen known to infect open wounds, burns, and the lungs of Cystic Fibrosis patients. Calcium (Ca^{2+}) has been known to induce virulence factors of *P. aeruginosa* such as pyocyanin production and swarming motility, which has been shown to be required for biofilm formation. In order to swarm across semi-solid surfaces *P. aeruginosa* secretes a biosurfactant called rhamnolipid. In addition, rhamnolipid is a virulence factor that aids in defense against the host immune response. Based on the observation that swarming motility is induced by Ca^{2+} , we hypothesize that rhamnolipid production is also increased in the presence of Ca^{2+} . In order to demonstrate this, we are testing the effect of elevated Ca^{2+} on the expression of *rhlA*, the gene required for rhamnolipid production. For this, we will measure the fluorescence of an *rhlA-gfp* translational fusion cloned under the *rhlA* promoter. We anticipate that fluorescence will increase with increasing Ca^{2+} levels confirming that Ca^{2+} regulates *rhlA* production. The next aim will be to test the role of several earlier identified Ca^{2+} -binding proteins (*EfhP*, *CarP*, and *PA2604*) in regulating Ca^{2+} -induced rhamnolipid production. The mutants with each of the corresponding genes disrupted showed significant alterations in Ca^{2+} -induced swarming. We will transform these mutants with the *rhlA-gfp* fusion containing plasmid and monitor fluorescence during growth at varying Ca^{2+} concentrations. We anticipate that these mutants will also show a reduction in Ca^{2+} -dependent rhamnolipid production.

Valasco, Cassandra - Oklahoma City University

Small mammal assemblage composition and habitat usage in a semirural landscape.

During the summer of 2016, we studied the small mammal fauna at John W. Nichols Scout Ranch in extreme southeast Canadian County, Oklahoma. Six species of small mammals, including *Peromyscus leucopus*, *P. maniculatus*, *Neotoma floridana*, *Sigmodon hispidus*, *Reithrodontomys fulvescens*, and *Didelphis virginiana*, were represented in 52 captures. The habitat preferences for these species were then assessed using species' abundance and 21 habitat variables from 10 randomly selected plots. These data were subjected to principal components and niche overlap analysis. *Peromyscus leucopus*, *P. maniculatus*, *N. floridana*, and *D. virginiana* exhibited the highest degree of niche overlap, occurring mostly in habitats with large amounts of woody litter and overhead canopy. *Sigmodon hispidus* and *R. fulvescens* were found in open grasslands with high grass and forb cover. In this landscape, woodland habitat exhibits higher mammal species diversity probably due to a greater amount of vertical structure.

VanZant, Timothy - University of Central Oklahoma

Zener Gravitational Wave Detection Apparatus.

Gravitational wave detection is at the forefront of physics at the moment. The Laser Interferometer Gravitational-Wave Observatory (LIGO) is the most widely known experiment for their detection. However, the large size of the project and budget make duplication of their results prohibitive, both logistically and financially. A tabletop apparatus has been proposed that purportedly detects gravitational waves via quantum fluctuations registered as micro-ampere changes in an array of reverse biased Zener diodes. These changes were previously thought to be random, but are now under observation to prove otherwise. Our project is to duplicate this device and results while eliminating as many sources of statistical error as feasibly possible. This project is still in early development because it includes engineering design, physics research, and undergraduate research. It also has the potential to supersede the current methods for detecting gravitational waves by introducing a smaller, less expensive device.

Vazquez Sanroman, Dolores - Oklahoma State University

Nicotine self-administration remodels perineuronal nets in ventral tegmental area and orbitofrontal cortex in adult male rats.

Nicotine is the principle addictive agent delivered via cigarette smoking. Nicotine not only excites different types of neurons, but it also alters synaptic properties and modulates synaptic plasticity. One neuron type sensitive to nicotine is the pyramidal neuron in the medial prefrontal cortex (mPFC). Activity of mPFC neurons is highly modulated by GABAergic parvalbumine interneurons, the majority of which are enveloped by specialized structures of extracellular matrix called perineuronal nets (PNNs), which are integral to maintaining many types of plasticity. This study investigated PNNs in mPFC (prelimbic and infralimbic subregions) and orbitofrontal cortex (OFC) following intravenous (IV) nicotine self-administration training in rats.

Walker, Nicholas - University of Central Oklahoma

Cell Manipulation in Microfluidics using Dielectrophoresis.

Cell purification and isolation is critical in many biomedical applications such as tissue engineering and stem cell based regenerative medicine. The conventional cell separation processes such as cell strainer and centrifugation cannot ensure purity, and are incompatible to microchips. Our research has focused on the development of a cell separation system with higher precision using electric field driven microscale characteristics of flow. This paper presents continuous manipulation and separation of rat fibroblast cells using direct current (DC) insulating dielectrophoresis (iDEP) in a microfluidic chip. Dielectrophoresis is a physical phenomenon that moves particles in a fluid media under a spatially non-uniform electric field. Sample was prepared by mixing fibroblasts cells in a sugar solution composed of 8.5% sucrose and .3% glucose in DI water with a cell concentration of 8×10^5 . The cells were cultured using standard cell culturing procedures. The microfluidic chip was pre-loaded with sucrose-glucose solution and the cells were loaded using a 10 μ L pipet. An electric field was introduced through inserting wire into the reservoirs and observed under microscope. Both experiment and numerical simulation demonstrated the manipulation of fibroblasts towards specific outlets for a range of applied voltages. Separation of fibroblast cells from 4 micron polystyrene beads in a 1:1 mixture of cells and beads was also demonstrated in the same microfluidic chip for varying applied voltages. The efficiency of manipulation and separation was found to be about 90%. The efficiency of cell manipulation and separation was estimated by counting how many cells/beads in each outlet reservoir and each experiment was repeated at least 3 times. Numerical simulations were conducted using COMSOL Multiphysics 5.1. This study is a step towards developing miniature cell separation systems for biomedical research and applications.

Watson, Jamie - University of Central Oklahoma

Transcriptomic Analysis in an Avian Model of Maternal Phenylketonuria.

Maternal PKU is a disease that affects embryos exposed to high levels of Phenylalanine (Phe) from mothers with PKU. This results in severe cardiac and cranial defects. Currently the only treatment is restricting the mother's diet of Phe. It is not known which genes in the developing embryo are differently expressed in the presence of high Phe. Methods Fertilized chicken eggs were treated with 2500 μ M PHE through yolk injection at HH6. Embryos were incubated until HH14 and then dissected. The brain/head region anterior to the otic placode was isolated separately from the thoracic/cardiac region between the otic placode and the 4th somite. The remaining tissue was discarded. For the control group, 3 embryos were pooled and 2 embryos were used for treated for a total of 3 samples. RNA was isolates followed by storage at -80°C. RNA was shipped to Applied Biological Materials for enrichment for mRNA, library construction, and sequencing on the Illumina NextSeq500. Using the open source software Galaxy Suite, the Fast QC program, first 6 bases trimmed and Tophat2 used to align and

assemble the library reads to the chicken genome assembly Gal Gal4. Results Cufflinks was used determine differential gene expression. In cranial tissue we found 6 differentially expressed genes ($q \leq 0.05$). In cardiac tissue, we observed 10 differentially expressed genes ($q \leq 0.05$.) Discussion Based upon the RNA-Seq data we have analyzed, in the cardiac tissue there are two differentially expressed genes found in the retinoic acid (RA) pathway, Retinol Binding Protein 4 (RBP4) and Transthyretin (TTR). In review of the literature RA signaling is important in heart development and increases or decreases in levels of RA can cause significant developmental defects. These types of defects are very similar to those seen in MPKU associated CVMs, thus warranting further analysis.

Weigand, Rhonda - Redlands Community College

Environmental Enrichment in the ISS Rodent Habitat Hardware System.

The resulting data from space based animal experiments is often used to determine the effects of spaceflight on humans. However, the housing conditions experienced by the murine aboard the International Space Station (ISS) may be unnecessarily inducing anxiety, thereby altering the data obtained from the experiments. The response to the microgravity environment of murine housed in the current Rodent Habitat Hardware System were reviewed from available video recording archives from NASA and ESA. Observations of murine behavior clearly indicated that weightlessness conditions induced stereotypy behaviors indicative of their response to stressful situations. Such stresses exert damaging psychological and physiological changes, which can influence some experimental test results. In response to the recognized need to improve the environmental conditions of the inhabitants and to reduce such stresses, we proposed a modification of the current rodent housing system. A cylindrical wire grid tubing network system was engineered to fit into the current housing system to provide the murine with more control and interaction within their environment by increasing the volume and surface area of the habitat. The tubing system also supports homeostasis, crucial nesting and other natural behaviors that benefit all strains of murine. The new tubing configuration was also developed to incorporate the placement of innovative medical monitoring technology and accessories which would allow non-invasive monitoring in real-time for stress free data collection. The proposed tubing network system is capable of being further developed and modified to fit requirements of future missions and data collection to include duration of missions beyond the current 30 days, returning murine back alive, and missions that could support murine husbandry.

Wells, Andrew - East Central University

Alternating Advantage in Two Player Games.

Many competitive games feature a mechanism that confers advantage to one player. Most often, this advantage alternates from one player to another when they play a series of games. This presentation looks at other ways advantage can be shifted from player to player and how that might change outcomes of a series.

Wiggins, Jodie - Oklahoma State University

Fitness correlations with juvenile color in *Crotaphytus collaris*.

Conspicuous coloration is common in avian and non-avian reptiles. However, such coloration is uncommon in juveniles. Juvenile males of the species *Crotaphytus collaris* develop orange bars (hatchling orange bars; HOB) on their lateral exposition roughly mid-way through their first season, prior to sexual maturity. We measured sex steroid levels (T, DHT, P, E2) and color of HOB (hue, saturation, and brightness) and plotted these measures against the number of offspring juvenile males later produced who survived to reproductive age (yearlings). We found that fitness is strongly positively correlated with HOB brightness and that androgens are strongly negatively correlated with HOB saturation.

Wiggins, Will - Oklahoma State University**Macronutrient Effects on Early Carnivore Growth.**

A large body size is important for many reasons, including competing for access to resources and decreasing the risk of predation or cannibalism. However, building a large body is costly and may require particular amounts and ratios of nutrients. For many animals, especially carnivores on which less is known of their nutritional ecology, the balance of nutrients at which animals maximize growth and body size remains unknown. The goal of this study was to test how the quantity and nutrient content (lipid and protein) of prey affected the growth of jumping spiders, *Phidippus audax*. We measured the body size of 420 F1 spiderlings raised on 21 different diet treatments ranging from high protein to high lipid across several prey quantities. The ratio of lipid to protein in prey had the largest effect on spider growth in the high prey abundance treatments. Overall, spiders weighed more and had larger body size on diets that were more lipid-biased. Our results suggest that spiders require lipid rich prey for maximal growth. We compared this to potential prey items in the habitat where the parents were collected, and found that most prey had low lipid content. We hypothesized that spiders could compensate for lipid poor prey by supplementing with carbohydrates in the form of nectar. To test this we reared another group of spiders on 5 different qualities of diet and gave half supplemental carbohydrates and the other half water as a control. Spiders on high protein with supplemental carbohydrates grew two times the size of the next largest spider, while there was no effect between the lipid rich diets with or without the supplemental carbohydrates. Overall, our results suggest that lipid may be a limiting nutrient for jumping spiders in nature but that feeding on liquid carbohydrates may alleviate this nutrient limitation.

Williams, Karen - East Central University**Gamma Analysis of Trinitite.**

I purchased some trinitite glass at our local rock and gem show. The samples were all labeled NM/7-16-56. Curious if the samples were actually trinitite, I performed gamma analysis of them to determine if they fit the known spectra of trinitite.

Wilson, Weldon - University of Central Oklahoma**Bohr Model of Hydrogen-Like Atom in 2D.**

The Bohr model for hydrogen-like ions in 2D is presented. The model may be of use in the study of two-dimensional materials such as graphene.

Winters, Dana - Midwestern State University**Comparing Predators and Predation Rates of Scissortailed Flycatchers Between Two Habitat Types.**

Previous studies have addressed nesting success for Scissor-tailed Flycatchers (*Tyrannus forficatus*), though none have been of sufficient duration to address variation in success rates and factors contributing to nest failure across years. We tracked >1000 nests over eight breeding seasons in southwestern Oklahoma, USA. Our study sites contained two distinct habitat types: oak (*Quercus* spp.)-elm (*Ulmus* spp.) savannah associated with native mixed-grass prairie and mesquite (*Prosopis glandulosa*) savannah associated with invasive grass species. Nesting success varied significantly among years (22% - 44%) and among habitat types. Nest success was highest in mesquite savannah and lowest in the oak-elm savannah. Low success in the oak-elm savannah was associated with higher predation rates than mesquite savannah habitat type, accounting for up to 85% of nest failures in some years. Nesting failure due to weather-related events were uncommon, with the exception of one year of observation in which almost 30% of nest loss was due to wind. We used wildlife cameras positioned in nest trees to determine primary predators of Scissor-tailed Flycatcher eggs and nestlings for three

breeding seasons. Predation events to date were associated with raptor, snake, and ant species. A single nest failure due to Brown-headed Cowbird (*Molothrus ater*) parasitism was also documented. Differences between predation rates of egg versus nestling stages will be discussed.

Xu, Gang - University of Central Oklahoma**Biomechanics of Single Flagella.****Yadav, Rohan - University of Central Oklahoma****Self-Regulated Realistic Modeling and Optimization of a 2D-Functionally Graded Stem in a Cemented Femoral Hip Prosthesis.**

The longevity of hip prostheses is contingent on the stability of the implant within the cavity of the femur bone. The cemented fixation was mostly adopted owing to offer the immediate stability from cement-stem and cement-bone bonding interfaces after implant surgery. Yet cement damage and stress shielding of the bone were proven to adversely affect the lifelong stability of the implant, especially among younger carriers with active lifestyle. The geometry and material distribution of the implant can be optimized more efficiently with a three dimensional realistic design of a functionally graded material (FGM). We report an efficient numerical technique to achieving this objective, for maximum performance stress shielding and the rate of accumulation of cement damage were concurrently minimized. Results indicated less stress shielding and similar cement damage rates when compared to 1D-FGM and Titanium implants.

Yerokhin, Vadim - Oklahoma State University Center for Health Sciences**Spatio-temporal variations in miRNA, mRNA and protein expression in peripheral nerve injury.**

Peripheral nerve injury (PNI) affects approximately 20 million Americans annually, costing the healthcare system over \$150 billion each year. Although current therapies attempt to promote nerve regeneration, only 50% of persons fully regain motor and sensory function. Injured peripheral axons can regenerate, but this is rarely complete due to the slow rate of regeneration. Clearly, a new therapeutic approach for accelerating peripheral nerve regeneration is needed. Although miRNA and anti-miRNA therapy has proved fruitful in normalizing dysregulated protein expression in other diseases, clinical use of this therapeutic modality in pain and PNI has yet to be realized. The absence of translational application of miRNA therapeutics stems mostly from our limited understanding of the molecular mechanisms underlying nerve injury and regeneration. Because nerve regeneration requires a complex coordination of finely regulated events, understanding these molecular mechanisms is key for designing an effective bio-pharmacological intervention. In this study, we present novel findings of spatial and temporal expression of miRNA let-7a and 23b post-PNI in the spinal cord (SC), and elucidate their relationship with Nerve Growth Factor (NGF) and Glutaminase (GLS) expression. Sciatic nerve crush injury was performed in male adult rats. Lumbosacral SC was divided into 4 quarters and miRNA let-7a and 23b, NGF and GLS mRNA and their corresponding protein expression was measured at 4 and 7 days. Expression in partial SC section was compared to the whole SC. Spatio-temporal patterns of miRNA, mRNA and protein expression were detected in both, a partial section of the SC, as well as the whole SC, suggesting presence of site-specific expression changes. These findings shed light on the molecular relationship during PNI, contributing to the knowledgebase required for the development of a novel therapeutic approach to peripheral nerve injury and regeneration.