

# SUBMITTED PRESENTATION ABSTRACTS

(Listed Alphabetically by First Author)

\*: Designates presenter

**Abraham, Aaron**

## **DETECTION OF *NAEGLERIA FOWLERI*, THE CAUSATIVE AGENT OF PRIMARY AMEBIC MENINGOENCEPHALITIS, AND OTHER PATHOGENIC AMOEBEA FOUND IN GRAND LAKE, OK, USING PCR FOR DNA AMPLIFICATION.**

*Naegleria fowleri* is the causative agent of primary amebic meningoencephalitis (PAM), a highly fatal disease of the central nervous system. The primary means of contraction is through the nose, generally while swimming in freshwater lakes, ponds, and splash pads that have pools of standing water. Water was collected from Little Disney State Park, Grand Lake, OK, as it was considered to be a likely candidate for finding *N. fowleri*. Samples were collected using sterile centrifuge bottles; they were completely submerged before collection to reduce any risk of contamination. Samples were filtered using 0.45µm filter paper to collect all cellular organisms. The samples were processed for DNA using the Mo-Bio DNA Extraction kit, then nano-dropped to estimate the amount of quality DNA present. Standard PCR was employed to amplify the DNA; primers specific for *N. fowleri*, *B. mandrillaris*, and *Acanthamoeba* spp. were used to ensure that only the DNA of those organisms was amplified. The final step was to run the samples through gel electrophoresis as a final means to verify if DNA of the amoeba was present. 23 samples were taken at Grand Lake between June and July 2013; of those, 65% of the samples tested positive for *N. fowleri*, 61% were positive for *B. mandrillaris*, and only 39% were positive for *Acanthamoeba* spp. These results point to a high prevalence of these amoeba in Oklahoma bodies of water, which is cause for concern. Future studies will focus on exploring the presence of these organisms in other Oklahoma waters.

**Adcock Smith, Echo, Kevin Farmer, Parameswar Hari, Kenneth Roberts**

## **DOPING ZnO NANORODS WITH COBALT AND THEIR PHOTOLUMINESCENCE SHIFT INTO THE VISIBLE SPECTRA**

Zinc oxide (ZnO) is currently investigated as a n-type material for photovoltaic cells. Typical absorption of ZnO is in the UV range. In this study we modified a chemical bath deposition technique for growing ZnO nanorods with various sizes ranging from 100-900 nm. The rods were prepared using hexamethylenetetramine (HMT), and cobalt (II) nitrate in high purity water, the pH was then altered and the solutions were placed in the oven at temperatures ranging from 65-95°C. Photoluminescence (PL) spectra showed a shift for doped nanorods into the visible range and also found that if the solution contained more than 10% cobalt absorption peaks greatly diminished. EDX and XRD were used to verify the presence of Co into the ZnO crystals.

**Akbari, Babak**

## **DRILLING AND DRILL BITS**

Drilling is the process of excavating the rock for the goal of reaching targets deep down in the earth's crust. These targets could be water, hydrocarbon, geothermal energy, or other resources. A conventional drilling system consists of four basic components: rotary, hoisting, hydraulic, and power supply. The combined action of these four basic systems causes destruction of the rock and transportation of the resultant cuttings to the surface. This means that the main drilling agent, the drill bit, penetrates the rock formations and advances down.

Drilling research encompasses all the four basic components of a drilling system and the goal is to optimize the process and reduce the associated costs. The cost plays the most vital role in practical drilling applications; the operator should be convinced that the final production revenue offsets the costs of drilling the well. The drill bit, as was called the main drilling agent, is truly one of main cost determining factors.

Drill bit not only impacts the drilling cost by its own monetary value, but also, determine the frequency of some other highly cost-determining drilling operations such as tripping.

The importance of drilling engineering research in general, and drill bits research in particular, is manifested in the above paragraph. The research of the author deals with modeling and optimization of the drill bits. The main objective is to conduct experiments and modeling to be able to predict the behavior of the bit and optimize the design and thereby the entire drilling process.

**Alanagreh, Lo'ai\*, & Mark Buchheim**

#### **NEW INSIGHTS INTO MICROBIAL DIVERSITY: THE *HAEMATOCOCCUS PLUVIALIS* MODEL**

*Haematococcus pluvialis* (Flotow) is a flagellated, unicellular microalga. It is well known as a producer of the strong antioxidant, astaxanthin. In addition, recent studies suggest that *H. pluvialis* is a possible energy source because of its high lipid content. Despite the economic impact of this unusual flagellate, little is known about population level variation that could be used to enhance the commercial utility of this organism. Furthermore, because it is easily recognized, *H. pluvialis* has the potential to serve as an excellent model for studies of microbial diversity in time and space. Combined with its ability to be dispersed by air and by birds, this set of traits makes *H. pluvialis* an ideal subject to test the traditional notion that microbes have no barriers to dispersal. That is, *H. pluvialis* should be regarded as among the least likely organisms to manifest any geographic bias. Studies of various rRNA genes (including the internal transcribed spacer [ITS] 2) and Inter-Simple Sequence Repeat (ISSR) markers have been suggestive of geographical bias. In this study data derived from the ITS2 gene was analyzed using isolation by distance (IBD). Moreover, variability of 21 new, geographically diverse strains of *H. pluvialis* was studied using 7 ISSR primers. Results from IBD and ISSR support the presence of geographical discrimination among the isolates. Data from ISSR showed more variability among strains than ITS2, but scoring ISSR bands and their reproducibility pose challenges for this method. Nonetheless, these data indicate that at least some barriers to microbial dispersal are not absolute.

**Muna, Alharpi\*, & Mohamed K. Fakhir**

#### **PREVALENCE OF THE FOODBORNE STAPHYLOCOCCUS AUREUS IN RETAIL FRESH MUSHROOMS SOLD IN TULSA, OKLAHOMA**

*Staphylococcus aureus* is a significant cause of food poisoning. The rapid identification of *S. aureus* is important so that the suitable antibiotic therapy can be initiated, and it would be helpful in improving the diagnosis of *S. aureus* infections in the clinical microbiology laboratory. Contaminated mushroom can be an important transmission vehicle for human foodborne pathogens particularly if used uncooked in salads. The prevalence of this pathogen in retail mushrooms is understudied. The objective of this project is to determine the prevalence of this bacterial foodborne pathogen in both conventional and organic retail mushroom sold in the Tulsa area. Retail mushroom samples were purchased from retail stores including Asian markets across the Tulsa area. *Staphylococcus aureus* was first isolated using Trypticase Soy Broth (TSB) as enrichment media and Baird Barker agar media plates. Prospective colonies were identified by PCR. So far, a total of 92 of mushroom samples were tested for the presence of *Staphylococcus aureus* and MRSA. The prevalence of *Staphylococcus aureus* in the tested mushroom samples was 10%. Screening more retail mushroom samples is currently underway. The positive isolates will be later subjected to Molecular typing by Multilocus Sequence Typing (MLST), *spa* typing, and Pulsed-Field Gel Electrophoresis (PFGE). Virulence factors will be also screened for.

**Ali, Ijaz\*, Amjad Ail, Munazza Khan, Jawad Ahmad, Fazli Zahir, Abdul Wahid, Mohsen Khan, Farzana Habib Ahmad & Akhtar Ali.**

#### **RECENT OUTBREAKS OF *DENGUE* VIRUS SEROTYPES IN PAKISTAN**

*Dengue* virus (DENV) is a positive sense RNA genome (genus *Flavivirus*; family *Flaviviridae*) and has four distinct serotypes (1-4). DENV is transmitted by mosquitoes (mostly *Aedes* species) and causes classical *Dengue* fever and *Dengue* hemorrhagic fever (DHF) in humans that can lead to *Dengue* shock syndrome (DSS). Two major outbreaks of the DENV occurred in Pakistan during 2011 and 2013 and caused 357 deaths and thousands of hospitalizations. In this study, we analyzed more than 1200 samples for the distribution of DENV serotypes in Lahore, Punjab province and Swat, Khyber Pukhtunkhwa (KPK) province of Pakistan. PCR results showed that DENV-2 (41.64%) and DENV-3 (40.14%) were the most prevalent serotypes compared to DENV-4 and DENV-1. In addition, mosquitoes' population was also found infected with DENV-2 and DENV-3 in 2012 and 2013 outbreaks. The distribution of these DENV serotypes and their role in future epidemics of *Dengue* disease in Pakistan will be discussed.

**Arabnejad, Hadi\*, Amir Mansouri, Siamack A. Shirazi, & Brenton S. McLaury**

### **CALCULATION OF TURBULENT BOUNDARY LAYER FOR A SLOT JET IMPINGEMENT ON A FLAT SURFACE**

The objective of this study is to characterize flow parameters for two-dimensional turbulent jets impinging on a flat surface. An integral form of the momentum equation has been used to obtain a hydrodynamic solution. The boundary layer was divided into three regions, stagnation zone, developing zone and fully developed zone for free-surface and free shear, and into two regions, stagnation and wall jet zone for submerged jet configurations. A nonlinear ordinary differential equation has been obtained for frictional velocity at each zone using a logarithmic velocity profile with Coles's law of the wake and solved numerically to predict wall shear stress as well as boundary layer and momentum thicknesses. The proposed method is more straightforward and computationally less expensive in calculating the main flow parameters as compared to turbulent flow models such as RANS and LES. Predicted wall shear stresses for a submerged jet were compared to experimental data for different cases and showed agreement with experimental data.

**Asfaw, Seniet\*, & Akhtar Ali**

### **CHARACTERIZATION OF A POSSIBLE NEW VIRUS INFECTING SQUASH IN FLORIDA**

Squash is one of the important vegetables grown worldwide. In the United States, squash is grown on approximately 43,600 acres and contributes 248 million dollars to the national economy. Florida is the leading state in squash production where it is cultivated on approximately 10,000 acres and contributes 66 million dollars to the state economy. Squash like other cucurbits is susceptible to infection by a number of plant viruses, which can have a devastating effect on the yield of squash. Thus, it is important for commercial growers to be able to control the occurrence and spread of plant viruses among their crops. Recently, an unknown virus infecting squash was isolated from leaves collected in Florida. Plants infected with this virus exhibit symptoms of intense discoloration and shriveling, downward cupping, and lack of fruit. These symptoms are more severe than other viruses infecting squash. We have used various techniques to characterize this possible new virus infecting squash. We will present our results obtained so far from this research project.

**Baghernejad, Lida**

### **THE PRODUCTION OF FUNCTIONAL, ELECTROSPUN, CELLULOSIC NANO-MATERIALS AND THEIR APPLICATIONS**

The dimensions of nano-structures and their resulting large surface area to volume ratio are beneficial and crucial to their functionalization and subsequent applications. In recent years different methods have been introduced and developed to construct new nano-structure materials. Nano-fibers are 2-D nano-structures with unique properties and diverse applications. Many studies focus on the production, characterization, functionalization, and applications of nano-fibers and nano-fibrous materials. One of the most efficient, cost-effective, and scalable methods for producing nano-fibers is electrospinning. In electrospinning a high voltage electrical field is applied to a polymer solution or polymer melt so that a liquid jet is ejected from the solution (melt) towards a grounded collector on which the electrically charged, aligned polymer molecules collect as solid nano-fibers. Many parameters including solution properties (polymer properties,

solvent properties, solution concentration, viscosity, etc.), instrumentation settings (voltage, flow rate, distance to collector, etc.), and ambient conditions (temperature, pressure, etc.) affect the electrospinning process and the quality of the fibers produced. In our work we have successfully electrospun nano-fibers from cellulose and cellulose-copolymer mixed solutions, and then characterized and functionalized them for different applications. Cellulose is an abundant and cheap natural material. Therefore, it is a cost-effective and green raw material that is used in the manufacture of many products. We used Scanning Electron Microscopy (SEM), Thermal Gravimetric Analysis (TGA), and Goniometry for the characterization of the nanofibers. Functionalized, electrospun nano-fibers composed of cellulose material possess unique properties that make them more efficient in their various applications as compared to bulk materials.

**Balestrieri, Joseph**

### **THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY BREAKS AND ELEMENTARY STUDENTS' STANDARDIZED TEST SCORES**

In a thirty-year span from 1980 to 2010, obesity rates in children (age 6-11) jumped from 7% to 18%, while obesity rates in adolescents (age 12-19) soared from 5% to 18%, (CDC). Nearly one-third of all children today are classified as overweight or obese (Saxe, 2011). With a growing emphasis being placed on academic achievement in American public schools during the *No Child Left Behind* era, school-based physical activity is drastically being reduced or eliminated from school's curriculum. Studies have shown that a well-rounded school-based physical activity program can increase children's academic achievement by increasing brain function, improving concentration, focus, and on-task behavior immediately following physical activity, and by improving children's academic scores over time as they spend more time engaged in physical activity and less on academic instruction. This research proposal will test two hypotheses to examine the relationship between the number of school-based physical activity breaks children receive and their standardized test scores.

**Banjade, Bharat**

### **GEOCHEMISTRY OF ATOKA SANDSTONE AND MUDROCK FROM THE SOUTHERN OUACHITAS OF OKLAHOMA: IMPLICATION FOR PROVENANCE**

Atoka Formation consists of sandstone and mudstone deposited in the rapidly subsiding Carboniferous Ouachita trough, formed during the final stages of Rheic Ocean closure. Mudrock geochemistry, identification and geochemical analysis of heavy minerals, and mineralogical study of mudrock and sandstone are key for the provenance analysis of the Atoka Formation to evaluate or limit the possible plate tectonic configuration between southern Laurentia and Gondwana during the closure of the Rheic Ocean.

From preliminary results, geochemistry of mudrocks from Boktukola syncline suggests both mafic and felsic igneous provenance. NASC normalized REE plots demonstrate 1.5 to 2.0 enrichment, and Eu anomaly is very slightly negative. Plots of REE vs Al<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub> imply that LREE are associated with clays either by absorption or ultrafine heavy minerals. REE trends are consistent with both mafic and felsic sources. Environment of deposition is changing from oxic to dysoxic to suboxic toward younger strata indicated by transition element ratios [V/(V+Ni) vs Ni/Co, V/Cr vs Ni/Co, and Mo vs Ni/Co].

Decreasing pattern of CIA is observed towards younger strata. Cross-plot of CIA vs. ICV also indicates mixing of mafic and felsic sources. Plot of Zr/Sc vs Th/Sc shows stratigraphically the Zr/Sc is increasing more rapidly than Th/Sc, which indicates zircon enrichment towards the younger strata. Plot of Cr/V vs Y/Ni indicates possible ultramafic source. These results will be further evaluated using trace element analysis of zircon, rutile, magnetite, and garnet detrital grains.

Sandstone framework composition varies from subarkose to sublitharenite to quartz arenite, with altered framework grain restoration. Lithic grains found in sandstone include Metamorphic, volcanic, and lesser sedimentary rocks. Heavy mineral fraction includes zircon (variety of shapes, angularity and color including distinctive volcanic elongate bipyramidal grains) as dominant grain, with significant amounts of magnetite in some sandstones, and minor tourmaline, rutile, and garnet (ugrandite group).

**Bell, Colleen A.**

## **WHAT WERE THEY THINKING?: TRACKING COGNITIVE EVOLUTION THROUGH THE MAJOR STAGES OF LITHIC INDUSTRY DEVELOPMENT**

While psychologists have been using many different methods to map brain activity during various tasks in order to better understand the regions of the brain associated with that task, archaeologists have only recently begun to use this technique to examine early human cognition. Paleolithic stone tools provide a potential line of evidence in human behavioral and cognitive evolution. Previously, archaeologists have used proxies such as symmetry, complexity, and standardization within each lithic industry to answer questions of cognitive development of hominids. Only very recently have brain imaging modalities such as Functional Magnetic Resonance Imaging (fMRI) or Positron Emission Tomography (PET) been used to more directly link cognition and stone tools. By conducting brain scans on modern flint knappers to illuminate the areas of the brain that are activated during various flint knapping activities (Stout *et al.*, 2007, 2008, 2011; Uomini and Meyer, 2013) researchers hope to find potential parallel trends of brain expansion and technological elaboration in human evolution. These studies have made comparisons between inexperienced versus experienced knappers in the Oldowan (Mode I) and Acheulean (Mode II) traditions and comparisons between those two industries. The results from these studies indicate cognitive changes associated between these two industries. This paper will review these previous studies and propose a new protocol to examine the parallels of cognitive development with lithic industry advancements. Applications of recent psychological research in tool-using behaviors and their neural correlates (Baber *et al.*, 2014) supplement this new protocol.

**Black, Kauri**

## **THE RELATIONSHIP BETWEEN COLLEGE PREPARATION, ACADEMIC PREPARATION BETWEEN COLLEGE STUDENT ATHLETES VS. NON-STUDENT ATHLETES**

The purpose of this research is to study the relationship between college preparation, athletic participation and academic success. The term “student-athlete” refers to an individual being student first and an athlete second. Many student athletes today view themselves more strongly as an athlete than student. This is observed when student-athletes give more weight in selecting a university based on the reputation of their athletic program than academic program (Reynaud, 1998). This study focuses on student’s academic measures such as High School GPA, ACT test scores and current college GPA. Research indicates student-athletes enter college less prepared than non-student athletes, in regards to SAT/ACT scores and high school cumulative GPA (Mixon, 1995). Colleges and universities routinely lower admission standards to admit athletes (Laderson, 2002). A survey will be conducted comparing 100 intercollegiate student-athletes to 100 non-student athletes at The University of Tulsa. The study will focus on the attitudes student-athletes have regarding being an athlete versus being a student; attitudes which hinders their academic achievement. The results from the survey can be used by universities to be more prepared for athletes entering their campuses.

**Brachtenbach, Travis**

## **OBSERVATION OF STRAINED ALKENES AND ALKYNES AS CYSTEINE SULFENYLATION PROBES**

**BACKGROUND:** Regulation of reactive oxygen species is an essential function in cellular health. Indeed, disruption in cellular redox regulation is a hallmark of atherosclerosis, cancer, neurodegenerative disease, and aging. Therefore, it is critical to monitor the proteins that maintain redox homeostasis. One such protein residue implicated in cellular redox maintenance and maintaining protein structure is cysteine sulfenic acid. Yet, despite its putative role as a messenger in redox regulation, very few methods exist for its real-time analysis.

**METHODS:** By reacting strained alkenes and alkynes with alternative oxidation states of cysteine I will be able to determine whether they are indeed *specific* for cysteine sulfenic acid or whether it is merely *selective* for cysteine sulfenic acid. Their absolute specificity is a paramount goal of this study. After reactions at various pH values and temperatures to fully assess the reactivity, I purify any products that show signs of reaction by column chromatography. Afterwards the purified samples are characterized by IR, NMR, and/or MS.

**RESULTS:** Due to the reactive nature of certain species (namely nitrosylated cysteine) I am interested in the reactivity of strained alkenes and alkynes with other oxidative species of cysteine. Experiments with a strained alkene have shown promise of interaction with representative sulfenic acid molecules. Our novel chemical reporter, a strained alkene, is designed to react specifically with sulfenic acids, through a cycloaddition reaction, allowing unprecedented selectivity and sensitivity in analysis of cellular redox regulation.

**CONCLUSIONS:** Use of strained alkenes as possible alternative probes is also of great interest and I have been having some success in synthesizing these alternative probes to cysteine oxidation. Strained alkenes show potential in becoming a reliable probe for the determination of cysteine sulfenylation in real-time.

**Brachtenbach, Travis**

### **PALEOECOLOGICAL RECONSTRUCTION: EVALUATION OF DZUDZUANA CAVE SITE MICROFAUNA**

The western Georgian Caucasus include paleoanthropological sites that represent the transition between Middle Paleolithic and Upper Paleolithic time periods dated to ca. 33,000 years ago. Dzudzuana was excavated in the mid-1960s and then reopened from 1996 until 2009 to is one such cave site that has evidence of being occupied by early humans when they first entered the Caucasus. The site contains lithics, bone tools, and most interestingly microfauna, which can be used to determine the local climate of the area.

It has been hypothesized that climate changes was one of the main factors that allowed humans to disperse from the Levant into the Caucasus. To test this hypothesis, micromammals found in the cave will be used to reconstruct the paleoenvironment and compared to contemporaneous sites.

Determination of pre and post depositional taphonomic processes which may have affected the species composition is determined by backscatter electron microscopy used to examine the surfaces of the remains. Results suggest that the assemblage was accumulated by raptors such as a barn owl and further impacted by trampling. Following the taphonomic analysis, paleoecology of the site is based on the micromammal community structure (species composition and relative abundance).

**Brown, Cameron**

### **PERSONALITY TRAIT-BASED DIFFERENTIAL REWARD PREFERENCE**

Traditional motivation theory in psychology largely ignores how individuals differ in what they find rewarding. Testing the trait activation concept of differential reward preference (Tett et al., 2013), we assessed how different personality traits (extraversion, agreeableness, independence, openness to experience, methodicalness, and industriousness) are related to preference for each of nine job rewards (increased pay, supervisory responsibility, autonomy, coworker support, role clarity, job security, feedback, recognition, and professional development). Participants completed self-report personality measures and a specially developed assessment of work-reward preference. Results supported 13 of 30 hypotheses (43%; e.g., methodical participants especially prefer greater role clarity) in overall support of recent developments of trait activation theory. Practical implications include the use of tailored rewards for individual workers. Our findings call for further research on personality as a motivational construct.

**Brown, Nassus R.\* and Dale Teeters**

**STABILIZATION AND INCREASE IN ION-CONDUCTION OF LITHIUM METAL/POLYMER ELECTROLYTE INTERFACE AS A RESULT OF A PROTECTIVE MOLECULAR LAYER FORMED BY SURFACE “BLOOMING”**

In lithium ion batteries, the lithium electrode/electrolyte interface is an area of intense chemical activity and can be a source of unwanted reactions leading to unsafe battery conditions. A new method of stabilizing this interface using PEO polymer electrolyte will be discussed. This method utilizes a surface blooming additive, acting as a surfactant. Hydrocarbon tails of the surfactant preferentially occupy the polymer surface and align making crystalline regions. AFM and IR studies have shown that the hydrocarbon regions are arranged in “island” configurations with uncovered PEO surrounding the hydrocarbon areas. However, long-term stability studies show that this surface, when in contact with lithium metal, stabilizes the interface. Interestingly the addition of surfactant has another beneficial effect of increasing the bulk ionic conduction of the polymer electrolyte. The stabilization of the lithium/polymer electrolyte interface and the increase in ionic conduction will further be studied by using ac impedance spectroscopy, AFM phase imaging and attenuated total reflection IR (ATR-FTIR) spectroscopy. The mechanism for stabilization and increased ionic conduction will be discussed.

**Brown, Timothy D.**

**ZINC OXIDE EPITAXIAL GROWTH BY RF SPUTTERING FOR FERROELECTRIC-ZNO BILAYERS**

Wide band-gap materials such as Zinc Oxide could hold the key to the next generation of optoelectronic devices. LEDs in particular require the fabrication of an interface where p and n-doped materials meet, i.e. a p-n junction. Some of the challenge in creating a ZnO p-n junction is in p-doping the ZnO, which typically has a predisposition towards n-type doping. Some specialized techniques for p-doping ZnO currently exist, and we are interested in exploring a type of “artificial doping” wherein the electric field induced by ferroelectric material grown on top of the ZnO is used to move carriers and create an effective charge imbalance. Our project investigates the growth of the ferroelectric/ ZnO system in two steps. First, the structural qualities of ZnO grown by radio frequency sputtering on GaN/ sapphire substrates is characterized with x-ray diffraction for several different temperatures. It is seen that at higher temperatures, the films grow epitaxially. Second, several films of ferroelectric Lead Zirconate Titanate

**Bryant, Laura**

**FEMALE EFFIGY BOTTLES OF THE CENTRAL MISSISSIPPI RIVER VALLEY**

Using stylistic and configurational analyses, this paper will determine styles and visual themes of female effigy bottles and explore the likelihood of whether the effigies’ identity is that of a single, potentially supernatural, entity or that of individuals. The indigenous people of the central Mississippi River valley during the Middle and Late Mississippian periods practiced several unique material traditions, including the creation of ceramic female effigy bottles. These bottles have been found in burials in sites and counties bordering the Mississippi, St. Francis, Tennessee, and Cumberland rivers. The female figures are almost always kneeling, and many have a rounded, humped back. None of the female effigy bottles is exactly like another, though many possess the same emphasized traits, including well-defined legs under the body, a raised ridge or backbone along the spine, and thin, defined arms. Analyzing the bottles’ characteristics stylistically will reveal patterns and forms that will make the next phase of analysis possible. Configurational analysis is the identification among, in this paper, the female effigy bottles of significant formal elements that contribute to the development of visual themes, from which one can infer who or what

the objects represent. Configurational analysis involves differentiating between salient features, those that contribute to the visual identification of the subject, and nonsalient features, those that are not necessary to identify the subject. Through a statistical and descriptive examination of the female effigy bottles' traits using stylistic and configurational analyses, this paper will determine the female effigy bottles' styles and probable identity.

**Budzyn, Charles**

#### **FACTORS AFFECTING LOCAL DENSITIES OF PARASITIC FLIES.**

*Apocephalus paraponerae* are parasitic phorid flies that depend on injured bullet ants, *Paraponera clavata*, for nourishment as well as reproductive success. Female flies will use *Paraponera clavata*, as host for their eggs. The fly larvae feed upon the tissues of the dead ant. The flies are able to locate the injured ants using visual, audible, and pheromone cues produced by the ants. Other species of parasitizing flies are known to perch on low branches in order to locate other species of parasitized ants. In these cases, the parasitic fly targets prey as they leave the nest. This study focused on the search behavior of *Apocephalus paraponerae*, specifically densities of attracted flies at various distances from their host ant nest openings. The purpose of this study was to observe if *Apocephalus paraponerae* are most abundant at nest entrances. This study took place at La Selva Biological Station, Costa Rica. The results suggest that the distribution of flies is random with regard to nest opening.

**Burnworth, Christopher W.\*, & Michael W. Keller**

#### **THERMAL PROPERTIES OF THERMOSET POLYMERS IN THE PRESENCE OF MICROENCAPSULATED FLUIDS**

Self-healing materials offer the potential of changing the way engineers and designers think about polymers and composites in structural applications. These materials mimic biological materials by possessing the ability to react to damage by initiating a healing mechanism. One of the most successful approaches is to embed a microencapsulated adhesive in the polymer. Damage ruptures the embedded microcapsules and releases the adhesive that can then locally repair the damage in the material. Self-healing materials have been extensively characterized with respect to their fracture resistance and elastic properties. However, the thermal properties of these materials have not yet been thoroughly characterized. Here we present the results of a dynamic mechanical analysis of the thermal properties of a thermoset polymer matrix with embedded microcapsules as a model self-healing composite material. The glass transition temperature ( $T_g$ ) was measured as heating rate, frequency, and weight percent microcapsules were varied.  $T_g$  was found to be directly proportional to the total weight percent microcapsules in the system. Neat samples exhibited a  $T_g$  of  $115 \pm 3^\circ\text{C}$  and there was a  $2.1^\circ\text{C}$  decrease in  $T_g$  per weight percent capsules added. In addition to the glass transition temperature, the creep performance of the microcapsule-epoxy composite was also studied.

**Burton, Erik\* and Dale Teeters**

#### **PROPERTIES OF ALL SOLID STATE BATTERY ELECTROLYTE MATERIALS SPUTTERED AS NANOSTRUCTURED THIN FILMS**

Solid state lithium ion batteries are important to improving the usefulness and safety of modern batteries. Solid electrolyte material that has high electronic resistance and high ionic conduction is in high demand to provide low internal resistance and better performance. Five ceramic materials, ( $\text{Li}_5\text{La}_3\text{Ta}_2\text{O}_{12}$ ,  $\text{Li}_{0.33}\text{La}_{0.55}\text{TiO}_3$ ,  $\text{Li}_{1.5}\text{Al}_{0.5}\text{Ge}_{1.5}\text{P}_3\text{O}_{12}$ ,  $\text{Li}_{1.3}\text{Al}_{0.3}\text{Ti}_{1.7}\text{P}_3\text{O}_{12}$ , and  $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$ ) were chosen from initial testing in recent literature. The ceramics were sputtered using RF magnetron to form nano-sized thin films. To test

the ion conduction AC impedance spectroscopy measures the impedance to the flow of ions. Atomic force microscopy and scanning electron microscopy characterize the morphology of the surface and observe the grain boundaries of the bulk material. X-ray diffraction reveals the crystal structure of the sputtered material. All of these test can show the differences in material used for an electrolyte in all solid state batteries and their potential for use in commercial batteries.

**Chancellor, Blake\*, Ahlam Alarbi, & Robert J. Sheaff**

#### **A NOVEL ROLE FOR THE TUMOR SUPPRESSOR P27 IN EARLY-STAGE CANCER**

Advanced cancer has the ability to form its own blood vessels to import energy, but how do early-stage cancer cells obtain energy? A protein, p27, may play a role in this phenomenon. P27 has been demonstrated as a cell cycle regulator: upregulation of p27 results in cell division arrest, while downregulation of p27 results in cell division. Thus, cells without p27 are cancer-like. In addition, p27 has been linked to metabolic differences in mice. Mice without p27 tend to be bigger than mice with p27. This suggests cells lacking p27 preferentially direct nutrients towards greater cell production. To support this hypothesis, cells with p27 and cells without p27 were given a complete set of nutrients. The cells with p27 used glucose to depletion while cells without p27 switched to another nutrient – potentially the amino acid glutamine - before glucose was expended. If this hypothesis is correct, then inhibitors of glucose metabolism should preferentially kill cells containing p27, while inhibitors of glutamine metabolism should preferentially kill cells lacking p27. To test this idea, cytotoxicity assays were used to monitor the effects of glucose and glutamine inhibitors on cell viability. Our results support this hypothesis by showing that p27 cells are much more sensitive to glucose inhibitors, while cells lacking p27 are able to switch to glutamine under similar conditions. They then become sensitive to glutamine inhibitors, indicating they switched nutrient usage. These results have important implications for developing novel therapeutic intervention strategies to target aggressive human cancers with deregulated p27.

**Chen, Yuanhang\* and Mengjiao Yu**

#### **A NOVEL APPROACH IN LOCATING LOSS ZONE DURING DRILLING WITH DISTRIBUTED TEMPERATURE MEASUREMENT**

This paper describes an innovative approach in identifying the location of moderate to severe loss zone using distributed temperature measurement while drilling. A transient thermal model in predicting the temperature profile in the wellbore and formation with mud loss is presented. The numerical solution under different lost circulation conditions, when used together with the distributed temperature measurement, can identify the location of mud loss. For a deep HPHT well with severe lost circulation, there is a significant change in the thermal behavior in the wellbore as mud loss proceeds. The characteristics of mud thermal behavior over time are evaluated and identified as good indicators of loss zone location. The distributed temperature measurement while drilling was recently enabled by the Drilling Microchip technology which has been developed and validated with successful field tests. By matching the simulated results with the distributed temperature measurements at different timestamp, the depth of the loss zone can be accurately identified. Case Studies are given to show the practical applications of the method. The results are important in applying expandable tubular system, setting cement plug and spotting LCM pills. Additional usage of such approach includes identifying highly permeable zone for reservoir or formation evaluation purpose.

**Christian, Brianna\* and Selen Cremaschi**

#### **A MULTISTAGE KNAPSACK APPROACH FOR HEURISTIC SOLUTIONS TO THE PHARMACEUTICAL R&D PIPELINE MANAGEMENT PROBLEM**

The pharmaceutical R&D pipeline management problem is characterized by a set of new-product-development projects which follow a stage-gate framework. If a product fails to complete a stage, the product does not continue through the subsequent stages. Decisions are made to select which projects to pursue. Investments are limited by resources associated with the development of each product. Returns for each product are realized when the product reaches the market. Whether a product will successfully

complete a stage is not known at the time of the investment, and this uncertainty can be represented with a probability of success. These uncertainties are resolved as the selected products travel through the pipeline. The formulated optimization problem created for the planning and scheduling of the Pharmaceutical R&D pipeline belongs to a class of mathematical problems known as stochastic programs. The nature of the uncertainty associated with R&D pipeline management problems is endogenous. Endogenous or decision-dependent uncertainty is not resolved before the decision is made, and in this problem, it is resolved once the decision of pushing a product through a stage is made and the product completes the stage. The endogenous nature of the uncertainty makes solving the R&D pipeline management problem difficult. This talk presents a heuristic approximation to reduce the computational time for solving the pharmaceutical R&D pipeline management problem.

**Christianson, Deanna**

### **ATHEISTS ON A COLLEGE CAMPUS: CONSTRUCTING IDENTITY THROUGH BORDER WORK**

Over the past twenty years, there has been more and more social science research on non-religion and atheism. However, this research has been survey and demographic-based. We know that more and more people are identifying as non-religious, and we know a thing or two about the demographic characteristics of this emerging group. Surveys have posed the question of why people are becoming atheists, but there has been little in-depth qualitative research on how people go about becoming atheists and how they perform their identities as atheists. One recent study, however, takes a social movement approach, examining how members of formal New Atheist organizations shape their narratives to build a collective identity among members and construct borders between the religious and the nonreligious. In this study, I interviewed five self-identified atheists on the University of Tulsa's campus. I use the same social movement theory to frame my analysis, and I show the ways that atheists on a college campus narratively construct borders between themselves and the religious by 1) stressing the utmost importance of critical thinking, and constructing religion and critical thinking as incompatible, and 2) discussing religious ideas as threatening or dangerous. This study is consistent with the finding of the previous study, and suggests directions for new research exploring collective identity, belonging, and group membership on college campuses.

**Christianson, Deanna**

### **LOCAL ECONOMIC DEVELOPMENT PRACTICES AND URBAN NEOLIBERALIZATION**

Neoliberal ideology calls for the tossing aside of regulation and the diminishing of government in favor of unregulated, free markets, which supposedly provide the optimum mechanism for economic development. However, in reality, these unregulated markets require ever-larger support from government entities; nowhere is this clearer than in urban economic development policy over the past 30 years. Local economic development departments have increasingly offered business services and monetary incentives to draw in businesses to their respective regions. It is clear that these local incentives are part of a larger trend of unbridled global capitalism; but how is this trend played out on a small scale? How is neoliberalization played out in the offices, applications, and goings-on of city government? How do city economic development departments negotiate and reproduce the neoliberal agenda on a small scale? Analysis of Tulsa, Oklahoma's economic development policies and practices show the ways that the city's business incentive structure, and the discourse surrounding business attraction, fit into the larger trend of urban neoliberalization. This study contributes to a growing literature exploring the ways "actually existing neoliberalism" manifests itself in many ways and processes in the urban environment.

**Clardy, Kelsey**

### **BECOMING THE FACE OF ARCHAEOLOGY: THE IMPORTANCE OF AN ARCHAEOLOGICAL PRESENCE WITH THE PUBLIC**

Academic archaeology is vastly different from the archaeology that the public sees and thinks they understand. Part of this is due to popular shows that feature self-proclaimed archaeologists discovering things about America's past. However, the media perception of archaeology is not solely to blame for the chasm that has developed between academia and the public. Archaeologists are often concerned that by disclosing sensitive site information, a culture of treasure hunters, who think they are preserving the past, will be created. This presentation seeks to explain why it is important to make archaeological research accessible and relevant to a wider audience and to challenge archaeologists to do so by demonstrating models that have had proven success.

**Cocklin, S., M. Grover, V. R. Whiteside, L. Bumm, I. R. Sellers**

*University of Oklahoma*

### **LEAD SULFIDE QUANTUM DOTS FOR PHOTOVOLTAIC HETEROSTRUCTURES**

Colloidal quantum dots (CQDs) have been proposed as a cost effective method for improving solar cell performance by increasing light absorption in devices. An investigation of the application of PbS CQDs to hybrid-ZnO nanorod arrays and bulk silicon is presented. In the hybrid-silicon devices, since CQD deposition uses wet chemical processing, the potential exists to improve power conversion efficiencies over conventional silicon systems with negligible additional economic impact to manufacturing costs. In the case of heterostructures incorporating ZnO nanorod arrays, there are several potential advantages including enhanced carrier extraction, cheap manufacturing, and, through the nanorod structure, light scattering, which increases the likelihood of absorption and therefore of higher conversion efficiencies. When applying CQDs to silicon wafers we observe a larger open-circuit voltage and better rectification when compared to a reference Si-Schottky diode. This demonstrates the creation of a heterojunction resulting from the addition of the higher energy PbS film and the consequent heterostructure solar cell that is formed in this hybrid system. Furthermore, Capacitance-Voltage measurements show clear Mott-Schottky behavior, indicating the formation of a depletion capacitance and therefore diode behavior. These characteristics provide strong proof-of-principle evidence for the operation of these devices and their potential for practical applications.

**Cook-Reynolds, Nigel**

### **THE INFLUENCE OF NEWS HEADLINES ON ATTITUDES AND BEHAVIORS TOWARD POVERTY**

Newspaper articles and news broadcasts are popular means by which information about current events is conveyed to the general public. Additionally, people will rely on news headlines to obtain quick information needed to be informed (Infantidou, 2009) Further, it has been shown that repetitious exposure of news headlines makes the information appear more factual (Gibbons, Lukowski, & Walker, 2005).

Poverty is a social issue which receives a disproportionate amount of attention compared to other social issues. Often, stories about poverty only make mainstream news when they pertain to a political agenda (i.e. a new legislative proposal which addresses poverty) or if they depict an "extreme" case of poverty (i.e. tell the story of a single poor individual) (Rose & Baumgartner, 2013).

How public opinions about poverty are either challenged or reinforced by news stories has rarely been studied. This presentation synthesizes some of the existing literature regarding the relationship between social issues and media coverage. That is, how do media depictions (specifically, news headlines) of poverty influence the public's perception of poor people? If repetition makes news stories appear factual, then how will this belief influence the readers attitudes and behaviors towards poverty? Data from a pilot study assessing the influence of emotionally-skewed headlines on attitudes, behaviors, and knowledge of poverty will be presented.

**Cooley, Katharine**

### **LIFE WITH LEMURS: A STUDY ON THE BEHAVIOR, DIET AND HOME RANGE OF THE GREATER BAMBOO LEMUR (PROLEMUR SIMUS)**

This study is divided into two parts: the primary research on the daily activity pattern, diet, and habitat of the Greater Bamboo Lemur (*Prolemur Simus*) and a study on the type and load of parasites found in individuals of *P. simus*. The study took place between November 5<sup>th</sup> and November 25<sup>th</sup> within the FOFIFA Kianjavato coffee plantation on the south side of Sangasanga mountain near Kianjavato, Madagascar (S 21°37'708333, E 47°86.586411). The findings of this study concur with current research on behavior, showing that *P. simus* spends the majority of their daytime hours resting, followed by feeding, moving, auto grooming, and finally social behavior including grooming and playing. The results of this study also show there is likely a difference in *P. simus* behavior at different times of day. Fruits accounted for 49% of the feeding occurrences recorded which is more than the known annual average. The home ranges of *P. simus* were found to be smaller than average home ranges recorded (3.1795 ha at the largest), however more data is necessary to understand the size and seasonality of home ranges. The study on the parasite loads in *P. simus*, found that at least two different classes of parasite eggs were present in members of the observed animals, and significant amounts of parasite eggs were found which could be used as an indicator of the lemur's overall health. More research is necessary on the parasites present in this animal and the potential effects they have.

**Craig, Christy\*, Amanda Barbosa, Rachel Giebel, Rachel<sup>2</sup>, Lexis Learmonth, Evelyn Gutierrez, Melissa Urquhart, William Potter, & John Caruso.**

### **BLOOD LACTATE CHANGES PRODUCED BY $\beta$ -ALANINE SUPPLEMENTATION AND REPETITIVE SUPRAMAXIMAL EXERCISE**

$\beta$ -alanine supplementation aids exercise performance by increasing intracellular carnosine content. The added carnosine should buffer more  $H^+$  produced from exercise and elicit a higher blood lactate concentration ( $[BLa^-]$ ) before a person inevitably succumbs to fatigue. Thus with a within-subjects design, our study compared the effects of placebo (maltodextrin) and  $\beta$ -alanine administrations on  $[BLa^-]$  and average power (AP) values derived from repetitive sets of lower body supramaximal exercise. Over separate 30-day periods, sedentary subjects ( $n = 10$ ) ingested placebo, followed by  $\beta$ -alanine ( $3 \text{ g} \cdot \text{day}^{-1}$ ), capsules. After each period, subjects performed two four-set leg press workouts. For each workout  $[BLa^-]$  values were measured before, and zero-, five-, ten, 15- and 20-minutes post-exercise.  $[BLa^-]$  data underwent a 2x6 ANOVA, with repeated measures per treatment and time. AP values were compared with a 2x4 ANCOVA, with repeated measures per treatment and set. AP and  $[BLa^-]$  results each included a two-way interaction.  $\beta$ -alanine supplementation elicited higher set two and four AP values versus the corresponding placebo values.  $[BLa^-]$  values at zero-minutes post-exercise were significantly higher from  $\beta$ -alanine, versus the placebo, treatment. Greater AP and  $[BLa^-]$  values from  $\beta$ -alanine suggest exercise likely was able to proceed to a greater extent without increasing intracellular acidosis due to an increased buffer capacity.

**Crawford, Chad\* & Sandip Sen**

### **EFFECT OF OPINION-BASED TRUSTING DECISIONS ON SOCIAL NETWORKS**

Various computer and analytic models have been studied that analyze population dynamics of opinions of agents in societies under varying assumptions of interaction restrictions and influences. Of particular interest to us are societal models based on Self-categorization Theory and Social Judgment theory, which address how agents respond to interactions with other agents. However, few of these models take into consideration how interactions between agents are influence by and, in turn, affect the topology of their social network. The Bounded Confidence model, for example, posits that two agents whose opinions are not too dissimilar influence each other and are more likely to change their opinion towards each other after an interaction. Another model, the M2 model, incorporates repulsive interactions into the original Bounded Confidence model that encourage polarization of attitudes. Yet, in settings where opinions are not as malleable, agents may prefer to change their social connections over adjusting their own opinion. This can happen, for example, in trust networks where agents decide to trust others based on their inter-opinion differences. We to adapt models of opinion dynamics into topology-based interaction models and show the emergent phenomena reflecting real-life scenarios.

**Creedon, Patrick S.\*, & Daniel V. Simonet**

## **THE DANGERS OF MANIPULATION: THE RELATIONSHIP BETWEEN THE DARK TRIAD AND EMOTIONAL INTELLIGENCE**

The current study investigated the association between sub-facets of emotional intelligence and the Dark Triad – a collection of socially malevolent personality characteristics (i.e., narcissism, machiavellianism, and psychopathy) which are characterized by short-term, exploitative social strategies. We collected data on trait- and ability-based EI scales, the Big Five personality factors, and the Dark Triad in a sample of 110 undergraduates. Results reveal the entire Dark Triad is negatively associated with empathy and positively associated with regulation of others' emotions, psychopaths score lower on both ability- and trait-based emotional regulation, and narcissists scored higher on trait-EI than ability EI-tests. Hierarchical regression analyses further reveal certain elements of the Dark Triad explain unique variance in EI after accounting for the Big Five. These results suggest there may be unique emotional deficits as well as emotional strengths to the Dark Triad suggesting future avenues for understanding how socially malevolent characteristics are distinct from normal personality.

**Cunningham, Sydney**

## **A NEW INITIATIVE FOR A DIVERSITY TRAINING NEEDS ASSESMENT**

It is well known that diversity awareness and intercultural competency skills are essential skills to possess in the today's society. However, organizations are still struggling with determining the most effective ways to train and cultivate these skills in employees in order to prepare them for the global workplace. New research has shown that the most effective diversity management programs view diversity as a value that not only is a desirable end state (a terminal value), but also as an instrumental piece of achieving the successful business-related outcomes (an instrumental value) such as enhanced interpersonal communication amongst peers and colleagues, quicker resolutions of disputes, and greater personal effectiveness. Organizations, who view diversity as an instrumental and a terminal value and implement programs that reflect this, report more favorable attitudes amongst employees and less stigmatized minority groups. Research has also shown that accumulation into a diverse environment is also dependent on that the social networks that individuals join. The types and the extent of these networks can make or break an individuals' experience into a new company. The goal of this project is to bridge these two pieces of research in order to develop an innovative diversity program that would stress the instrumental and terminal values of diversity, while also providing their employees with the appropriate social networks to properly foster long-lasting relationships and to build a diversity- affirming environment.

**Curtis, Shane\*, Kalli Hannam, & Anupama Narayan**

## **THIRD PARTY VIOLATIONS OF JUSTICE AND INTERPERSONAL TRUST IN DYADS**

Organizational leaders provide team members with important instructions or information, as well as feedback on their performance. While doing so, many leaders may inadvertently violate team members' perceptions of fair treatment. Violations such as these are referred to as organizational justice (Ambrose & Schminke, 2009) which has been linked to trust (Holtz, 2013), an important property of effective teams. However, no research has been done to examine how a leader's violation of justice affects the trust between team members. This study utilized the actor-partner interdependence model (APIM) to examine the relationship between third party violations of justice and trust in dyads. Participants (n = 86) were randomly assigned to either an experimental or control condition to examine the effects of a justice violation. Using multi-level modeling (MLM), we tested our hypotheses that a team member's trust in their partner would be affected by both their own justice perceptions as well as their partner's justice perceptions. We find that when a leader violates justice, it alters the level of trust between team members. Interestingly, we also find that injustice changes the nature of the team's relationship, such that, teams experiencing injustice are more likely to participate in social comparison.

**Curtis, Shane\*, Jennifer Ragsdale, & Anna Brown**

## **WORK-SCHOOL CONGRUENCE AND JOB BEHAVIORS OF COLLEGE STUDENTS**

Since the early 1970's, there has been a steady rise in the number of college students who hold dual roles as a student and an employee (Fox, Connolly, & Snyder, 2005). Research has examined the effects of employment on academic performance, but less so on the workplace. As such, there is a need to identify how potentially competing student and employee roles affect job performance (task and non-task-related) and burnout from work. In the present study, we examine how work-school congruence moderates the relationship between workload and burnout, task performance, and organizational citizenship behaviors (OCBs). Work-school congruence can be defined as the degree of overlap between one's job requirements and their academic curriculum. When an individual's academic coursework is congruent with their job requirements, the knowledge and skills an individual acquires in the classroom can be applied to their work and have a positive impact their job performance. In addition, work-school congruence may mitigate the effects of high workload on burnout by limiting the strain individuals experience due to occupying competing roles. Participants ( $n = 187$ ) completed online measures of workload, work-school congruence, burnout, task performance, and OCBs. For college students who work part-time, number of hours worked predicts their job burnout. Their number of hours worked is more positively related to their job performance and to their organizational citizenship behaviors only if the nature of their work is congruent with the types of courses they are taking. Implications for theory and practice are discussed.

**Dahl, Haley**

## **EXAMINING THE DIFFERENCES IN ACADEMIC PROCRASTINATION BETWEEN THE UNITED STATES AND MALAYSIA: A CROSS-CULTURAL INVESTIGATION**

Culture is an important topic in much of the social science literature, focusing on what the differences are, how to measure them and creating best practices for cross-cultural relations. It is not always appropriate to define culture by country, however, because some countries are more culturally similar than others, leading to the need for a measurement of culture. Focusing on the globalization of American colleges and universities, it is important to understand how cultural differences might affect different academic processes. Procrastination is a common problem among college students and is one of the ways in which academic success is undermined at the personal level. Nearly everyone has procrastinated at some point in their life, whether at school or work, but it is unclear whether our conception of procrastination is universal. Research has indicated that our understanding of procrastination is negatively related with the personality facet of conscientiousness. The present study aimed to look see if two countries, the United States and Malaysia, had measurable cultural differences and if there were significant differences in procrastination and personality in the two. The sample consisted of 208 undergraduate students from the US ( $n = 125$ ) and Malaysia ( $n = 83$ ). Participants completed a self-report survey that included measures of individualism and collectivism (both horizontal and vertical), procrastination, and personality. Results, implications and limitations of the study will be discussed.

**Darling, Alexandra**

## **THE RELATIONSHIP BETWEEN POLICY ENFORCEMENT OF CYBERBULLYING IN SCHOOLS AND STUDENT BEHAVIOR**

The purpose of this paper is to show the relationship between cyberbullying policies and student behavior regarding the stopping of cyberbullying and promoting bullying education. Cyberbullying policies are in place, yet this does not necessarily mean students, parents, and even teachers are aware of their school's policy. The majority of schools across America are required to put cyberbullying policies in place in their school manual, but actually engaging students in the rule is something that is not required (Beale & Hall, 2007). Some schools talk with their students about cyberbullying and it's dangers, while other schools

leave it up to the parents to deal with the sensitive topic. Research says that if students are being taught about cyberbullying and what to do if it occurs, the occurrences of cyberbullying should decrease (Limber et al., 2008). The purpose of this study is to expand student knowledge about cyberbullying, along with expanding teachers and parent's knowledge as well. It is hypothesized that schools that engage their students in their anti-cyberbullying policies will experience fewer occurrences of on and off-campus cyberbullying than schools that do not.

**Davalos Navarro, Dolores**

### **TOURISM AND RESEARCH IN THE CASAS GRANDES AREA**

The archaeological studies in the north part of Mexico are scarce and lack of mayor funding compared with other archaeological sites in the country. The correlation between the touristic consumption and the research is really deep in the touristic economy managed by the country.

Just in the last March 21<sup>st</sup>, 21.200 persons visited Teotihuacan, being one of the most visited sites of Mexico. And this year a similar number of people are waited in the main Archaeological Zones.

In the archaeological sites of Casas Grandes area, the panorama is really different, the diverse crises in the international tourism of Mexico create trouble in the economy and it is being left aside of the internal and external sources of tourism coming back to the country in the recent years.

Even the site of Casas Grandes, being part of the World Cultural Heritage since 1998, struggles every day for a little attention and funding to preserve and develop itself as a cultural center. The lack of interest of the national tourism could be compensated with major education of the site and creating a good base for research and new attention in the extinct culture through investigation.

**DeCook, Ryan, Weston Kightlinger, Michael Tompkins, and Daniel Chang**

### **WATER DISTRIBUTION ENHANCEMENT IN COTANI, BOLIVIA**

The people of Cotani, Bolivia currently have an inadequate water distribution system. This system was capable of handling the population in Cotani when it was installed. Over time, additional households have been added and the system has exceeded capacity. The University of Tulsa Engineers Without Borders Chapter is currently investigating methods to handle this problem. The project will also alleviate high pressures that exist in the system. Finally, it will add an additional five households to the system. This project has involved collaboration on a vast scale. Our student chapter of EWB has been in communication with contacts in Bolivia and in the United States. We spent hundreds of hours analyzing various methods to solve the issues. We are currently sending a water analysis system to gather additional data on the situation to determine the best fix. Currently, we are determining if we can combine water storage tanks and additional pipelines into the current system. We may be returning to Bolivia this summer to implement the project. We also will remain in contact with Cotani for several years to ensure the project is a success. Everyone involved in the investigation of this project have learned countless lessons. We all have grown to become more effective engineers on a global scale and will make a deep impact on the community in Cotani, Bolivia.

**Deere, Bobi**

### **SOUTHEASTERN ICONOGRAPHY: A STATISTICAL STUDY**

In the Southeast US, a corpus of religious iconography has been identified that has themes and motifs that are shared throughout a very large regional area. This area encompasses many historic groups of peoples with varying languages, cultures and origins. This phenomenon is called the Southeastern Ceremonial Complex, or SECC. There are different hypotheses as to the origin of the complex, one saying that it starts with the southern Muskogean peoples, one that says it originates in the Northern areas bordering the plains, and another that says that it comes from Mexico. I am proposing to create a method and model to study

correlations between the icon assemblages that can support an answer for this and other questions within the SECC. I would like to start with a pilot study to try out my methods in a very focused area: Shells in the Craig Mound of Spiro. With this information I hope to find correlations that have not been seen before. Eventually I will add variables and more media that can answer more questions.

**Dokhani, Vahid\*, & Mengjiao Yu**

## **THE EFFECTS OF MOISTURE TRANSPORT ON WELLBORE STABILITY IN SHALE FORMATIONS**

Understanding the interaction of drilling fluid with shale formation is critical to properly describe pore pressure propagation which directly affects wellbore stability. In the case of reactive shale formations, it has been shown that clay minerals within the shale matrix have a tendency to adsorb water from drilling fluid. Using a concentrated drilling fluid, available models which are based on an ideal solution assumption fail to appropriately address the true shale-drilling fluid interaction. The available literature on adsorption of water to the shale surface is reviewed to identify the proper isotherm type curve. It is shown that the moisture content of shale is correlated with water activity where the multilayer adsorption theory can describe the phenomenon. Accordingly, the moisture content is incorporated in the transport equations. The constitutive equations are generalized to consider the case of non-ideal solutions. The governing equations are extended to obtain the pore pressure and stress distribution around the wellbore. The coupled equations are solved using a finite difference method and numerical computations are conducted to predict the stability of the wellbore. Having developed a transient model which predicts the moisture content around the wellbore, it is possible to evaluate the strength of shale as a function of moisture content. The results of this realistic analysis indicate that the wellbore can experience failure earlier than it is predicted via existing models. A sensitivity analysis is also performed to measure the extent of important factors on wellbore stability for a given shale formation. The results of this investigation assist in drilling fluid design and address wellbore stability issues in troublesome shale formations.

**Douglas, Sara**

## **MACHINE LEARNING ANALYSIS OF DIFFERENTIAL RESTING-STATE FUNCTIONAL-MRI NETWORK CONNECTIVITY IDENTIFIES CORRELATES OF AUTISM SPECTRUM DISORDER**

**INTRODUCTION:** The CDC estimates one in every 88 children has some form of Autism Spectrum Disorder (ASD). Although ASD is widespread, little is known about its causes or potential treatments, and clinical diagnostic methods vary in their accuracy. Our research aims to use resting-state functional-MRI (rs-fMRI) scans of ASD and typically-developed (TD) individuals' brains to build functional neural networks and compare connectivity differences between brain regions that differ between ASD and TD.

**METHODS:** RS-fMRI scans were performed on 28 TD and 32 ASD subjects at the National Institute of Mental Health Clinical Center in Bethesda, MD. After pre-processing consisting of noise removal and signal enhancement of the resulting neural time series, we computed correlation networks between 91 regions of interest (ROIs) in the brains of all subjects. We computed individual subject networks and average networks for both phenotypes, and we calculated network centrality for each ROI. Also, we used machine learning algorithms to identify regions that differ most between ASD and TD and to classify, through Bayesian Logistic Regression, subjects as ASD or TD.

**RESULTS AND CONCLUSIONS:** Disruption of neural network modules occurs in the ASD group compared with the TD subjects, with specific pairs of regions displaying functional disconnections or connections at a weaker correlation level. However, the left-right symmetry of brain regions is preserved for the most part across ASD and TD subjects. Our analysis suggests candidate brain regions that may help explain the neural pathology of ASD and may lead to improved diagnosis and therapeutics.

**Dunn, Clarissa**

## **THE DEVIL IN THE DETAILS: DEBUNKING THE MYTH OF THE SALEM WITCHCRAFT TRIALS**

In the winter of 1691, a young girl's mysterious illness led to the complete disruption of the surrounding area's political, social, and religious practices. Different factions within the town began attacking one another on the grounds that they were committing witchcraft. Many notable historians have written on this period; this research means to complement rather than contradict previous scholars, and will hopefully shed light onto lesser-known dissidents of the Salem Witchcraft Trials. While many people publicly condemned the Trials after the fact, very few did so contemporaneously. Captain Nathaniel Cary and Reverend Thomas Brattle were two of those outliers; and alongside Reverend Deodat Lawson they show that opinions within the public discourse on the Trials varied considerably. While contemporary society may depict the events of Salem as endemically riotous, these documents effectively show that there was much political and religious dissent amongst its participants.

**El-Waraky, Mohamed\* & Michael Formolo**

## **ORGANIC BIOMARKER CLASSIFICATION OF OIL FAMILIES IN SOUTHERN OKLAHOMA**

In the mid-continent, The West Velma and Sholem Alechem fields are located in the Sho-Vel-Tum region and host oils whose source rocks remain unresolved. In this study, a suite of oils sampled from a range of producing depths in the Sho-Vel-Tum region are characterized based on their organic biomarker signatures and correlated with regional source rocks to accurately assign the oil source(s).

The focus of this research is to categorize twelve oils sampled from the Deese C, E and D intervals between 3416-4704 feet in the West Velma and Sholem Alechem fields. In order to properly do this, an understanding of the organic biomarker signatures of the oils and potential source rocks is essential. I measured the biomarker distribution for these oils using gas chromatography and mass spectrometry (GC-MS). Then, I correlated the biomarker signatures of these oils, specifically the n-alkanes, hopanes and steranes with the published literature of known source rocks in the area to determine the source(s) of these oils.

The biomarker data indicates that the West Velma and Sholem Alechem oils are two separate oil families. The West Velma oils have higher maturity levels, and were sourced from a marine carbonate source deposited under reducing marine conditions while The Sholem Alechem oils have lower maturity levels, and were sourced from a marine carbonate source characterized by slightly higher reducing marine conditions. Also, the biomarker signatures of these oils are correlated with the Ordovician Viola Limestone as the potential source rock.

**Fahar, Maryam**

## **CONCENTRATION MEASUREMENT TECHNIQUE OF BINARY LIQUIDS CONTAINING COLLOIDAL SUSPENSION OF NANOPARTICLES**

The experimental characterization of the concentration of binary liquids used in refrigeration can be accomplished in a variety of methods for pure solutions but recent research has complicated this through the suspension of nanoparticles within these liquids. With the addition of nanoparticles to the liquid conventional techniques need to be modified to account for the presence of nanoparticles. Here we present a measurement technique to determine the concentration of binary liquids containing nanoparticles based on the known density of the base fluid. The method is based upon a density measurement coupled to a theoretical expansion of the volume fraction and Hamilton-Crosser mixing model. The uncertainty analysis of pycnometric density measurement indicated that the developed equation is capable to evaluate the density in a reasonable accuracy range. Experiments are carried out with two binary liquids (LiBr and LiCl solutions) containing two different nanoparticles (silver and iron oxide) starting at three initial volume fractions. In each experiment, the parent solution is made with initial amount of nanoparticles and the concentration of base liquid is changed by adding water which changes the volume fraction of nanoparticles

as well. Finally concentrations of new samples are calculated and compared with known data. The method can determine the concentration of any unknown sample with only the initial concentration of base liquid, initial volume fraction of nanoparticles, and density of the nanoparticles a priori with an error  $\pm 2\%$ .

**Fahar, Maryam\* and Todd Otanicar**

### **AN INVESTIGATION OF EVAPORATION RATE FOR BINARY LIQUIDS WITH COLLOIDAL NANOPARTICLES**

The evaporation process has a wide application range including absorption refrigeration systems, desalination, thermosyphons and heat pipes. It has been proposed that adding nanoparticles in binary liquids as the working fluids can enhance the thermal transport properties like heat capacity and thermal conductivity. Although some of heat transfer mechanisms such as pool boiling and droplet evaporation are well studied for fluids with nanoparticles, studies on heat and mass transfer rate are limited to dispersion of nanoparticles in pure base liquid like water and alcohol. Since nanoparticles have significant effect on thermo physical properties of a base fluid including surface tension, investigation on diffusivity and mass transfer are required to better understand and predict the heat and mass transfer rates through the fluids having dispersed nanoparticles. Here we systematically investigate the role of nanoparticles on the evaporation rate from binary liquids (aqueous LiBr and LiCl<sub>2</sub>) that are common in absorption cooling systems. Experiments are conducted under controlled ambient air conditions and through monitoring of mass loss as function of time during constant temperature operation. Iron oxide and silver nanoparticles with volume fraction ranges from 0-1% are tested to find the effect of type and amount of nanoparticles on evaporation phenomena.

**Fonseca, Rose**

### **EFFICACY, COMMUNICATION, AND SATISFACTION IN A TEAM CONTEXT**

Teamwork is becoming increasingly important in all aspects of everyday life. Several studies have supported the importance of teamwork and the impact it can have on individuals (Neu, 2012; Kutzscher, Sabiston, Laschinger & Nish 1997). Satisfaction is also an important aspect when it comes to teamwork. Team processes such as cohesiveness (Robins & Fredendall, 2001), interdependence (Van Der Vegt, Emans, & Vliert, 2001) and communication (Ulloa & Adams, 2004) all contribute to team satisfaction. The purpose of this study was to examine the mediating role of communication in association with efficacy and satisfaction. Communication allows team members to exchange information and is essential to team progress. This study supports that some of the relationship between efficacy and satisfaction can be explained by communication for both self and team. Individuals with confidence in their abilities communicate more and are more satisfied than those who are not confident in their abilities. Similarly, team efficacy, individuals who perceive their team as capable are more likely to communicate and perceive a more satisfied team.

This study highlights the importance of referent shift (self and team) by allowing participants to refer to their self (self-efficacy and self-satisfaction) and their perceptions of the team (team-efficacy and team satisfaction). This study helps recognize that people are able to distinguish between themselves and their team as a whole and that communication is important to both the individual and the team.

**Fonseca, Rose**

### **WORK-SCHOOL CONFLICT AND WORK SCHOOL FACILITATION**

The relationship between work and non-work (work-family balance, work-school conflict, and work-school facilitation) is a growing field of research that looks to understand the impact of these relationships on outcomes as well as what influences them. Job characteristics such as job control, job demands and hours worked per week can influence whether someone experiences conflict or facilitation between roles. This study examined the roles of employee and student and how these roles conflict with or facilitate one another. Job control is a job characteristic that is related to both work-school conflict and work-school facilitation

(Butler, 2007). Whether an employee/student is experiencing conflict or facilitation can influence the amount of satisfaction they feel, not only with their roles (job satisfaction and school satisfaction), but also in a more general sense.

This study supports that the relationship between job control and life satisfaction can be explained by both work-school conflict and work-school facilitation. Job control is indirectly related to life satisfaction through the negative (work-school conflict) and positive (work-school facilitation) processes associated with managing multiple roles. Employers should allow employees to have more job control because more job control leads to work-school facilitation, which leads to life satisfaction. Employees with less job control are more likely to experience work-school conflict, which leads to less life satisfaction.

**Gabriel, Kristen**

### **DOOR OPENING: AN ECOLOGICAL STUDY OF HUMAN BEHAVIOR**

Social behaviors appear to develop in humans for the same evolutionary reasons as in other animals, though the behaviors themselves are very different. Humans opening doors for one another is a common occurrence in many cultures, yet the meaning of this behavior has not been fully explored beyond the sociological level of being polite or chivalrous. The following theories were considered in examining the ecological benefits of door opening behavior: (1) attracting a mate, (2) exerting dominance, (3) showing altruism, and (4) caring for young. Previous observations in door opening have shown that males are more likely to open doors for others than females are, especially when there is mating potential. 154 humans were observed approaching a door at the same time as another human. For each pair, the genders, ages, relationship, and door opening activity were recorded and these observations were analyzed to determine which variables affected door opening behavior. In two-thirds of the cases involving a male and a female approaching the door, the male opened it for her. Strangers opened doors for each other over two-thirds of the time while acquainted humans did so less than half of the time. These findings give rise to the conclusion that humans value attracting mates and making new allies. These observations can be explained ecologically as they have potential to lead to increased evolutionary fitness.

**Gad, Ahmed H.\*, & Mohamed K. Fakhr**

### **DIVERSITY OF EXTREMOPHILES AT THE GREAT SALT PLAINS OF OKLAHOMA**

The Salt Plains National Wildlife Refuge in North Central Oklahoma is a unique environment for microbial diversity studies due to its variable salinity levels of zero to saturation with variable rain falls. The area has a large salt flat of about 65 Km<sup>2</sup> which includes few wild vegetative areas along some of the rain fall streams. The objective of this study was to determine the genetic diversity of extremophilic bacteria and actinomycetes from the Great Salt Plains of Oklahoma. Forty soil samples were subjected to three types of enrichment to isolate thermophilic, halophilic, and thermophilic/halophilic bacteria and actinomycetes from both vegetated and unvegetated areas of the salt flat. A total of 265 bacteria and 14 actinomycetes strains were isolated and 224 representative isolates were selected for phylogenetic relatedness investigation on the basis of their 16S rDNA gene sequences. The representative isolates were also screened for salt tolerance from zero to 30% NaCl. Molecular characterization showed that extremophilic bacterial isolates belonged to two only phyla and few genera like *Brevibacillus*, *Aeribacillus*, and *Aneurinibacillus* were reported for the first time from this Great Salt Plains area. Screening the isolated bacteria is currently underway for production of antimicrobials, anticancer compounds, and extracellular enzymes. In conclusion, the Great Salt Plains of Oklahoma has a diverse extremophilic microbial population with promising biological active compounds.

**Garner, Katie**

### **CLIMATE CHANGE AND THEIR ROLE IN HUMAN CULTURAL ADAPTATIONS: PALEO-ENVIRONMENT RECONSTRUCTION IN THE HOLOCENE OF CENTRAL TEXAS**

Between 100 BC and 1200 AD, there were extreme changes in Native American culture in the southeastern United States, specifically a change from semi-sedentary, tribal-like communities, to the large Mississippian chiefdoms. Archaeologists have suggested that changing climates were one cause that led to this shift. However, as these cultural transitions did not happen uniformly or everywhere, the role of climate in this transition has been contested. Specifically, in central Texas, the Mississippian culture never developed providing an excellent case study to test this hypothesis. Using micro-mammal community structure as a proxy for climate change, I propose to examine if climatic change occurred between the Archaic to the Late Classic Periods from two central-Texas archaeological sites. The micro-mammal analysis will be compared to climatic proxies published from the literature and used to establish whether or not similar climatic events were occurring in central Texas as in the Mississippian southeast. The comparison will be used to offer an interpretation on the effects of climate change in central Texas and human cultural adaptations in the area.

**Gilcrease, Sarah**

### **FAUNAL ANALYSIS OF TOR HAMAR, JORDAN: IMPLICATIONS FOR EARLY HUMAN DIET AND LANDSCAPE USE**

The purpose of my current research is to identify aspects of early human diet and landscape use in the Upper Paleolithic through the taphonomic analysis of the faunal assemblage of Tor Hamar, Jordan. Lithic analysis of Tor Hamar, Layer F, indicate that the site was utilized in the Upper Paleolithic, a highly contentious period of evolution. Analysis of faunal remains at other sites dated to the Upper Paleolithic in the region indicates a pattern of ephemeral settlements with relatively few signs of severe environmental stress. I hypothesize Tor Hamar should exhibit this pattern and therefore the ephemeral status of the site should correspondingly be reflected in the faunal assemblage as indicated in the taphonomic status of the remains. Preliminary results indicate that the faunal remains of Tor Hamar share a blending of aspects of Upper Paleolithic sites and later Epipaleolithic sites, an anomaly that requires further investigation.

**Golden, Timothy M. J.**

### **THE EVOLUTION OF STRIDULATION IN THE ANTS**

The presence and use of a stridulatory organ (SO) to produce vibrational signals is highly variable and structured within the ants. The file and scraper that make up the SO are specialized morphological features not used for functions other than stridulation (a vibratory signal) and not found in non-stridulating species. Using character mapping analysis, I have mapped the presence of the SO on a molecular phylogeny of the ants, compared the presence of the SO to nesting preferences, and found support for the hypothesis that the SO evolved multiple times in the ants. I quantitatively tested the hypothesis that stridulation evolved initially to signal burial/rescue by comparing the presence of the SO to general nesting preferences for 76 genera evenly spread throughout the currently accepted ant phylogeny. I found that a greater proportion of genera considered primarily arboreal possess a SO, as opposed to the ground nesting genera; none of the five entirely subterranean genera I included to possess a SO. I therefore suggest that we reject Markl's (1973) hypothesis regarding burial/rescue signaling and a reduced use for the organ in arboreal species.

**Gove, Scott**

### **THE RELATIONSHIP BETWEEN FRATERNITY MEMBERSHIP/NON-AFFILIATION, IDENTITY DEVELOPMENT, AND HYPER-MASCULINE BEHAVIOR**

Are undergraduate fraternity members more likely than non-affiliated students to perform traditional and hyper-masculine acts? Previous work found that fraternity men succumb to high levels of peer pressure, perform risk taking, and use emotional restraint to establish a powerful and dominant individual fraternity masculinity identity (Drout & Corsaro, 2003; Iwamoto, 2011; Kalof, 1991; Boeringer, 1991). In this research, undergraduate males at a Midwestern, private university will complete an anonymous online survey asking what behaviors they thought they performed to categorize their masculinity cultivation between fraternity men and non-affiliated men. It is hypothesized that fraternity men perform more masculine behaviors than non-affiliated students and that gay and racial minority identities are affected when joining a fraternity. This study will determine if fraternity men are engaging in hyper-masculine behavior to cultivate a more stratified masculinity identity than non-affiliated students are.

**Graham, Antonio**

**THE EFFECTS MENTORING PROGRAMS HAVE ON AFRICAN AMERICAN MALE'S GPA AND SCHOOL INVOLVEMENT**

This research focuses on the effects mentoring programs have on African American GPA'S and school involvement of male teenagers. This ties in directly to role models. Who these young black teens decide to follow directly or indirectly shapes their actions. What makes a good role model for young black teens? Does it matter what backgrounds the role models have for these teens? Would it GPA'S and school involvement if these teens have good role models? It is hypothesized that African American teenagers who are involved in mentoring programs will be more involved in school than African American teenagers who are not involved in mentoring programs. Research show that positive role models produce better student's than negative role models do. The results of this study are important to the African American community do to their history of not having enough positive role models for their youth.

**Güereca, Yvette M**

**DOES PLACEBO ANALGESIA MODULATE PAIN SIGNALING AT THE SPINAL LEVEL?: A PILOT STUDY**

Placebo analgesia is pain reduction evoked by an inert treatment mediated by psychological factors. Brain imaging studies suggest that supraspinal regions involved with descending modulation of pain are activated during placebo analgesia, but evidence for inhibition of spinal nociception is mixed. A previous study failed to show that a physiological correlate of spinal nociception, the nociceptive flexion reflex (NFR), and subjective pain ratings were inhibited by placebo analgesia. However, the study used an expectation only manipulation, and a combination of expectation + conditioning (E + C) elicits greater placebo effects. The present study examined whether pain and NFR were inhibited by E + C placebo manipulation. Twenty healthy pain-free individuals were randomly assigned to natural history (NH,  $n=10$ ) or E+C ( $n=10$ ) groups. Pain and NFR were tested before and after two cream applications. The E+C group was told that the cream was a powerful painkiller (Lidocaine) while the NH group was told that the cream was sensor gel. Following the first application of the cream (Session 1), the stimulus intensity was surreptitiously lowered in E+C group (for conditioning). Stimulus intensity was not lowered after the second application of the cream (Session 2) therefore, only data collected before and after the second application were analyzed. Results indicated that pain was reduced in the E+C group following cream application ( $p < .05$ ), but NFR was unaffected ( $p > .05$ ). Our findings suggest that placebo analgesia is associated with modulation of pain, but not inhibition of spinal nociception.

**Hannam, Kalli\* & Anupama Narayan**

**INTRINSIC MOTIVATION, ORGANIZATIONAL JUSTICE, AND CREATIVITY**

For individuals to generate creative ideas that are not only original, but also useful, they must interact with their workplace environment to determine organizational needs. Therefore, it is important to consider both aspects of the individual as well as their environment when studying creativity. Intrinsic motivation, a predictor of individual level creativity, is associated with feelings of enjoyment and interest in the task at hand. To the extent that tasks are nested in an environment, intrinsically motivated individuals may perceive their environment more favorably than individuals who are not interested in the task. Specifically, such individuals may view their environment as more fair, due to the positive affect associated with intrinsic motivation. In the present study, we examine the relationships between intrinsic motivation, perceptions of organizational fairness, and creativity. Participants ( $n=133$ ) worked on a task in a laboratory setting and completed measures of intrinsic motivation and organizational justice. Findings were supportive that intrinsically motivated participants viewed their environment as fairer than participants that were uninterested in the task. Consequently, distributive and interpersonal justice were shown to significantly

mediate the relationship between intrinsic motivation and creativity. Implications for theory and practice are discussed.

**Hannebaum, Stacey**

**POPULATION GENETICS OF THE WHITE-FOOTED MOUSE, *PEROMYSCUS LEUCOPUS*, IN HUMAN MODIFIED LANDSCAPES**

Anthropogenic habitat modifications are thought to act as dispersal barriers potentially affecting wildlife ecology and evolution. *P. leucopus* is a habitat generalist found throughout much of the United States. While it plays an important role in the food web of many species, its role as a reservoir for human diseases cannot be underestimated. Here we investigate the impacts of habitat fragmentation on dispersal and gene flow of *P. leucopus* populations in urban (Tulsa, Oklahoma) and agricultural (Union County, Indiana) landscapes. The Oklahoma location consists of fragmented forest sites in suburban settings while the Indiana location is comprised of woodlots and farmsteads isolated by agricultural fields. Non-destructive samples were collected at each site and screened at a suite of polymorphic microsatellite loci. We found significant population structure among sites in the absence of obvious physical barriers suggesting that cryptic habitat-type barriers exist and may play a role in population subdivision. Given that *P. leucopus* is a reservoir and vector for several diseases that can be harmful to humans and livestock, such barriers to dispersal may also act as barriers to disease spread. Ultimately, this study forms the base of a larger project to understand the movement of disease reservoirs and disease vectors within anthropogenically modified landscapes.

**Harikumar, Amritha\*, Michael R. Basso, Abigail Carter, Ashley Miller, Dennis Combs, Douglas Whiteside, & Brad Roper**

**NEUROPSYCHOLOGICAL CORRELATES OF ATYPICAL DEPRESSIVE SYMPTOMS AMONG OUTPATIENTS**

Deficits involving executive function and new learning occur commonly among people with depression. These deficits have been linked to psychotic features, depression chronicity, and severity of depression. However, the impact of agitation or atypical features of depression have received little attention. Their relationship with neuropsychological dysfunction was assessed among depressed outpatients and a control sample.

Participants included 48 young adults recruited from a university setting. 16 met diagnostic criteria for major depressive disorder based on structured diagnostic interview. All were administered the Inventory of Depressive Symptoms (IDS), Stroop Color Word Test, California Verbal Learning Test-2 (CVLT-2), and the Iowa Gambling Test (IGT). IDS items were summed to assess total depressive severity, agitated symptoms, and atypical symptoms.

To control for Type I error, a  $p < .01$  was employed. Atypical symptoms correlated with IGT ( $r = -.4$ ), and CVLT-2 recall and recognition ( $r^2 = .4$ ). Agitated symptoms correlated with Stroop inhibition ( $r = -.4$ ) and inhibition/switching ( $r = .5$ ) and CVLT-2 delayed recall ( $r = .5$ ). Total IDS score correlated only with Stroop inhibition ( $-.4$ ) and CVLT-2 recall ( $-.5$ ) and delayed recall ( $r = .6$ ). No other correlations were significant.

Distinct patterns emerged, with agitation relating to mental flexibility, and atypical symptoms associating with impulsive responses. Both related to recall, but only atypical symptoms reflected poor recognition, implying that poor acquisition is consequent to atypical symptoms. Overall depressive severity failed to demonstrate a unique relationship with neuropsychological function, offering credence to the unique associations manifested with agitation and atypical symptoms. These data conform with emerging data concerning neuropsychological heterogeneity with specific depressive dimensions.

**He, Yang\*, Brooke A. Hemphill, Michael W. Keller, Tyler W. Johannes, & Daniel W. Crunkleton**

## **MEASURING THE MECHANICAL PROPERTIES OF A *VOLVOX* COENOBIA BY DIRECT MICROCOMPRESSION**

Various algal species in the *Volvox* genus have long been of interest to researchers as a model organism for investigating cell specialization within the context of molecular evolution, and they are one of the most studied algae genera that form spherical colonies. Each mature *Volvox* colony is composed of numerous [flagellate](#) cells, similar in size and shape to [Chlamydomonas](#) and has been identified as a model organism for evolutionary studies. In this work, we present a technique for quantifying mechanical properties of these coenobia by directly micromanipulating a single *Volvox* coenobium of the species *Volvox* through compression between two parallel surfaces. In this experiment, a glass probe with a diameter of 1 mm is used to compress the microalgae against a glass surface. As the colony is compressed, force/displacement data is taken which allows various mechanical properties to be calculated, such as the cell wall modulus and burst stress. In this study, measurements of the cell wall modulus and burst stress are determined for daughter cell colonies by comparing the load-displacement behavior with an analytical elastic shell model of the compression process. Results are presented as a function of different cell diameter of single *Volvox* cell. Specifically, the average Young's modulus of a colony with no daughter cells is determined to be ~1.1 MPa. Turgor pressure of the coenobium is zero, and pressure drop during cell relaxation is negligible.

**Heffington, Hannah**

### **THE UTILIZATION OF GRANT MONEY FOR A CHEROKEE BASKETRY THESIS PROJECT**

In the Fall of 2013, I received a Student Research Grant from The University of Tulsa for travel expenses and short conferences involving my thesis research. My thesis topic is "The Recent Revitalization of Cherokee Cultural Art: Basketry." I have interviewed Cherokee basket weavers regarding their history, traditions, and practices. I have combined those interviews with historical and contemporary research of written sources. To fully understand Cherokee basketry, I attended weaving classes and wove several baskets. I spent grant money to travel to Tahlequah, where the classes were located, and to cover the cost of admission and materials of the classes. Not only did learning to weave greatly assist in my research and understanding, I also utilized the classes to make contacts. Without funding from TU, my thesis project would be missing multiple key elements.

**Hendrickson, Jordan**

### **AN ECOLOGICAL SURVEY OF *NAEGLERIA FOWLERI*, *BALAMUTHIA MANDRILLARIS*, AND *ACANTHAMOEBA* SPP. IN TULSA AREA SPLASHPADS**

*Naegleria fowleri* is a free-living amoeba that proliferates well in improperly chlorinated and warm waters. This accounts for its prevalence in lakes and ponds during the hot summer months. *N. fowleri* is associated with the neurodegenerative disorder Primary Amebic Meningoencephalitis (PAM). PAM is a very quick-moving infection whose early symptoms are often associated with lethargy, headaches, and neck stiffness. If not treated within the first few days of symptoms, it often results in death. In 2005, two young boys died of PAM a few days after playing in a mud puddle located directly by the splashpad in Mohawk Park, Tulsa, OK. Throughout the summer of 2013, samples were collected from four splash pads and tested for *Naegleria fowleri* as well as two other free living amoebas, *Balamuthia mandrillaris* and *Acanthamoeba* spp., which are known to cause PAM-like symptoms. Identification was confirmed using Polymerase Chain Reaction (PCR) and gel electrophoresis. Of the seventeen samples collected from the four various splashpads, sixteen were positive for *N. fowleri*. I am currently working on a nested PCR protocol which will determine if these *N. fowleri* are one of the two pathogenic strains that can cause PAM.

**Hendrickson, Jordan**

## **SODIUM PREFERENCES IN TROPICAL ANTS**

In the rainforest, the ability to find food is essential for the survival of organisms and the colonies in which they live. Certain organisms have been shown to specifically forage for certain nutrients lacking in their normal diets. The leaf cutter ant, *Atta cephalotes*, has been demonstrated to perform this behavior towards salt sources. Several hypotheses attempt to explain why the ants exhibit this type of behavior. The simplest explanation being that salt is readily washed away in a rainforest environment. My study attempted to replicate previous studies demonstrating leaf cutter ant's attraction towards sodium sources. It also attempted to draw conclusions regarding salt preferences of carnivorous bullet ants and army ants. I hypothesized that carnivorous ants would have less of a dependence on salt sources because of their ability to receive some salt from their diet. To test this, seven concentrations of salt-soaked cotton balls were randomly placed one inch apart along each ant species trail. In ten trials performed on *Atta cephalotes*, ants seemed to prefer the 0M, 0.5M, and 5.0M concentrations of salt solution. Army ants showed no preference towards for higher or lower concentrations of salt. Bullet ants showed an aversion towards the two highest concentrations of salt solutions. Ultimately, my hypothesis was not supported by the data collected. Differences in ant diets do not seem to be an indicator of salt preferences.

**Henke, Jonathan**

## **THE EFFECT OF SUNLIGHT AVAILABILITY ON THE PREVALENCE OF LEAF ENDOPHAGY**

Leaf endophagy, or digestion of leaf tissue from within the leaf itself, is a widespread feeding mechanism of numerous insect species. Despite its prevalence, many facets of endophagy remain obscure, especially in understudied environments such as the neotropics. One such facet is the effect of local environmental factors on the presence of endophagy. In the neotropics, sunlight is a major environmental factor that can limit plant growth. Plants with limited sunlight have less energy to invest in leaf growth. As a result, they tend to invest in defenses, such as secondary chemical compounds, to protect their leaves from destruction. These secondary compounds should be expected to deter insects from ovipositing and feeding within the leaves. Thus, my hypothesis predicts that, without attention to specific species, plants with less access to sunlight will exhibit less evidence of leaf endophagy. To test this hypothesis, I observed the frequency of leaf mines, an outward indication of endophagy, in sample plots of three distinct areas, differing in their access to sunlight. All tests were performed within La Selva Biological Reserve in Costa Rica. Analysis of the data indicates a correlation between access to sunlight and presence of leaf mines, as predicted by my hypothesis.

**Hennigan, Christian**

## **LOVE IN THE MIDST OF NARRATIVES: EMBRACING THE FICTION OF PERSONAL IDENTITIES WITHIN ALAIN RESNAIS'S *HIROSHIMA MON AMOUR***

The bombing of Hiroshima erased the neat lines of memory. Fourteen years later, Alain Resnais's film *Hiroshima mon amour* weaved together a tale of suffering and love that explores the possibilities of human relationships in the face of such an unbelievable event. This project interprets the film as a revelation of the fiction of personal identities and draws out of Resnais a reinvention of love that may make sense of Hiroshima and of ourselves. Techniques of film criticism first establish the landscape as one of shifting identities and personal ambiguities. A particular focus will be held over the duality of the responses to this background condition. A French woman visiting Hiroshima obsesses over understanding things directly, and a Japanese man asserts the impossibility of truly seeing anything. It will be finally demonstrated how Resnais synthesizes these radicalized approaches into a new way to approach love once identity breaks down: as the two characters together probe the woman's humiliating past, they come to collectively redefine what has taken place and allow both to love again.

**Hice, Stephanie A.**

## **CHARACTERIZATION OF SWITCHGRASS DEGRADING THERMOPHILIC**

## **ACTINOMYCETES FOR BIOFUEL PRODUCTION**

Switchgrass is a lignocellulosic biomass that has begun to show great promise in the production of biofuel. Filamentous bacteria, known as actinomycetes, are well known for their antibiotic production, and excellent degradation abilities. Actinomycetes are able to flourish in both hay and compost, which emphasizes their cellulolytic activities. Some strains of actinomycetes have been reported to degrade lignin and cellulose. As a result, this puts these filamentous bacteria in a highly favorable position when compared to other bacterial species. Preliminary investigations conducted in Dr. Mohammed Fakhri's laboratory at the University of Tulsa resulted in an excellent collection of thermophilic, cellulolytic actinomycetes isolated from mushroom and cotton burr compost samples produced in Miami, Oklahoma. A number of these isolates demonstrated growth on switchgrass, utilizing it as a carbon source. The main objective of this proposal is to screen additional cellulolytic actinomycete isolates for their ability to degrade switchgrass; as well as the identification of the aforementioned isolates using molecular techniques, including 16S DNA sequencing. Preliminary screenings of these isolates—as grown on either cellulose or switchgrass—have been conducted, and have tested positive for the presence of glucose. Using actinomycetes in the biomass conversion of switchgrass to glucose is advantageous, as the aerobic fermentation technology required for this process is currently available. Moreover, fermenting sugars for ethanol production is a successful industry, and has been at the forefront of research on sustainable energy sources. Offering an efficient method of obtaining ethanol, without exhausting the agriculture industry, is desirable.

**Hoover, Coty S.\* & Jennifer Ragsdale**

### **INVESTIGATING THE EFFECTIVENESS OF WEEKEND RECOVERY**

Research has suggested that a weekend should provide more opportunities to recover (Fritz et al., 2010), but it is unclear if a weekend fully replenishes resources depleted during the workweek. Assessing employees ( $N = 233$ ) before and after a weekend, we examined the carryover effects of Friday interpersonal conflict and role ambiguity onto Monday need for recovery, with occupational self-efficacy and organizational-based self-esteem as mediators. Results showed that only occupational self-efficacy mediated the relationship between Friday stressors and Monday need for recovery. Our research suggests that the weekend may not provide sufficient time to fully recover employees, especially when the stressors cannot be resolved prior to the weekend. Implications for practice include the importance of resources in recovery and recommendations to facilitate resource recovery.

**Hoyt, Jordan\*, Shota Ushiba, Shoji Satoru, Junichiro Kono, & Satoshi Kawata**

### **MACRO-SCALE BUBBLES FOR ALIGNING CARBON NANOTUBES**

Single-wall carbon nanotubes (SWCNTs) exhibit high aspect ratios that can lead to extreme anisotropic mechanical and electrical properties if macroscopically aligned SWCNT ensembles can be made. Here, we used simple macro-scale bubble structures to align SWCNTs in larger quantities and in less time compared to pre-existing methods. We mixed SWCNTs, surfactant, and water to make the macro-scale bubbles that were composed of three layers with a total thickness of around 1  $\mu\text{m}$ . The inner and outer surfaces of these bubbles were made up of surfactant and the middle layer was composed of SWCNTs and water. After using a pipette to create a 5 to 25 mm diameter bubble, pressing a glass substrate against a living bubble garnered a flat sample for testing. We demonstrated the bubble's aligning qualities from this two-dimensional imprint via polarized Raman microscopy. Since SWCNT's Raman G-bands intensities are dependent on the polarization of light, the alignment direction and intensity were determined by using a half-wave plate and light polarizer. Our results show that SWCNTs can be aligned in bubbles oriented towards the peak apex of the bubble structure. We also have evidence that SWCNTs are aligned tangent to the curvature of the bubble near the boundary. Possible reasons for these behaviors include water molecule runoff down the side of the bubble and surface tension forces pulling the SWCNTs into thin spaces where they are forced to align. Our method is promising for a wide range of applications that include nanoelectronics, sensors, and photonic devices.

**Hubb, Andrew J.\* and Steven M. Tipton**

## **CRACK PROPAGATION ANALYSIS IN COILED TUBING FATIGUE TESTS**

The high, fluctuating bending strains experienced by coiled tubing inevitably lead to fatigue cracking. Because of this, much research has been conducted to understand the fatigue phenomena in coiled tubing. As models of fatigue behavior in coiled tubing continue to improve, fatigue cracking and ultimately failures can be avoided in field applications. Although existing life prediction models for coiled tubing have been successful, an improved understanding is needed of coiled tubing mechanics and how they relate to crack propagation.

This presentation will present a brief review of fatigue analysis on in coiled tubing. Considerable time has been spent analyzing coiled tubing fatigue behavior in terms of total cycles to failure. However, fatigue life can be considered the sum of cycles required to cause crack initiation and cycles required for the crack propagate through the wall thickness. Attempts to account for crack propagation life in the past only attempted to count striations on the fracture surfaces of failed coiled tubing. In this project, crack growth will be monitored throughout the duration of the test, separately from crack initiation life.

In practice, cracks nucleate on both outer and inner surfaces. Therefore sharp transverse starter notches are used to nucleate cracks and eliminate the crack initiation portion of overall fatigue life. The results from this testing are compared to tests conducted on samples without starter cracks. Crack depth is measured by examination of the fracture surface after the test is complete. The data are used with elastic-plastic fracture mechanics models for future crack propagation estimates. The approach holds promise for assigning the influence of surface defects on coiled tubing fatigue life, since defects tend to cause cracks to start immediately, eliminating the crack initiation contribution to total life.

**Huffman, Jill**

## **CASTE DIFFERENCES IN *ATTA CEPHALOTES* IN ELICITING ALARM RESPONSE FROM NESTMATES**

Many insects use pheromones to communicate with their nestmates about important things such as location of food sources or presence of a predator. It has been suggested that the different castes within a colony could potentially have differing levels of effectiveness in emitting alarm pheromones and eliciting a response. To test this, studies were conducted under controlled conditions using minim (the smallest), worker, and soldier (the largest) castes of the leaf cutter ant species *Atta cephalotes* collected from La Selva Biological Station in Costa Rica. The ultimate goal was to observe the response that the alarm pheromones of each different caste could stimulate in worker ants of the same species. The hexane pheromone extracts from the heads of minims elicited a higher alarm response from the worker ants than did the extracts from the other castes; with the extract from workers eliciting slightly less of a response and the extract from the soldiers even less. This demonstrates that the smallest ants (minims) may be more effective in provoking an alarm response due to the composition or concentration of their alarm pheromone.

**Hunting, Travis\*, Echo Adcock-Smith, Parameswar Hari, Kenneth Roberts**

## **MAXIMIZING THE ECONOMY OF WELL ORDERED ZINC OXIDE NANOROD PRODUCTION**

In order to be cost effective, photovoltaic fabrication should involve a low energy production process. The most important ways to achieve this are by mitigating cost and maximizing efficiency of energy harvesting. Zinc Oxide nanostructures have proven efficient in a wide variety of applications as thin films in solar cells. This project focuses on growing well aligned Zinc Oxide nanorods at low temperatures, for short periods of time. Previous methods have used growth times of over 24 hours, and temperatures over 100°C; this research aims to show that oriented nanostructures can be generated in as little as 2 hours, at temperatures

of approximately 70°C. Various factors effecting growth are analyzed, and results are examined with a scanning electron microscope.

**Ishak, Joanne**

### **FATIGUE LIFE IMPROVEMENT VIA AUTOFRETTAGE: OVERVIEW AND NUMERICAL SIMULATION**

Structural When structural components are subjected to severe cyclic loading in routine service, residual compressive stresses are often used to impart fatigue resistance. Often fail before their intended design life due to a multitude of reasons including loading, surface roughness, surface flaws and imperfections that emanate in the material during manufacturing, loading direction, temperature and the overall geometry that creates zones of high stress concentration. Residual surface compression can be imposed with a number of techniques. But this work focuses on a process called autofrettage.

The objective motivation for of this work is to enhance the fatigue life of positive displacement pumps by imparting compressive residual stresses at locally high stress locations at the surface of the specimen fluid ends. The process introduces plasticity by overloading the material above its yield stress then releasing the load, which imparts residual compression at the high stress locations. and putting the component back into service. The fatigue stresses now occur with residual compression, which reduce their detrimental effect. Usually this process is referred commonly employed to pressure carrying products where a large subjected to high levels of fluctuating internal pressure is applied.

Fatigue life estimation techniques give a rough estimate of the fatigue life due to the variety of reasons behind fatigue failures in the presence of residual stresses. Hence, however, there is no consensus for how to account for, the necessity of developing a tool for accurate fatigue life predictions that accounts for residual stress relaxation, a major phenomenon observed in metallic components. Residual stress relaxation profiles are extracted from experimental tests performed on fatigue specimens.

Fatigue life estimations using this tool prior to and after autofrettage are also investigated. The research also addresses the effectiveness of intermediate re-application of autofrettage to restore residual stresses following relaxation.

**Ivey, Kim**

### **WHAT CAN MEDICAL ANTHROPOLOGY TELL US ABOUT THE EFFECTS OF STRESS?**

Recent research in the field of medical anthropology has proven that a stressful social and cultural environment, especially early in life, can be detrimental to a person's physical health and functioning—effecting them into adulthood. Results such as addiction, mental health issues, and physical illness can be created through prolonged exposure to stress in any of its various forms such as financial insecurity, poor nutrition, or physical abuse. In addition to further stress, reciprocal results can produce poor parenting quality, self-medication/substance abuse, or chronic disease. Nearly every item on each list can be classified as a proximate cause, as well as, a result, leading to a vicious generationally transmitted cycle. These results, playing out in tandem, often go hand-in-hand with a condition of poverty. The socioeconomic status of a person can determine the way they perceive and live their life and, subsequently, can seal their fate in the long run. Stress, primarily in childhood, should be taken seriously as a force in the recurring cycles of poverty, inequality, health issues, substance abuse, and crime. By relying on pertinent research in the field of medical anthropology, stress and its resulting issues can be addressed utilizing such avenues as state and federal level policies and programs.

**Jayasekara, Indumini\* and Dale Teeters**

## **IONIC CONDUCTIVITY ENHANCEMENT OF SOLID POLYMER ELECTROLYTES DUE TO THE QUANTUM- CONFINEMENT EFFECT**

Polymer confined nanoporous membranes can be used as solid polymer electrolytes for the formation of nanobatteries with enhanced stability. Nanoporous aluminum membranes with 200nm channels are used to make nano-confined poly(ethylene oxide),PEO, complexed with lithium triflate. Polymer is placed inside channels that are perpendicular to surface by melting the polymer and taking the advantage of capillary action. SEM images showed the formation of polymer rods inside nanopores, and ac impedance analysis showed the enhancement of ionic conductivity of nano-confined polymer due to the quantum effects. DSC and XRD analysis are used to characterize the changes in crystallinity and alignment of polymer chains. Due to the nano-confinement of PEO, conductivity of polymer is increased by an over an order of magnitude by providing unusual pathways for the ionic conduction.

**Johnson, Casey**

### **TATE BRADY IN THE 21ST CENTURY**

Wyatt Tate Brady was born in Missouri in 1870 and moved to Tulsa and opened one of the first mercantile stores in 1890, and in April 1895, Brady married Rachel Davis and started a family. Tate Brady was a prominent Tulsan; he opened the first hotel in Tulsa with indoor baths, played a large part in Oklahoma politics, protected Indian interests and affairs, developed and protected oil interests in Oklahoma, and helped to incorporate the city. By 1908 the city of Tulsa, recognizing Brady as a prominent citizen, honored him by naming a downtown street after him. In 2012 Brady, Brady Street and the Brady district along with the City of Tulsa, came under scrutiny This critique of Brady began with an article written by Lee Roy Chapman entitled *Nightmare of Dreamland*. Due to this article, and subsequent criticism, Brady gained a very negative 21<sup>st</sup> century reputation and became known solely as a Klansman.

Through my research I went back through the primary documents concerning Brady's life which were used to create Brady's latest negative portrayal. In going through newspaper articles, government documents, investigation reports, and a military tribunal court transcription in which Brady testified, I reexamined Brady and the circumstances surrounding his life and discovered that Brady's life is more complicated than first thought. I delve into and explore several key events in Brady's life that show us there is more to the story and that we cannot simply mark Brady as a Klansman and look at nothing else.

**Johnson, Janet**

### **THE EFFECTS OF FAMILY DYNAMICS ON COURSE CHOICE**

Research has shown the impact of socioeconomic status on student achievement (Klugman, 2004), Advanced Placement courses on achievement (Santoli, 2002), and the impact of family dynamics on attitude (Bozick, Alexander, Entwisle, Dauber, & Kerr 2010) (Advanced placement students show a high level of achievement (Santoli, 2002). This study will use a survey to evaluate the effect of family dynamics on AP course choice to determine if home structure affects the courses students choose. It is expected that students from two parent homes will have a higher enrollment rate in advanced placement courses than students from single parent homes. The differences in expectations between two parent families and single parent families should reveal parent roles, parent-centered motivations, and student-centered motivations in course choice. Results from this study should help teachers better prepare students to make decisions regarding enrollment in advanced placement courses.

**Johnson, Trokon & Bennett Krack**

### **MODELING AND ANALYSIS FOR A NANOBATTERY CHARGING CONTROL SYSTEMS**

As technology advances, a trend is developing toward the minimization of systems and devices. An important aspect of this trend has been the miniaturization of energy storage and delivery methods. We are

part of a multidisciplinary research team seeking to create a nanobattery system and evaluate its qualities and potential applications.

Our work involved examining the electrical characteristics and the charging and discharging processes of the nanobattery. We based our research on a thesis, *Evaluation and Modeling of Nano-Scale Battery and Capacitor* by Joseph Collette. We recreated the Spice model of the nanobattery found in the Collette thesis in order to examine the battery characteristics, particularly when multiple cells are placed in a grid.

In addition, we began devising a state machine to model how a microcontroller could manage charging a grid of nanobattery cells. The design focused on charging individual cells in sequential order, while being capable of adapting to different charge conditions. For example, one configuration involved charging the system using a photovoltaic system. In this system, the individual cells would charge more quickly when exposed to more ambient light.

Going forward, we intend to measure the electrical characteristics of a nanobattery prototype created by other members of the team. We will compare our measurements to the parameters of the Spice model, and adjust the model accordingly. We will then use the model to examine the effectiveness of various configurations of the control system.

**Jones, Gregory**

### **STRAINED ALKYNES AS CYSTEINE PROTEASE INHIBITORS**

Cysteine proteases are proteins that serve as catalysts for many important chemical reactions in the body; however, it has been found that certain cancers overexpress these proteins as a mechanism to facilitate tumor migration. Methods for inhibiting these proteases are therefore an important goal in the development of cancer therapeutics. While studying a model cysteine protease, papain, we serendipitously discovered that a strained alkyne, dibenzocyclooctyne-amine, reacted with and effectively inhibited the enzyme. This reaction was unexpected because previous reports in the biochemical literature suggested strained alkynes were inert to biological molecules. Thus, this research has not only provided new leads in the treatment of cancer, but also reveals a more fundamental understanding of alkyne reactivity. Included in this presentation are fundamental studies in chemical reactivity to explain how and why strained alkynes react with cysteine proteases. We also discuss how this research can inform the development of a new class of anti-cancer drugs that positively impact human health.

**Keane, Kristopher**

### **FEMALE PREFERENCE IN THE WILD**

Mate preferences are an important piece in determining which individuals experience the most reproductive success, providing a glimpse into microevolutionary processes at work. Unfortunately, results of closed preference trials conducted in captivity often do not match preferences seen in the wild, perhaps due to individuals' ability to evaluate several mate characteristics at once. Moreover, preferences are known to be plastic in many species. In the prairie mole cricket *Gryllotalpa major*, males aggregate in competitive clusters known as leks to display for females flying overhead. Although lekking is seen in a handful of diverse taxa, the benefits of such a mating system are relatively obscure. Exploration of female preferences in this system is one way to determine these benefits. Here, we compare advertisement call characteristics and environmental features of successful and unsuccessful males in the wild to determine if females are exercising direct choice over males (actively choosing one male over others) as opposed to indirect choice (choosing a group of males, a location, or visiting the first male they hear). In an indirect choice scenario, male competition is often the deciding factor. Our research shows clear patterns in male-male competition within a lek, and this is most likely the dominant variable in determining female choice.

**Kham, Mary**

## **NATURAL PROCESSES IN THE PHONOLOGICAL ACQUISITION OF BURMESE LEARNERS OF ENGLISH**

The purpose of this study is to determine the correlation between age and the use of the phonological process of deletion in Standard American English (SAE) among native Burmese speaking immigrants residing in America. The study had three participants, who will be referred to as Subjects A, B, and C for protective purposes, that were interviewed in order to determine their proficiency of the English language. The linguistic development of the three subjects was compared to that of a native SAE speaker through analysis of phonetic transformation. The transcribed conversation was organized into phonetic process charts for comparison of the use of middle and final phoneme deletion between the three participants. Results show there is a correlation between the age of the Burmese immigrants studied and their use of deletion in SAE. Contrary to initial thought, the oldest speaker used both middle and final deletion less than the younger participants. Further study is suggested to discover if deletion is a result of the difficulty to learn English as a second language. Likewise, more participants would develop a better understanding of the correlation between age and deletion.

**Kiani, Mahdi**

## **ANALYTICAL AND EXPERIMENTAL INVESTIGATION of FATIGUE IN HIGH CYCLE PUMP COMPONENTS**

Many high-pressure components have intersecting bore geometries, such as in reciprocating pumps that are widely used in gas and oil industries for well stimulation. These intersecting bore geometries are central to the design of fluid ends on positive displacement pumps.

Because the fluctuating pressure history in a fluid end is so extreme, with pressures alternating between 0 and 20,000 psi, fatigue often limits the useful life of the pump. Approaches such as autofrettage are typically used to extend fatigue lives through the imposition of beneficial compressive residual stresses at crossbore intersections. Direct investigation of the impact of residual stresses on the crossbore geometry in a working pump is not typically possible. In order to improve understanding of the impact of residual stresses on fatigue life and to optimize the fatigue-strength improvement provided to liquid ends through autofrettage, a unique sample geometry was designed to simulate the stresses in the crossbore. These samples can be tested on laboratory-based servohydraulic fatigue frames and eliminate the need for complicated in-situ stress analysis on the fluid ends.

The sample geometry was designed to create a surface stress gradient that closely resembles the distribution derived from finite element analysis (FEA) on crossbore intersections. This way, the effectiveness of autofrettage can be assessed experimentally and compared to analytical models, including elastoplastic FEA, quickly and efficiently.

To calculate the optimum autofrettage load, elastoplastic FEA was accomplished utilizing a nonlinear combined isotropic-kinematic hardening material model. Both monotonic and cyclic testing were done on modified 4330 steel to determine the material characteristics required to define the FEA material model.

**Koduri, Naga Durgarao\* & Syed R. Hussaini**

## **SYNTHESIS OF BIOACTIVE ENAMINONES VIA COPPER CARBENOID CHEMISTRY**

A systematic study was conducted on thirteen different commercially available copper (I) and copper (II) catalysts (fig. 1) to identify effective copper catalysts for inter and intramolecular coupling of  $\alpha$ -diazocarbonyl compounds and thioamides. The use of selected catalyst for the coupling of primary, secondary and tertiary thioamides and thioformamides with  $\alpha$ -diazodiester,  $\alpha$ -diazoketoesters, and  $\alpha$ -diazodiketones (Scheme. 1) will be discussed. The kind of transformations are traditionally conducted with

either Rhodium or Ruthenium. But, both are expensive catalysts. However, the published reaction conditions with ruthenium and rhodium are harsh. Whereas reactions with copper catalysts will work under milder conditions and provides better yields. Copper is also more economical than Rhodium and Ruthenium. Attempts for the synthesis of, type of enaminones that have not been prepared previously by rhodium and ruthenium catalysis will be discussed in addition to the known systems. It includes formamides, acyclic and cyclic thioamides, five and six-membered thioamides, acyclically and cyclically positioned thioamides. Efforts for the synthesis of bicyclic enaminones obtained by the intramolecular reaction of the thioamides will also be discussed.

**Kuiper, Joseph\* & Mark A. Buchheim**

### **THE INTERNAL TRANSCRIBED SPACER ONE: PRIMARY SEQUENCE AND SECONDARY STRUCTURE ANALYSES**

Nucleotide data from the internal transcribed spacer two (ITS2) have been used extensively (>30,000 accessions at the NCBI) for assessing diversity across all eukaryotic kingdoms. One of the advantages of ITS2 (over most other phylogenetic markers) is the ability to generate secondary structure models that can be exploited to expand the data that can be used to assess variability. Moreover, the structural models permit analyses of compensatory base change (CBC; changes that affect both nucleotide pairs in a helix region of ITS2) which have been statistically correlated with species boundaries. In contrast, the ITS1—which is part of the rRNA array that includes ITS2—has largely been ignored as a phylogenetic marker. The few studies that have suggested that ITS1 might be a good marker have, apparently, been countered by other reports that claim ITS1 is too variable. As a means to test the ITS1 as a phylogenetic marker, data that parallel ITS2 accessions for a large set of flagellated green algae were assembled into a primary sequence matrix. Analyses of ITS1 sequence data alone showed a high degree of congruence with the results from parallel analyses of ITS2 data. Algorithms for RNA folding were used to prepare secondary structure models. Structural data were incorporated into the primary sequence data (xfasta format) for sequence-structure analyses. Results from analyses of these data also showed similar results for sequence-structure analyses of ITS2. This investigation indicates that ITS1 may be an overlooked source of data for eukaryotic cell phylogenetics.

**Kunkel, Joshua**

### **THEMES OF AMERICAN MANLINESS IN WWI FRANCE**

This paper's purpose was to examine the experiences of American soldiers in Europe during WWI, and the themes that emerge from them. Of primary interest were what could be gleaned from these men's writings that related to American and Western ideas of masculinity and manhood. This purpose was pursued through examination of primary documents such as diaries and correspondence, as well as by comparing these primary sources to each other and to secondary literature.

**Lacey, Kelly\*, Ahmed Gad, & Mohamed K. Fakhr**

### **ANTI-MRSA ACTIVITY OF BACTERIA ISOLATED FROM EXTREME ENVIRONMENTS**

It is no longer uncommon to see antibiotic resistant strains of bacteria, particularly in hospital settings. Just last year, a 'superbug' was reported at the National Institutes of Health's Clinical Center in Maryland. A lack of funding from pharmaceutical companies limits the production of new antibiotics to combat these evolving pathogens. The main objective of my research is to determine the potential for bacteria isolated from extreme environments (caves, salt plains, and thermophilic environments) to combat hospital acquired Methicillin Resistant *Staphylococcus aureus* (MRSA). To achieve my objective, approximately 600 isolates from the aforementioned environment types will be cultured and used in antibiotic susceptibility testing. Preliminary testing of 82 cave bacteria has shown a few of them with slight anti-MRSA activity against one hospital-isolated strain and one strain isolated from retail meats. This experiment is being repeated after adjusting the right growth conditions for this group of bacterial cultures. Further testing is currently underway to conclusively determine whether the bacterial strains are capable of inhibiting the MRSA

strains. The rest of the 600 bacterial strains will be screened in the near future. The long-term goal of this project is to provide laboratory testing for the preliminary stages of the drug development process and to discover new antimicrobials effective against MRSA .

**Laney, Samuel**

### **SYMMETRICAL CLOSE PACKING OF CYLINDRICAL OBJECTS**

The focus of this research is to establish a framework concentric close packing. This packing arrangement consists of cylindrical objects placed tangent to one another in such a way as to minimize the area of the circumscribing circle. Each successive ring of objects contains a multiple of the initial ring.

There are three objectives: 1) Establish bounds for the number of units added to each successive ring. Beginning with an initial ring of  $P$  objects, additional cylinders are added in concentric rings of  $A * P$  cylinders outside prior rings. A bound for the multiplier  $A$  will be found for a maximum of 1000 units. 2) Investigate the apparent chaotic nature of the number of units added to each successive ring. The multiple of  $P$  contained within each ring has no apparent periodicity. 3) There are sometimes many placement options for a new ring. It currently appears that the second best option from the prior ring becomes the best option for the successive ring such that,  $B_i = A_{i+1}$  where  $A$  denotes the best ring placement option and  $B$  denotes the second smallest ring placement option. This study aims to determine definitively whether for large numbers of iterations this will cease to be the case because choice  $A$  consumes the space necessary to place a unit at choice  $B$ .

This work will be conducted using an algorithm currently in development. This algorithm locates and places each successive unit on each expanded ring and will provide data for discrete cases.

**Lareau, Caleb A.\*, Tania Carrillo-Roa, Brett A. McKinney, Elisabeth B. Binder, & Helen S. Mayberg**  
**A MIXED-MODEL OF GENE EXPRESSION IN PATIENTS WITH DEPRESSION TREATED WITH DEEP BRAIN STIMULATION IMPLICATES AUTOPHAGY AND ANGIOGENESIS**

Recent studies have demonstrated that deep brain stimulation (DBS) may be an effective therapy for treatment-resistant depression. However, DBS requires a highly invasive surgery, minimizing its utility in the clinic. In this study, we aimed to uncover the biological mechanisms behind DBS to identify molecular targets for less invasive treatment. After collecting gene expression data during the course of DBS treatment for 17 individuals, we constructed a mixed linear regression model to identify transcripts differentially expressed throughout treatment. Our results implicate the role of *E2F6* and several genes regulated by this transcription factor. In particular, we present evidence that *E2F6*-mediated genes increase autophagy and inhibit angiogenesis in response to DBS treatment.

**Lau, Lily**

### **DETECTION OF COACHED NEUROPSYCHOLOGICAL DYSFUNCTION: AN EXPERIMENT REDARDING MILD CLOSED HEAD INJURY**

**OBJECTIVE:** The Test of Memory Malingering (TOMM) and Word Memory Test (WMT) are used to detect symptom exaggeration. Some attorneys may coach clients to defeat such validity tests. Yet, the effects of coaching are undefined. In this experiment, normal subjects were presented with either superficial or sophisticated information concerning head injury symptoms, and attempted to simulate performance of genuine head injured patients.

**PARTICIPANTS AND METHODS:** College students served as research subjects. 13 received sophisticated information, and 12 received superficial details concerning head injury symptoms. 12 controls also participated. All were administered the TOMM, WMT, CVLT-2, WRAT-IV Reading test, and Judgment of Line Orientation (JLO).

**RESULTS:** On ANOVAs and Tukey HSD post hoc contrasts, the simulated patients performed worse than controls on all tests. Moreover, the sophisticated simulators performed worse than the naive simulators on all tests, including the WMT and TOMM. Scores of simulators fell far below standard cutoffs for performance validity. All  $p$ 's  $<.01$ .

**CONCLUSIONS:** These results suggest that simulated symptoms of head injury are readily detected by the TOMM and WMT. This is an important consideration in light of previous findings that at least 70% of patients are suspected of modifying their symptoms in forensic settings. Unexpectedly, simulators who received the most detailed information concerning head injury symptoms performed worse than those who received superficial details. These findings suggest that neuropsychological malingering measures are sensitive to symptom coaching and are valid indicators of performance validity.

**LeClear, Mckenna**

### **BHIKSHUNIS AND BREAKING BARRIERS: THE CHANGING STATUS OF WOMEN IN MONASTIC LIFE**

Since the time of the Buddha Siddhartha Gautama, women in Buddhist monastic life have been viewed as second-class citizens in comparison to their male counterparts. Their inferiority has been built into and reinforced by Buddhist ideology and policy for thousands of years, until recently when a movement toward equality began. Thanks to the efforts of many organizations, chiefly the Tibetan Women's Association and the Tibetan Nuns Project, higher levels of religious education have been made available to nuns wishing to study Buddhist philosophy and scriptures. Just last year, the work of these organizations culminated in tremendous landmark results: Tibetan nuns were allowed, for the first time in history, to take the examination for the geshema degree, the equivalent of a PhD in Buddhist philosophy. The Tibetan Nuns Project has also had a hand in several other changes concerning the status of nuns, including incorporating debate into the nuns' studies and striving to settle the controversial issue of full ordination for Tibetan Buddhist women. With all these factors combined, it is a very significant and dynamic time for women in monastic life.

**LeClear, Mckenna**

### **SAVAGES AND SPIRITUALISTS: AN EXAMINATION OF STEREOTYPICAL IMAGERY IN NATIVE AMERICAN AND TIBETAN CULTURES**

This research focuses on the establishment and perpetuation of cultural stereotypes in two particular cases: the Noble Savage myth of the Native Americans and the Shangri La myth of Tibetans. My intent with this research was to explain how these myths originated in the minds of Europeans in the first place and how the stereotypical images have been perpetuated across time, both by scholars and by creators and consumers of popular culture. The research concludes with an examination of the economic, political, and social consequences that these images have had for the Native American and Tibetan peoples.

**Lin, Suqin and Logan Dierker**

### **RUSTY THE ROBOT HELPS LITTLE LIGHT HOUSE CHILDREN PLAY IN THE SANDBOX**

The College of Engineering and Natural Sciences at the University of Tulsa is one of the main sponsors for the Booker T. Washington robotics team. Each spring, the BTW robotics team builds at TU a robot for the FRC competition with the assistance of TU students, faculty and other community mentors. At the end of the 2013 robotics season, the team was challenged to participate in a unique experience: using their skills to build a robot as a service project for the Little Light House (LLH), an educational and therapeutic center for children with special needs.

The program started in June as TU-Robotics Camp 2013 and delivered Rusty to the LLH for initial testing in January. Service was an intrinsic part of the program. While it was a TURC service project for a TU student, every one that was involved in the project was volunteering their time including TU faculty and students, BTW faculty and students, and community mentors

The Little Light House (LLH) requested a robot to interact with toys in a sandbox to allow participation by those children that could not do so because of some limitations. The LLH children are 2-6 years old. Hence, the interface with the robot was a critical component. The interface had to use large buttons and preferably use colors that could be distinguishable by all the children.

Rusty the LLH robot has three basic joints and a hand for gripping toys. It is built as a tower on wheels where the electro-mechanical components are mounted at the top. It has a rotational shoulder on which an arm is mounted. This arm can extend out over the sandbox. At the end of this arm there is a forearm which provides vertical movement. At the end of the forearm, there is a pneumatic controlled hand. This hand a fail-safe device allows controlling the amount of gripping power it provides.

The children interact with Rusty through a control box. The control box has four sets of large Red/Yellow buttons that control each of the functions of the robot. Pictures associated with each set uses an icon to indicate the actions of the robot that it controls. These icons are replicated with toys mounted on the robot itself to assist the association of the buttons with the robot action. Rusty allows some children at the LLH to play and interact with toys in the sandboxes that were unable to do so before.

The main sponsor for this project is the Tandy School of computer Science in the College of Engineering and Natural Sciences at the University of Tulsa.

**Liu, Yingdi\*, Hongli Dang, & Sanwu Wang**

## **COAL SWELLING AND SEQUESTRATION OF CARBON DIOXIDE: THEORY AND MECHANISM**

Global warming is attributed to the rise of carbon dioxide (CO<sub>2</sub>) concentration in the atmosphere. Sequestration of CO<sub>2</sub> into geological formations has been suggested for mitigating this phenomenon. Coalbeds are investigated as potential storage sites; especially, the cost of CO<sub>2</sub> sequestration can be offset by the enhanced coalbed methane (ECBM) recovery. While numerous experimental studies have investigated that coal swelling takes place after CO<sub>2</sub> injected into coal seams, the mechanism of coal swelling has not been well established. We report quantum mechanical calculations for the interaction between CO<sub>2</sub> and the coal network. The calculations show that CO<sub>2</sub> can be injected into coal and strong bonding between CO<sub>2</sub> and coal can be formed, suggesting that coal swelling is due to the formation of chemical bonds. The incorporated configurations can be formed with low activation energies at different bonding sites. Even lower activation energies are found for the dissociations of CO<sub>2</sub> from the corresponding configurations, suggesting that coal swelling can be considered as a reversible process.

**Longtine, Charles\* & Akhtar Ali**

## **PARTIAL SEQUENCES OF TWO NEW ISOLATES OF PAPAYA RINGSPOT VIRUS**

*Papaya ringspot virus* (PRSV; Family: *Potyviridae*; genus: *Potyvirus*) is a rod shaped virus that causes major disease cucurbits and papaya worldwide. PRSV contains a single positive single-stranded RNA genome that is about 10.3kb long. Its PRSV-P is a pathogen of Papaya (*Caricaceae*) and Cucurbits (*Cucurbitaceae*) and the PRSV-W biotype is a pathogen only of cucurbits and is prevalent in the continental US. Although a 2008-2010 survey found an incidence of 51% in cucurbits sampled from Oklahoma, no full genome sequences are available from PRSV-W from the continental US. Two isolates of PRSV-W from Oklahoma and Texas were collected during field surveys. Ten primer pairs were made from the published sequence of PRSV isolates in order to amplify the complete genomes of these new isolates by reverse transcription-polymerase chain reaction (RT-PCR). Partial genome sequences were obtained after cloning and transformation, and preliminary results show that both PRSV-W isolates cluster with homologous sequences from PRSV isolates from Hawaii and South America. Complete sequencing is in progress.

**Mahayni, Abdulah**

## **CHOLERA: UNDERSTANDING MULTI-SEROTYPE DISEASE DYNAMICS THROUGH MATHEMATICAL MODELING**

Cholera is a disease of the digestive tract that impacts millions of people worldwide, affecting areas in Africa, South Asia, and Latin America. Cholera is readily treatable and curable, but the disease is still a major problem in many parts of the world. Many serotypes (strains) of Cholera exist, but the most important two are serotype Inaba (I) and serotype Ogawa (O). Interestingly, medical evidence suggests that infection with either of those two serotypes can grant partial immunity towards the other, a phenomenon called cross-immunity. This study attempts to model the spread and persistence of Cholera in three countries in order to better capture the spread of the disease and to understand its dynamics. The model we use incorporates effects of cross immunity on a traditional model of disease spread to approximate the behavior of epidemics of cholera. This study uses annual data from the United Nations on cholera in three countries to find the parameters of the model which fits each country best. Once these parameters are found, we determine the stability of the disease in each country as well as the impact and effectiveness of different methods of combating the disease in each of these countries.

**Mahayni, Abdulah**

## **ROLE FOR THE TUMOR SUPPRESSOR PROTEIN P27KIP1 IN CANCER PROGRESSION**

The tumor suppressor protein p27kip1 is commonly deregulated in aggressive human cancers, but the reason remains unclear. Recent evidence from mouse fibroblasts lacking p27 protein (p27<sup>-/-</sup> cells) indicated these cells can utilize a nutrient other than glucose for metabolic activity. We hypothesized that cells lacking p27 can switch from glucose to amino acids (particularly glutamine) as an energy source. To test this idea, we compared the use of glutamine over time in p27<sup>+/+</sup> and p27<sup>-/-</sup> cells. Our results show that as the media is depleted of nutrients the p27<sup>-/-</sup> cells preferentially switch to glutamine. In contrast, p27<sup>+/+</sup> cells are not able to efficiently utilize this amino acid. We propose that p27 deregulation in cancer provides a significant growth advantage during the early stages of tumor development (before it becomes vascularized) by allowing cancer cells to metabolize readily available amino acids. Once the tumor establishes blood vessels and glucose is delivered to the tumor, p27 levels could be reestablished to utilize this readily available nutrient instead. These results have implications for developing more effective treatments for aggressive human cancers with deregulated p27kip1.

**Mahdavi , Marzieh\* and Siamack Shirazi**

## **EXPERIMENTAL INVESTIGATION OF EROSION IN HIGH CONCENTRATION SLURRIES**

High concentrated slurries can be found in many different industrial and environmental applications, such as hydro-transport systems of the oil sands industry, drilling and fracturing applications, and stirring vessels. When the volume fraction of particles is low; particles have little influence on the structure of the flow. Even when average concentration is relatively low, there can still be some regions of high concentration. In highly concentrated flows, the effect of particles on the dynamics of the flow cannot be neglected. Consequently, particle concentration can affect the turbulence intensity and even erosion ratio.

Previous studies mostly have examined dilute slurries and less attention has been paid to the effect of concentration of the particles on erosion. The main objective of this research is to investigate the effects of high concentration of solids on erosion rates. The approach of this work; is to search literature for data on erosion caused by high viscous slurries, then determine gaps in literature data, identify and introduce experimental setup to study erosive behavior. The erosion magnitudes and patterns of specimens under different experimental conditions are measured with scale and the 3D profilometer images as well. Then, Scanning Electron Microscope (SEM) is conducted to examine the eroded surface and examine any possible difference in erosion caused by high concentration slurries.

Utilizing the experimental results, it would lead to lower costs of erosion inspection and maintenance and also, the risk of component failure would be reduced by optimizing the models that are used to predict erosion.

**Mansouri, Amir\*, H. Arabnejad, and R. S. Mohan**

### **NUMERICAL INVESTIGATION OF DROPLET- DROPLET COALESCENCE AND DROPLET-INTERFACE COALESCENCE**

The oil produced from offshore reservoirs normally contains considerable amount of water. The separation of water from oil is very crucial in petroleum industry. Studying the coalescence of two droplets or one droplet and interface can lead to better understanding of oil-water separation process. In this study, the coalescence of two droplets and droplet-interface are simulated using a commercial Computational Fluid Dynamics (CFD) code FLUENT 14. In order to track the interface of two fluids, two approaches, Volume of Fluid (VOF) and Level-Set method were utilized. The results are compared with experimental measurements in literature and good agreement was observed. The effect of different parameters such as droplet velocities, interfacial tension, viscosity of the continuous phase and off-center collision on the coalescence time has been investigated. The results revealed that coalescence time decreases as the droplet velocities increase. Also, continuous phase with higher viscosities and lower water-oil interfacial tension, increase the coalescence time.

**Marasini, Daya\* and Mohamed K. Fakhr.**

### **MOLECULAR CHARACTERIZATION OF LARGE PLASMIDS IN *CAMPYLOBACTER* SPP. ISOLATED FROM VARIOUS RETAIL MEATS**

*Campylobacter* spp. is one of the most prevalent bacterial pathogens in retail meat particularly poultry and is emerging as a leading cause of diarrhea in humans. Very few studies have been published discussing the role of plasmids in *Campylobacter*. The literature is lacking, in particular, studies related to *Campylobacter* large plasmids due to difficulty in isolating them using available alkaline lysis methods. The objective of this study was to determine the prevalence of plasmids particularly large ones in *Campylobacter* spp. isolated from Oklahoma retail meats. Plasmids were isolated from 189 (96 *Campylobacter jejuni* and 93 *Campylobacter coli*) strains by alkaline lysis methods. Pulsed Field Gel Electrophoresis (PFGE) was also used to screen for larger size plasmids from these strains. Overall, out of 189 strains screened, 117 (62%) were found to harbor plasmids. Using the alkaline lysis method, most of the plasmids detected were smaller than 70 Kb in size but three of them were about 90 Kb. Using PFGE, 34 strains were found to harbor larger plasmids over 70 Kb in size of which 10 strains harbored plasmids larger than a 100 Kb. Plasmids were more prevalent in *Campylobacter coli* (73%) than in *Campylobacter jejuni* (50%). Most of the larger plasmids were more prevalent in *Campylobacter coli* strains. In conclusion, PFGE was able to detect larger plasmids up to 180 Kb in *Campylobacter* spp. which would have been otherwise missed if the alkaline lysis method was solely used.

**Marshall, Allen**

### **A DISTRIBUTED SOFTWARE SYSTEM FOR ADAPTIVE COORDINATION OF ISR ASSETS**

In this presentation, I will discuss a research and development project that I, along with other TU students and faculty, have worked on beginning in the summer of 2013. This project (which is being funded by the U.S. Air Force) has the goal of developing a distributed software system to coordinate groups of intelligence, surveillance, and reconnaissance (ISR) assets in highly dynamic environments. Additionally, it is hoped that our group's investigation of this coordination problem will yield new insights and information that will be applicable to a variety of dynamic problems.

Our planned approach to asset coordination has some novel aspects, and, as a result, there are multiple research questions to be investigated as part of this project. One of our planned research tasks is to collect and interpret empirical data on the performance of existing distributed coordination techniques in

environments with varying levels and types of dynamic activity. In order to collect the required data, we are developing a simulator that can model a dynamic world containing ISR assets (such as satellites and surveillance aircraft), tasks to be carried out by these assets, and policies that restrict the allowed behaviors of the assets. Since the creation of this simulator has been the main focus of my work so far, I will devote most of my discussion to the simulator and closely related issues. However, I will also briefly discuss the other research topics and work involved in the overall project.

**Martin, Blake**

### **THE RELATIONSHIP BETWEEN PARENT INVOLVEMENT, STUDENT ACADEMIC ACHIEVEMENT AND STUDENT MOTIVATION**

The purpose of this paper is to present a brief overview of the relationship between parent involvement, student academic achievement and student motivation in school as well as new research on the topics. This study is based on Coleman's (2009) study that examined the relationship between parental involvement and student motivation and student academic achievement among fifth graders, and Cheun and Pomerantz's (2012) study on parent-oriented motivation and its effect on academic achievement. The study examines whether or not parent involvement affects student academic success. The subjects are first through fifth grade students at Moore Elementary in Union Public School district in Tulsa, Oklahoma. Surveys with open-ended questions will be distributed to parents and students. It is hypothesized that parent involvement affects student motivation, student motivation affects student academic success, and parent involvement has a positive affect on student academic success. The results of this study will address gaps in previous research.

**Martin, Samuel**

### **BODY AND RANGE SIZE EVOLUTION IN NORTH AMERICAN MINNOWS**

Body size is one of the most important traits influencing an organism's ecology and is often a major axis of evolutionary change. Among freshwater fishes, body size may influence patterns of biogeography and macroevolution. Fishes with larger sizes are better dispersers, inhabit larger streams and rivers, and may have larger ranges. Conversely, smaller fishes can inhabit smaller streams, are generally poorer dispersers, and are thus more likely to become isolated among drainages. Since isolation can promote speciation through allopatric divergence, small fishes may have higher species diversity in a region. We tested for a relationship between body size and range size in a highly speciose endemic clade of North American minnows (Cyprinidae: Leuciscinae), which exhibit diverse body sizes. We developed a species level phylogeny based on 7 mitochondrial genes and 12 nuclear genes. We then used this phylogeny to reconstruct ancestral body and range sizes, compare rates of size and range evolution among clades, and determine whether range size is related to body size in North American minnows.

**Marzouk, Sam**

### **CORRELATES OF DRUG USE AMONG WOMEN DURING TREATMENT: A PROSPECTIVE STUDY**

Drug use following abstinence based treatment for substance abuse has long troubled substance abuse rehabilitation programs. A growing body of research has emerged studying factors related to drug use following treatment among women. However, there are currently no studies examining factors related to drug use *during* a treatment program among women. A thorough literature review showed three specific psychosocial factors that are related to drug use following treatment among women. These factors are trauma history and severity, interpersonal conflict, and symptoms of depression. The purpose of the present study is to examine whether these three factors will also be related to drug use in a sample of women *during* treatment. Analyses will be conducted on data that have been collected from 186 women within four weeks of enrolling in a trauma informed, prison diversion, substance abuse treatment program for women. Logistic regression analyses will be conducted to determine whether or not there is a significant relationship between trauma, interpersonal conflict, or depression with drug usage during the treatment program. It is

hypothesized that all three factors will significantly predict drug use during treatment. Results and implications will be discussed.

**McGarity, Connor**

#### **ANALYSIS OF COMMON POLYSACCHARIDES AS DRAG REDUCING AGENTS**

Polymers and polysaccharides have been used in industry to improve flow and reduce drag in piping systems for many years. However, there is very little known about how the structure of these polysaccharides affects the effectiveness of drag reduction. Over the last summer, we tested several common polysaccharides, including xanthan, guar, locust bean, tara, and fenugreek gums, in an attempt to find a relationship between drag reduction effectiveness and the structure of these polysaccharides. A correlation for the galactomannan series (guar, locust bean, tara, and fenugreek gum) was made, showing an increased effectiveness with lower ratios of mannose to galactose. Several other variables were tested, including reynolds number and concentration to see their effects on the overall amount of drag in a pipe flow system. A drag reduction of up to 28% was observed for the concentration variable with xanthan gum. In conclusion, the study of drag reduction using galactomannans and other polysaccharides has yielded insightful relations between the flow reynolds number, compound concentration, compound structure, and the overall effectiveness of the polysaccharides.

**McGuire, Heather**

#### **TESTING THE PALEOECOLOGICAL FIDELITY OF TIME AND SPACE AVERAGED MICROMAMMAL ASSEMBLAGES IN GLADYSVALE, SOUTH AFRICA**

Micromammal assemblages have been recognized for their utility in reconstructing paleoenvironments for research in paleoanthropology and geosciences. However, one of the main questions is how robust these reconstructions are in light of time and space averaging. Raptors deposit pellets resulting in large accumulations of micromammals. In order to test how time and space averaging affects paleoecological reconstructions, I will compare two temporally distinct collections from Gladysvale, South Africa; one dated to 800,000 years ago and one modern. Using quantitative measures, preliminary results indicate that the predator in both assemblages is *Tyto alba* (Barn Owl) so the assemblages are isotaphonomic. Further analysis will allow me to compare the relative abundance of micromammal species in the different assemblages and infer about the effect of time averaging on the fidelity of paleoecological analysis.

**McHenry, Teresa**

#### **COMPARATIVE COMPOSITION OF PHYTOTELMATA COMMUNITIES FROM BROMELIAD AND CALATHEA**

Tropical plants often trap rainwater in leaf axils or flower bracts. These pockets of water are called phytotelmata. They can support populations of aquatic dipteran larvae, annelids, and crustaceans. The phytotelmata of each species of plant according to size, growth patterns, and detritus matter are unique habitats. The environment within the bracts have differing nutrient content, water quality, and food availability among each plant species. I predict that the community of organisms supported in phytotelmata of different species of plant will be different. Samples of collected water were taken from two kinds of plants (bromeliads and calathea) at La Selva Biological Research Station. Bromeliads catch water in leaf axils while calathea collect small amounts of water in the bracts of their inflorescences. Organisms were identified to major groups and counted for comparison. The results were striking. While one category of organisms (annelid worms) was common to both types of phytotelmata, four categories were unique to calathea and six categories were unique to bromeliads. Factors affecting these differences may include volume, pH, duration and differences in detritus.

**Miller, Ashley\*, Michael Basso, Eduardo Estevis, Dennis Combs, Brad Roper, and Doug Whiteside**  
**DETECTION OF POOR EFFORT IN NEUROPSYCHOLOGICAL ASSESSMENT**

**Objective:** Much research concerns detection of poor effort in neuropsychological assessment. Embedded effort measures offer an advantage over freestanding tests of performance validity (PV), because they require no additional time or materials. One such measure is the Rarely Missed Index (RMI) from the Logical Memory Recognition subtest of the WMS-III. Initial validation revealed 97% sensitivity and 100% specificity in detecting simulated head-injury patients (Killgore & DellaPietra, 2000). The current study compared the effectiveness of the RMI to the Reliable Digit Span (RDS) from the WAIS, another embedded PV measure.

**Participants and Methods:** Participants included 121 depressed inpatients (73 females and 48 males; age:  $M=37.02$ ,  $SD=12.55$ ). They were administered WMS-III/IV Logical Memory and WAIS-IV Digit Span. Standard cutoffs for the Word Memory Test served as the criterion of PV. RMI operational characteristics were compared to those of the RDS.

**Results:** Consistent with Larrabee (2003), 90% specificity guided selection of optimal RMI and RDS cut scores. The ideal cut score for the RMI was 136, yielding a specificity of 92% and sensitivity of 20%. Optimal RDS cutoff was 6, and resulted in a specificity of 90% and 11% sensitivity.

**Conclusions:** These data revealed excellent specificity but substantially lower sensitivity than originally reported for the RMI. This is similar to what other validation studies have demonstrated (e.g., Bortnik et al., 2010), and likely reflects the use of an actual clinical sample. The RMI achieved comparable specificity but better sensitivity than the RDS, suggesting that the RMI is a conservative and effective measure of PV.

**Miller, Melissa**

**AN ATTRIBUTE APPROACH TO DIFFERENTIATING GEOFACTS FROM ARTIFACTS**

The need for a method to determine if a lithic flake is a product of human manufacture or a product of natural forces is an essential one in archaeology. Such a method would have applications to controversial Old World sites which claim deep time-depth for the first hominid tools as well as controversial New World sites which claim very early human occupation of the Americas. It would also be of use in cultural resource management work when questionable flake material is uncovered during surveying.

This project directly compared known geofacts with known artifacts sampled from Oklahoma and Jordan, providing wide spatial and temporal variability within the project. The comparisons occurred at the attribute level and were evaluated statistically in order to determine which attribute characteristics are statistically significantly different between the geofact and artifact assemblages.

The objectives of this project are to empirically and statistically determine which flake attributes are diagnostic of human manufacture, using a large sample size and a multitude of attributes, and further to determine if the presence of multiple diagnostic attributes makes a flake more likely to be of human manufacture.

**Miller, Nathan\* and Estelle Levetin**

**COMPARISON OF ENDOPHYTE AND EPIPHYTE COMMUNITIES IN CERCIS CANADENSIS**

Endophytes are nonpathogenic fungi that live within plant tissues whereas epiphytes are fungi that live on plant surfaces. Relatively little is known about these fungi and their communities. This study compares the epiphyte and endophyte communities on leaves in Eastern Redbud (*Cercis canadensis*). Leaves were collected from three Redbud trees, one at the Oliphant Hall courtyard, one from USA West, and one from Oxley Nature Center. Diverse sites were selected to compare fungi between sites with varied habitats. To collect epiphytes, leaf surfaces were swabbed with a sterile cotton swab, then the swab was vortexed in sterile distilled water and then plated on potato dextrose agar with streptomycin. Samples were taken from

both the bottom and top leaf surfaces. The leaves were then surface sterilized with a dilute bleach solution and then were cored with a cork borer and these leaf cores were placed on PDA with streptomycin plates. Fungi were then isolated and replated in pure cultures, where they were identified morphologically. Twenty seven endophytes and 44 epiphytes have been isolated. Of the endophytes, there were 11 *Alternaria* colonies and the others were nonsporulating fungi. In the epiphytes, there was much greater diversity, with *Alternaria*, *Cladosporium*, *Fusarium*, *Aspergillus*, *Drechslera*, and many nonsporulating fungi still to be identified. The increased diversity and number of organisms in the epiphytic communities was expected, since less specialization is needed to live on a leaf surface.

**Miller, Nathan**

#### **HELICONIA LATISPATHA PHYTOTELMATA AS MODELS FOR SUCCESSION**

*Heliconia* inflorescences have sequentially opening bracts that hold the reproductive organs. *Heliconia latispatha* inflorescences open upward, allowing these bracts to accumulate water which can be a habitat for numerous microorganisms. This study looked at the phytotelmata (the small bodies of water in the bracts) in each of the bracts to attempt to determine a successional pattern in the communities. The water of each bract was individually collected and all the microorganisms identified within each sample. The number of organisms, total organisms, and total organism types were counted for each phytotelm. Density of each of these values was also calculated. The bracts were not statistically different from one another with regards to any of these variables. However, the total counts of individual organisms, total organisms, and types of organisms all increased with time as the bract aged. While this study cannot support an exact model for succession in *H. latispatha*, there is a general trend for older phytotelmata to be more densely populated with a greater diversity of organisms.

**Mohanty, Rashmi Prava \*, Mark Buchheim, and Estelle Levetin**

#### **MOLECULAR TOOLS FOR THE ANALYSIS OF AIRBORNE *JUNIPERUS* POLLEN**

*Juniperus* is an economically important genus in the Cupressaceae family. Pollen from some *Juniperus* species are major contributors to hay-fever in North America. Four different *Juniperus* species are dominant in southern parts of North America. The most common method used for the detection and analysis of pollen is direct microscopic examination. However, pollen of the various *Juniperus* species cannot be distinguished morphologically. Furthermore, there are some periods of time at which different *Juniperus* species release their pollen simultaneously. During this time, it is therefore, impossible to distinguish the pollen at the species level. The aim of this investigation was to develop an alternative technique for the detection and identification of *Juniperus* airborne pollen at species level. The current focus of this investigation is the development of a method in which plastid DNA from pollen in air samples is extracted and then characterized. Extensive studies using transmission electron microscopy confirmed that plastids are present in *Juniperus* pollen and that chloroplast specific primers can be used for the amplification of pollen DNA. The efficiency of the DNA extraction was checked through the serial dilution where it was determined that the DNA from 2-3 pollen grains could be successfully amplified. Species-specific primers for *Juniperus* are currently being developed for use in qPCR protocols.

**Moorman, Rebekah**

#### **HALIDE INHIBITION IN THE COPPERCATALYZED AZIDE ALKYNE CYCLOADDITION**

The copper-catalyzed azide-alkyne cycloaddition is a widely used reaction in organic synthesis, medicinal chemistry, material science, and biological chemistry. In a recent investigation of this reaction, we discovered that halide ions can, in certain cases, dramatically reduce the rate of this reaction. Since many applications of the copper-catalyzed azide-alkyne cycloaddition are run in a buffered media containing halides, an understanding of this phenomenon is important. We have also found conditions under which we can rescue the reactivity of the copper catalyst in the presence of halides. Specifically, we have used silver(I) salts to sequester the halides that are detrimental to the reaction, allowing the desired triazole to form. Since this azide-alkyne reaction is so widely used in synthesis, we have also developed a complementary inquiry-

based teaching lab that features the key reaction under investigation in this research. This laboratory has since been piloted and incorporated into The University of Tulsa Organic Chemistry lab curriculum. Therefore, this research is not only important for a fundamental understanding of one of the most widely used chemical reactions; it also contributes to general chemical education at the collegiate level.

**Moorman, Rebekah**

#### **TESTING THE MEMORY OF MALE *NYSSODESMUS PYTHON***

*Nyssodesmus python*, a large forest dwelling millipede, is found in large quantities at the La Selva Biological Station in Costa Rica. These millipedes exhibit mate guarding behavior as seen by the male riding atop the female post-copulation to protect the sperm he has deposited until the female uses it to fertilize her eggs. In past years, students recorded data suggesting the male *N. python* can remember his mate for approximately 5 minutes after separation. My intention ~~for my research~~ was to confirm the memory of the male millipede and then ~~proceed to do more tests~~ to determine if the memory was dependent on a chemical form of communication (i.e. pheromones). During the first part of my research I used an olfactometer to measure and record the choice of the male millipede between his mated female and a newly introduced female. During these trials, I found no evidence that the male can correctly identify the female he was riding. My data suggest that male millipedes either 1) had no 'memory' of their mated females or 2) that they do not recognize their mate by an airborne chemical cue.

**Mraz, Veronica**

#### **ACROSS THE LANDSCAPE: AN EXAMINATION OF ENVIRONMENTAL AND CULTURAL CHANGES THROUGH ANALYSIS OF LATE PREHISTORIC LITHIC ASSEMBLAGES FROM NORTH-CENTRAL OKLAHOMA**

The area of north-central Oklahoma is an under studied part of the Southern Plains, especially during the Plains Woodland and Plains Village periods. A model proposed for the mobility and settlement practices of the prehistoric groups of there was evaluated through analyses of lithic assemblages from four sites. The sites were selected from adjacent, but contrastive biomes thought to have been occupied by groups that followed a seasonal round in which grassland and woodland resources were exploited through an embedded procurement strategy during the peaks in resource availability. These included the Daniels Site and Von Elm site from the Bluestem Prairie and Big Hawk Shelter and Copperhead Cave from the Cross Timbers. The lithic analysis focused primarily on the identification of chert varieties and locations, the amount of cortex present, and the size/weight of lithic elements. These attributes were presented as proxies in evaluating the mobility and procurement practices of people in the study area. The results from the analysis suggest that Late Prehistoric groups in north-central Oklahoma were living in temporary, seasonal sites relying on an imbedded rather than logistical procurement strategy. This was a time-transgressive pattern present during both Plains Woodland and Plains Village periods.

**Myers, Jessie\* and Mark Buchheim**

#### **UTILIZING ALGAE-BACTERIA CONSORTIA FOR WASTEWATER BIOREMEDIATION**

Wastewater is a serious problem for many entities including industries, farms, and municipalities. Inadequate handling of wastewater leads to pollution of ground water, lakes, and rivers. Global scale ecological problems, i.e. the dead zone in the Gulf of Mexico, represent an extreme consequence from wastewater mishandling. Traditional physicochemical methods are costly and may cause further environmental issues but bioremediation may be utilized at less expense and, generally, causes fewer environmental problems. Algae-bacteria consortia are promising resources for bioremediation of many wastewater sources. Unfortunately, little is known about these consortia. As part of a larger project to

identify which organismal combinations work best to remediate wastewater, microbes have been isolated from a working consortium that can effectively treat agricultural and municipal wastewater. In addition, algal and bacterial isolations from other natural sites have been undertaken. . Combined techniques of microscopy and phylogenetic analysis (using ribosomal genes) indicate that the algal collection includes isolates of *Desmodesmus*, *Mychonastes*, and *Stigeoclonium*. Molecular characterizations indicate that the bacterial isolates include *Stenotrophomonas maltophilia*, *Roseateles depolymerans*, and *Novosphingobium spp.* Once algal and bacterial species have been isolated and characterized, individual species will be tested using synthetic sewage assays, toluene screening, and sodium benzoate degradation assays to identify which consortia work best to remediate wastewater. In addition to helping solve practical issues of wastewater treatment, these observations will provide new insights into areas of microbial ecology that have been largely unexplored.

**Neil, Austin**

### ***NAEGLERIA FOWLERI* IN OKLAHOMA FRESHWATER**

*Naegleria fowleri* is a free-living, thermophilic amoeba found in warm bodies of fresh water such as rivers, lakes, and ponds. Known as the brain-eating amoeba, *N. fowleri* attacks the nervous system and brain causing a disease called primary amoebic meningoencephalitis (PAM). Although infection is rare, it most often ends in the death of the host. In the last 13 years there have been six reported deaths caused by the amoeba in Oklahoma, the most recent being in the summer of 2012. Bodies of fresh water in Oklahoma are particularly susceptible to the amoeba due to its warm summer climate. Our purpose was to test for the presence of *N. fowleri* as well as two other amoebas, *Balamuthia mandrillaris* and *Acanthamoeba spp.* in Lake Keystone, Oklahoma. Throughout the fall of 2013, 31 water samples were collected at Keystone Lake State Park. DNA was isolated from each sample, PCR was conducted, and gel electrophoresis was run to determine if the DNA of these amoebas were present. The results showed that DNA for these three amoebas was not present in the water samples. However, testing conducted in the summer of 2013 confirmed the presence of DNA for these amoebas. It is possible that these amoebas cannot survive the colder water temperatures of the fall, or they are certainly not abundant enough to cause infection. Ongoing experimentation is being pursued with water samples being tested for amoeba presence during each month of the spring.

**Odewale, Alicia**

### **THE AFRICAN SLAVE TRADE AMONG SOUTHEASTERN CREEK INDIANS**

From the period of initial European contact through the post removal era, the Southeastern Creek Indians like many other tribes experienced drastic changes in their way of life. Previous theories attribute these changes primarily to the tribe's growing dependence on European goods and treat English, African, and Native American history as separate entities. This paper argues that the introduction of African slaves into Creek society was the primary force driving these drastic changes in Creek life both pre and post removal. The adoption of colonial plantation slavery warped the already existing Creek concept of slavery into a racially based institution, in which capturing slaves was not the result of warring with enemies but now stood to be a means of displaying individual wealth and superiority. The events leading up to the Red Stick War, Civil War, and especially Creek removal caused an enduring rift within the tribe as a group of elite mixed blood Creeks fought to keep the slaves, land, and wealth they had accumulated, going against the egalitarian and wealth averse practices that the majority of Creek Indians had practiced for hundreds of years. However, there was a strong sense of continuity within the tribe as well, as the basic elements of Muskogee life persisted in spite of the alien impact of African slavery and European culture.

**Olson, Luke\* and Joshua Corngold**

### **PROMOTING PERSONAL AUTONOMY: REEXAMINING THE CREATIONISM/ EVOLUTION DEBATE**

In this paper, I examine the thorny question of whether educating students for personal autonomy justifies including religious accounts of human origins in the school curriculum. Many influential educational theorists believe that personal autonomy is an important aim for education, especially insofar as it plays a vital role in the individual's pursuit of a flourishing life. According to this line of thought, teaching students the knowledge, skills and dispositions associated with autonomy--including an awareness of diverse points of view, as well as an ability and inclination to think critically about alternative beliefs and perspectives--will provide them with the best opportunity to lead a flourishing life. Educators, then, must provide students with opportunities to think through complex issues and to evaluate arguments with some degree of independence. Arguably, one key area in which such an opportunity may present itself is in thinking about human origins. I argue that if we strive to make personal autonomy one of the central aims in education we should not exclude religious accounts of human origins in the curriculum. If the aim is to achieve autonomy by exposing children to alternatives, the question then becomes where do alternatives to the theory of evolution appropriately fit in the curriculum? I argue religious accounts of human origins belong not in natural science courses, but in courses such as comparative religion, multicultural education, or a social studies course as a different way of viewing the world, and the origin of life.

**On, Camay**

### **RESEARCH STUDY OF *NAEGLERIA FOWLERI* FROM SALT CREEK AT LAKE KEYSTONE**

For the Tulsa Undergraduate Research Challenge (TURC), my research group and I studied the amoeba known as *Naegleria fowleri*. Often referred to as the "brain – eating" amoeba, there has been 31 confirmed cases of the infection in the United States between the years 2003 and 2012, including in the state of Oklahoma. The amoeba is the causative agent for the infection known as PAM, primary amebic meningoencephalitis. If infected, the amoeba enters the body through the nose and travels to a person's brain where it destroys brain tissue and causes swelling, which ultimately leads to death. As a result, my research group and I decided it was worth studying and conducting a survey of near by lakes to test for contamination.

One of the water sample sights that we collected from was Salt Creek from Lake Keystone. DNA was extracted from each sample and amplified using polymerase chain reaction and specific primers to observe whether or not *N. fowleri* was present along with *Balamuthia mandrillaris* and *Acanthamoeba sp.* Of the 21 samples collected from this location, the final results indicated 15 samples were positive for *N. fowleri* DNA, 11 samples for *Balamuthia mandrillaris*, and 21 samples for *Acanthamoeba sp.* Further research can still be done on the project to observe whether or not concentration of amoeba species differs throughout the year, such as a comparison of samples collected towards the beginning of the summer in June vs. samples collected in the hotter month of July.

**Parker, Kelsey N.\* and Jennifer Ragsdale**

### **EXAMINING THE INFLUENCES OF DISTRESS AND EUSTRESS ON TIREDNESS DURING THE WORKDAY**

Sleep deprivation has been estimated to cost companies in the United States \$63.2 billion each year (Kessler et al., 2011). Tiredness and fatigue at work have also been found to be related to increases in errors and accidents (Suzuki, Ohida, Kaneita, Yokoyama, & Uchiyama, 2005) and decreases in innovative thinking and attention management (Barnes, 2011). Given the consequences of tired employees, an increasing number of companies have started offering resources, such as workshops, to help employees improve the quality and quantity of their sleep (Weber, 2013). However, it is possible that there is more to workplace tiredness than just poor sleep. The current study examined workplace factors that may play a role in employee tiredness during the workday. Using data from the 2010 American Time Use Study (ATUS), a large-scale national study, we examined whether the relationship between tiredness upon waking (an indicator of poor sleep quantity or quality) and tiredness at work is related to feelings of happiness, meaningfulness, pain and stress while at work. It was expected that, in general, people would increase in tiredness throughout the day. However, indicators of eustress (i.e., happiness and meaningfulness) were expected to decrease the strength of this relationship while indicators of distress (i.e., pain and stress) were

expected to lead to a steeper increase in tiredness while at work. Using a sample of 1391 working adults, these hypotheses were partially supported. Indicators of eustress were not found to influence tiredness, but both pain and stress did moderate this relationship.

**Parsi, Mazdak\* and Brenton McLaury**

#### **CHARACTERIZING SLUG/CHURN MULTI-PHASE FLOW**

A wire mesh sensor (WMS) is an intrusive device used to investigate multi-phase flows. The WMS measures the instantaneous local electrical conductivity of multiphase flows at different measuring points. There is a significant difference in the electrical conductivity of the employed fluids (in this work air and water, conductivity of water is much higher than that of air). Using the difference in the electrical conductivity, the WMS provides the local void fraction. The WMS utilized in this work includes two identical planes of parallel 16×16 grid of wires. The separation distance between these two planes is 32 mm. The WMS was installed in a 76.2 mm (3-inch) diameter vertical pipe to extract information such as void fraction distribution, structure velocity, and slug/churn flow structure. The superficial gas (air) velocity (VSG) ranged from 10 to 38.4 m/s. Liquid (water) superficial velocities (VSL) of 0.30, 0.46, 0.61 and 0.76 m/s were employed. To study the effects of viscosity on the slug/churn flow structure, Carboxyl Methyl Cellulose (CMC) was added to water to increase the liquid viscosity without altering its density. Each experiment was performed for 60 seconds. An operation frequency for the WMS of 10 kHz (totally 600,000 frames per experiment) was used for all experiments.

**Pegg, Caitlin E.\*, Justin Chalker and Ruya Ozer**

#### **FACILE PREPARATION OF AMMONIUM ALGINATE-DERIVED NANOFIBERS CARRYING THERAPEUTIC PAYLOADS**

Alginic acid can be converted into a variety of ammonium alginate derivatives that carry medically relevant cargo such as analgesics, antibiotics, and enzymes. These modified polymers can then be fashioned into nanofibers by electrostatic spinning. These fibrous mats were shown to carry functional therapeutics through a variety of biological assays. Since these materials dissolve slowly in water and release the cargo through ion-exchange, we envision their application as next-generation, biodegradable wound dressings. In addition to our interest in the biomedical applications of these fibrous materials, we discuss ammonium alginates as general precursors to functional nanofibers. The straightforward preparation is key: the cargo need only contain a basic functional group such as an amine for ligation to alginate through an ionic linkage, neither coupling reagents nor purification are required, and cargo can be used in its native state.

**Pegg, Caitlin E.\* and Mark A. Buchheim**

#### **THE GREEN ALGAE: AN INVESTIGATION OF PHYLOGENY INFERRED FROM RIBOSOMAL RNA GENE SEQUENCE AND STRUCTURAL DATA**

*Ettlia* is a green algal genus comprised of several economically important species that have contributed to a taxonomic nightmare—the recognition that coccoid green algae are polyphyletic—that is only slowly being resolved with the aid of molecular evidence. The most recent investigation using 18S rRNA data demonstrated an extraordinarily close alliance between *H. pluvialis*, a flagellated organism, and the coccoid alga, *Ettlia carotinoso*. The putative evolutionary relationship between the green algal species *H. pluvialis* and *E. carotinoso* has, once again, placed coccoid algae at the center of systematic debate. The only apparent similarity between these two species is the ability to produce astaxanthin, a strong anti-oxidant with economic value. Because of the controversial nature of the 18S rRNA results, additional data from the ITS2 rRNA gene was collected. Results from analyses of these data corroborate a close alliance between *E. carotinoso* and *H. pluvialis*. In addition to the ITS2 data, the 18S rRNA data set was expanded using new, published data from other species of *Ettlia*. Phylogenetic analyses of this updated matrix revealed the existence of at least four distinct *Ettlia* lineages. These observations indicate that (1) additional taxonomic

revision of the genus *Ettlia* is needed and (2) the extraordinarily close alliance between *E. carotinos* and *H. pluvialis* offers an ideal system to use next-generation DNA sequencing to study patterns of gene expression. Comparing data from the transcriptome of these organisms has tremendous potential to answer fundamental questions about eukaryotic cell function and evolution.

**Pegg, Caitlin E.**

### **THE PROTECTIVE EFFECT OF FALSE-EYESPOTS IN LEPIDOPTERAN CATERPILLAR MODELS**

Anti-predatory adaptations serve as an excellent model for connecting the properties of biological behavior to organismal ecology. Research linking defensive strategies to organismal fitness will serve to further investigations in the contribution of a species within an individual niche to the overall preservation of the respective ecosystem. Hence, many studies have been directed toward explaining the role of protective adaptations found in a wide array of organisms. Particularly, insect defense mechanisms are a prevailing area of focus in current research. The caterpillars of many lepidopteran species possess distinct, faux eyespots. In lepidopterans, the role of eyespots as defensive devices has been tested experimentally. Recent studies allude to an intimate connection between these eye mimics displayed by caterpillars and the true eyes of a vertebrate counterpart. These false eyespots are thought to deter predator attacks by way of evolutionary mimicry. With this notion in mind, a simple method for creating artificial caterpillar models was implemented in a field study at La Selva Biological Station located in the tropical rainforests of Costa Rica. These models were used to evaluate the protective value of false eyespots. To test this functional hypothesis and unravel the defensive significance of eyespots, the models were designed to assess whether the presence of eyespots, color, or assuming an upright, defensive stance convey protection. A strong correlation between false eyespots and defensive posture was observed with models sustaining a significantly reduced number of attacks when compared to models lacking these features. Additionally, this study demonstrates that specific coloring also offers a clear protective advantage in the caterpillar models.

**Perera, Gamage A.N.\* and Jeremy Daily**

### **ANALYZING THE EFFECTS OF ROTATION ON AUTOMOBILE POST COLLISION TRAJECTORIES**

In a traffic crash, a spin is defined as a simultaneous translation and rotation in a horizontal plane where the orientation of the vehicle changes with respect to the path of travel. Post impact spin in a traffic crash is induced from impulsive collision forces localized on the body such that the force has an offset from the center of mass. If there is considerable amount of post impact spin in the vehicles, the deceleration due to spin should be taken into account for determining the separation speeds of the vehicles. But the methods used presently are very cumbersome and lengthy. So to test and validate alternative methods to analyze post impact trajectories is really essential.

For this, the post impact trajectories of the vehicles were virtually simulated using modified codes from SMAC algorithms. After the simulation run, using output data regression equations for each type of test run were obtained. Next using the appropriate regression equations, separation speed can be calculated. To validate the above computer-algorithm, data from previous crashes were used to calculate drag factor to friction ratio and rotation to distance ratio and used to calculate the separation speed of the vehicles.

A regression analysis is done on each scenario to compare the actual separation speed and the calculated speed from the regression equations. According to this analysis the post impact speeds from the computer algorithm can be  $\pm 2.8$  mph from the test values.

**Perry, Rachel\*, Amanda Barbosa, Rachel Giebel, Lexis Learmonth, Evelyn Gutierrez, Abigail Palmer, William Potter and John Caruso**

### **THE EFFECT OF PALM COOLING ON CARDIOVASCULAR INDICES**

Systolic blood pressures (SBP) denote the peak force exerted against vessel walls as the heart contracts. The mean arterial pressure (MAP) is the average force achieved throughout the cardiac cycle. To examine palm cooling's impact on SBP and MAP values derived from resistive exercise workouts, 16 (eight men, eight women) healthy subjects gave informed consent. They performed three workouts in a randomized sequence. All workouts began with baseline (resting) SBP and MAP measurements, and then by a ten-minute low-intensity (75-90 watt) stationary bicycle ride followed by a four-set eight-repetition seated leg press workout. One workout involved no palm cooling; a second entailed palm cooling between sets. Finally the third included palm cooling between sets and for 20 minutes post-exercise. A water bath (15° C) was placed beside our leg press device for the palm cooling workouts. SBP and MAP values were derived from an automated blood pressure cuff; they were obtained at baseline, after the bike ride and at 0-, 5-, 10-, 15- and 20-minutes post-exercise. SBP and MAP were each analyzed with a 3 (workout) x 7 (time) ANOVA with repeated measures per independent variable. With an  $\alpha = 0.05$ , SBP and MAP each yielded significant main effects for workout (palm cooling between sets & post-exercise > palm cooling between sets only, no palm cooling) and time (0-minutes post > 5-minutes post, post bike ride, > 10-minutes post, 15-minutes post, 20-minutes post, baseline). Yet there was no workout by time interaction. The workout with palm cooling between sets and post-exercise may have caused greater vasoconstriction that led to higher SBP and MAP values.

**Peterson, Heather**

#### **A TECHNIQUE FOR DETERMINING THIN-FILM ADHESION STRENGTH**

Thin films are used in a range of electronic and optical devices. The interfacial adhesion strength of the thin films determines the conditions under which these devices can reliably be used. Quantifying the adhesion strength, however, can be challenging. Because of the small size scale of these films, traditional methods of determining adhesion strength, such as the scratch, peel, pull, blister, and indentation tests, provide only qualitative and comparative measurements of the adhesion strength. The laser spallation technique uses short laser pulses to generate a compressive stress wave towards the test film. This stress wave is then reflected off the film surface, generating a tensile stress pulse which leads to spallation of the test film. A laser interferometer is used to measure the free surface displacement and velocity. These measurements are used to find a quantitative value for the thin film interface stress.

**Phillips, John**

#### **PHYLOGEOGRAPHY AND CONSERVATION GENETICS OF CAVE-DWELLING (TROGLOBITIC) SALAMANDERS**

The biology of many cave-dwelling organisms (troglobites) is poorly known due to their cryptic lifestyles and habitat inaccessibility. Some widespread troglobites whose molecular phylogenies have been examined display geographic genetic structure due to low dispersal rates and their highly fragmented habitat. However, an insufficient amount of phylogeographic studies of troglobites exist. This is particularly important given the potential for unrecognized cryptic species within troglobitic taxa, which are commonly imperiled by anthropogenic hazards such as land development, water pollution, and climate change. The Grotto Salamander (*Eurycea spelaea*) is endemic to the Ozark Plateau and its adults are confined to life in caves. There is only one currently recognized species of Grotto Salamander, but recent work has revealed high levels of genetic diversity, indicating the presence of cryptic lineages. In this study, we further investigate the fine scale genetic diversity and geographic structure within *E. spelaea*. Mitochondrial DNA shows evidence of three highly divergent lineages across the Ozarks. We will compare patterns of mitochondrial divergence and test if these patterns are correlated with geologic and hydrologic features of the Ozark Plateau. I also compare the phylogeographic structure in *E. spelaea* with structure in other troglobitic salamanders, such as the Georgia Blind Salamander (*E. wallacei*), which I have also examined phylogeographically, to better understand the pressures that have directed evolution of cave-dwelling vertebrates.

**Pirtle, Jenna**

**"'ARCHAEOLOGY IS ANTHROPOLOGY OR IT'S NOTHING': CREATING A MORE HUMAN EXPERIENCE AT THE MUSEUM"**

Museums and private collectors throughout the world have been collecting antiques for centuries. The antiques market is highly lucrative and, unfortunately, encourages looting of archaeological sites and the creation of counterfeit pieces. Modern laws and standards have insured that museums have ceased the accession of such items but many of the old collections have unknown provenience and dubious artifacts. The region of West Mexico is infamous for its rampant looting and fakery market. For the past century, the unique funerary figures from their shaft tombs have mostly been collected and viewed as art due to their seemingly unknowable past. Recent research has developed a method of authentication. This presentation reviews the importance of connecting our museum objects to their creators and bringing the past to life through archaeological research. It reviews a trial sample of critical and statistical analysis of the genuine shaft tomb figures from the Gilcrease Museum. This research is innovative and intriguing because for the first time it allows researchers to learn about the little-known culture of the people of ancient West Mexico, effectively reviving once more a culture that had been written off by history. Hopefully, this trial will illuminate anthropological trends in the society and provide more personal information to the museum visitor when the artifacts are displayed in a whole new light.

**Pook, Sarah**

**A SURVEY OF THE PATHOGENIC AMOEBIA POPULATION OF TAYLOR FERRY**

A lake-dwelling species of amoeba called *Naegleria fowleri* (*N. fowleri*) causes Primary Amebic Meningoencephalitis (PAM). When inhaled through the nose, *N. fowleri* causes severe neural damage, extensive inflammation of the brain, necrosis, and hemorrhaging. Contraction of PAM typically results in death within a week of infection; PAM's mortality rate is 96%. Last summer, Marsha Howard's lab worked on developing a more efficient method for using Polymerase Chain Reactions (PCR) to test for the presence of this deadly microbe as well as two other pathogenic amoeba in the Taylor Ferry swim area on Fort Gibson lake.

Samples were collected from Taylor Ferry on three separate occasions. Then, the microbes were isolate via centrifugation. The cells of the amoeba were lysed, or split, using heat, detergent, and force. From this solution, purified DNA was extracted using a spin filtration method. Next, a small portion of the DNA was amplified for 35cycles. The portion of the amoeba DNA that will be replicated is unique to one of the three species of amoeba—*N. fowleri*, *Acanthamoeba* sp. and *Balmuthia mandrillaris*. The DNA was electrophoresed on an agarose gel to indicate the presence of the amoeba. Amazingly, 16 out of 22 samples contained at least one of the three species of pathogenic amoeba. Our results indicated that 16 of the samples contained *N. fowleri*, only one sample contained *Balmuthia mandrillaris*, and 12 samples contained *Acanthamoeba* sp. These high amoeba counts exceed our hypothesis.

**Potts, Jolee**

**THE EFFECT OF FLORAL SYMMETRY ON POLLINATION OF BIDENS ARISTOSA**

Biological symmetry has shown to be a manifestation of an organism's level of developmental stability. The purpose of this study was to examine the relationship between pollination and a flower's symmetry (or lack thereof) through manipulations of *Bidens aristosa* flowers. Matched pairs of symmetric flowers were monitored for thirty minutes, and all pollinators that visited each flower were recorded. Then, one flower from each pair was manipulated in one of the following ways: petal shortening or petal removal, both of which yielded an asymmetric flower; or notches in each petal, which resulted in a symmetric but obviously different flower. The other flower in each pair was left unaltered as a control, and all pollinators were recorded for another thirty minutes. Through multiple T-tests, it was found that flowers that had been treated

with both asymmetrical manipulations were visited by significantly less pollinators than the control flowers. However, flowers that received the symmetrical manipulation showed no difference in pollinators from the controls. The results of the experiment suggest that pollinators have a preference for symmetrical flowers, and that radially symmetric flowers are more efficient at attracting pollinators than their asymmetric counterparts.

**Poyner, Mark\* and Dale Teeters**

### **NANOSTRUCTURED THIN FILM $\text{LiCoO}_2$ CATHODES FOR Li ION BATTERIES**

Li ion batteries are used as the preferred rechargeable power source for numerous applications. The need for smaller, lighter and higher capacity Li ion batteries is driven by the continued advances and demands of more complex technologies. Using techniques that increase an electrode material's surface area should result in more electrode-electrolyte contact, Li ion intercalation and ultimately higher capacities. Utilizing nanotechnology to improve Li ion battery performance has gained considerable interest as battery applications continue to grow. These unique properties exhibited by nanomaterials appear dependent on the amount of surface area exposed. Nanoporous anodized aluminum oxide (AAO) membranes with 200 nm diameter pores; provide a template to make a nanostructured  $\text{LiCoO}_2$  cathode material. The  $\text{LiCoO}_2$  was deposited on the AAO template using an RF magnetron sputter coater. This nanofabrication technique deposits the active cathode material while maintaining the nanoporous nature of the AAO template. These nanoporous  $\text{LiCoO}_2$  cathodes exhibit six times the surface area of traditional thin film cathodes, making for increased electrode-electrolyte contact. The crystal structure of these nanostructured cathodes was characterized using X-ray diffraction and surface structure was investigated by scanning electron microscopy. SEM was used to investigate the structural changes upon lithium deintercalation and intercalation.

**Proctor, J. Christopher**

### **ANALYZING DISPARATE ECONOMIC OUTCOMES IN POLAND AND UKRAINE IN THE POST-SOVIET ERA**

In 1990 the difference between the GDP per capita of Poland and Ukraine (in adjusted current US Dollars) was negligible: with Poland at \$1,694 and Ukraine at \$1,570. Today, Poland's GDP per capita stands at \$12,708, while Ukraine's lingers at \$3,867. While the skyline of Warsaw is now littered with gleaming modern skyscrapers, the streets of Kiev have become a battlefield, displaying to the world the political and economic woes Ukraine has faced since independence.

I want to better understand the divergence in these two countries' recent history. To do so I will compare and contrast the political and economic histories of Poland and Ukraine since 1991. The main, overarching question I am hoping to answer is what went wrong in Ukraine, and conversely what went right in Poland. By the end of this study I hope to better understand the history of the two countries' transitions and be able to highlight what factors, political, economic or otherwise that contributed to the disparate outcomes. It is important to have an answer for the question of what went wrong in Ukraine (and what went right in Poland) not just for the future of the two countries involved, but for future countries wishing to create well-developed market based societies.

**Proctor, J. Christopher**

### **DIGITIZING COLLEGIAN ARCHIVES**

Late in the Fall of 2012 I approached Dean Alexander at McFarlin Library with the idea of making archived issues of the Collegian available online in a digital form. He liked the idea, President Upham was willing to fund it and we now have a nearly complete online archive dating back to 1900.

While the archive is not yet public, (we hope to have the website ready to share publicly by the end of the year) we at the Collegian have had access to it since the start of the 2013-14 school year. In our short time with the archive we have already found some fairly incredible things including TU's first (basement-sized)

computer, an exclusive student interview with the Grand Dragon of the Ku Klux Klan and the world's highest piano drop on Harwell Field as a part of the second annual Springfest.

My involvement in the actual digitization was minimal (I was abroad when Dean Alexander and Marc Carlson send the materials away to be digitized), but I have since worked extensively with the archives as Editor-in-Chief of the Collegian and am excited about the opportunity to share what we are doing at the community service symposium.

While this project may not look like a traditional community service activity, I believe the Collegian's online archives are an incredible resource for the TU community and this presentation is a good opportunity let people know about the incredible wealth of TU history we now have available.

**Proctor, J. Christopher**  
**INEQUALITY IN POST-TRANSITION POLAND**

The roughly quarter of a century since the collapse of communism has seen a wide array of outcomes. While the world's eyes turn to Kiev and the mounting problems facing Ukraine, countries like Poland, the Czech Republic, Slovakia, Hungary and the Baltic countries have stable democracies and comparatively productive economies.

Poland in particular has been singled out as a model of reform. The Poles moved quickly towards the market economy after independence, and have been very successful in maintaining high growth rates since transition. In spring of 2013 I studied abroad in Warsaw and saw with my own eyes the remarkable transformation the country has undergone.

The 'Polish miracle' however has not been without its problems as one of the most pronounced drawbacks to Polish transition has been the country's explosion in inequality.

In 1990, Poland was one of the most equal societies in the world, with decades of communism keeping nominal reported incomes fairly equal (although also fairly low). With transition to a market economy an burst of inequality was expected. However, the Polish burst in inequality turned into an explosion, and the country is now among the most unequal in the developed world.

While in Poland I studied this change in inequality from a political-economic framework, focusing on the problems of high long-term unemployment, the development of the Polish upper-middle class and the exacerbation of centuries old urban rural divides. It is this research (along with some of my personal observations) I will share at the Colloquium.

**Provencher, Jessica**  
**THE BRETON PEASANT: THE FEMALE PEASANT AS A SYMBOL OF FRANCE**

Jules Adolphe Aimé Louis Breton (1827–1906) is best known for his paintings of female peasants, especially those from Brittany. The *Flax Spinner* or *Brittany Girl* (1872), at the Philbrook Museum of Art in Tulsa, Oklahoma, in many ways epitomizes his oeuvre: academic paintings of the noble, sentimentalized female peasant. The majority of art historians have noted the dignified and idealized way he has rendered his female peasants, but few acknowledge or even examine his peasants as representing significant historic or allegorical figures. In this paper, I argue that the *Flax Spinner* recalls imagery of Saint Geneviève, the patron saint of Paris, a timely allusion given the social and political conflicts in the 1870s. Analysis of similar representations of female peasants by other artists reveals an increase in imagery of flax spinning women in the late 19<sup>th</sup>-century. This imagery, I contend, assumes a nationalist charge in a besieged and war-wearied France and joins the ranks of other female symbols of the country, such as Jeanne d'Arc and Liberty. Thus far from timeless, Naturalist representations of a disappearing lifeway, as they have been

construed, Breton's peasant pictures perhaps tell us more about French economic and political fortunes in the 1870s, and the representation of women in constructing an image of the country to its public.

**Puhl, Maria**

### **DIFFERENTIATING AUTISM SPECTRUM DISORDER AND NEURO-TYPICAL SUBJECTS USING $L_1$ REGULARIZED LOGISTIC REGRESSION ANALYSIS OF RESTING-STATE FUNCTIONAL CONNECTIVITY DATA**

Autism spectrum disorders are characterized by social and communicative impairments. We seek to differentiate between autistic and neuro-typical cases by using the resting state functional connectivity correlation structure of seed regions over the social regions brain. This paper applies the logistic LASSO (Least Absolute Shrinkage and Selection Model) method to approximately 4000 pair-wise correlations between 91 seed regions in the brain. The LASSO method is a shrinkage method that will reduce the number of predictors in an over-determined model by shrinking the coefficients of some predictor variables to 0, by utilizing an  $L_1$  norm penalty term. Results will also be examined from a neurological standpoint, determining whether or not the output from the LASSO method is consistent with results found in other methods.

**Rajagopal, Nisha**

### **SYNTHESIS OF ENAMINONES USING COPPER CATALYSTS**

Enaminones function in organic synthesis as synthetic intermediates and are utilized in the development of pharmaceuticals. These compounds have recently come under study due to their ameliorative potential. Although several methods have been developed for the manufacture of enaminones, more efficient methods to manufacture these compounds are being sought after. The goal upon completion of the current project is to have found a mild method for synthesizing enaminones. The synthesis of three enaminones using a thioamide and diazo compound will be described.

Catalyst Screened:  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  in dichloromethane at  $50^\circ\text{C}$

Other copper catalysts are also screened within our group. The use of the most suitable catalyst for the formation of different enaminones will also be described.

**Rake, Nathanael\* and Lindsay Flasch**

### **INVESTIGATION OF AUTONOMOUS BIPEDAL ROBOT DESIGN**

This report details the research done by a small team from the University of Tulsa as a beginning step to constructing a low-cost autonomous bipedal robot with a heel-to-toe walking style. Information obtained by the team through investigation of similar projects is used to outline desirable physical specifications for bipedal robots. Optical and sonar based sensing are discussed with respect to object recognition and depth perception. The benefits and drawbacks of various platforms and programming schemes are also examined. The report concludes with a tentative physical design and loose overview of programming architecture.

**Rankin, Justin**

### **OBSERVATIONS OF FLIGHT INITIATION DISTANCE WITH REGARD TO ROAD SPEED LIMIT IN OKLAHOMAN BIRDS**

Species respond to changes in their environment in many different ways. Urbanization, more specifically the addition of roads, greatly alters the landscape and introduces traffic as a novel predator. Traffic induced road mortalities offer a unique selective pressure that changes the behavior of species that frequent trafficked areas. In this study, the relationship between Oklahoman bird flight initiation distances (FIDs), road speed limit, and vehicular speed was observed. Species and relative size of the bird were also studied in regards to their effects on bird FIDs. It was found that FID increased with speed limit and relative size

of the bird. However, species and vehicular speed had no effect on FID. This suggests that birds are able to recognize different road speed limits and adjust their FID accordingly, thus allowing for a safe response to traffic and optimization of time to foraging behaviors.

**Rao, Meghana\* and Estelle Levetin**

#### **A 15 YEAR STUDY OF AIRBORNE ALTERNARIA SPORE CONCENTRATIONS IN TULSA**

Both allergies and asthma affect millions of Americans. Airborne allergens, such as pollen and fungal spores, are well-known causes of these conditions. *Alternaria* spores are one of the spore types that have been associated with severe asthma exacerbations. In this study, concentrations of airborne fungi were tracked over time to investigate the variability in spore levels and correlations with meteorological conditions.

Airborne pollen and spores have been monitored using a Burkard sampler on the roof of Oliphant Hall by the Aerobiology Lab. Following collection, air samples are made into permanent slides for microscope analysis. Although there has been on-going analysis of air samples since 1987, not all the slides had been previously analyzed for all spore or pollen types. A complete set of 15 years' worth of *Alternaria* spore data has now been assessed.

Analysis of *Alternaria* concentrations from 1998 to 2012 showed variability in the cumulative yearly spore total. The highest cumulative *Alternaria* spore total was in 2012 at 120,055 spores, and the lowest was in 2007 at 39,581 spores. In addition, there was also variability in the peak daily concentrations with a range from 982 spores/m<sup>3</sup>, which occurred in 2004, to 5026 spores/m<sup>3</sup> in 2012. Highest monthly concentrations generally occurred in August and the lowest usually in February. Preliminary analyses of meteorological data indicated that cumulative yearly spore levels are negatively and significantly correlated with rainfall and positively with temperature. Additional data are needed for continued analysis of meteorological conditions affecting spore levels.

**Reed, Travis\*, Nick Materer, Parameswar Hari, and Allen Apblett,**

*Oklahoma State University, Stillwater, Oklahoma*

#### **LOW TEMPERATURE SYNTHESIS OF COBALT DOPED ZINC OXIDE FOR THE USE IN SEMICONDUCTOR MATERIALS**

Typically, the best photovoltaic materials convert only 30% of incident sunlight energy into electric energy. The main factors limiting efficiency are poor light collection and the high rate of electron/hole recombination in the photovoltaic material. To address these problems we are using a multidisciplinary, collaborative effort to develop zinc oxide (ZnO) nanostructured thin films that can be easily prepared and combined with either conventional or organic photovoltaic materials to enhance photovoltaic performance. ZnO has been shown to be well suited for fabrication of thin films or highly ordered arrays on a variety of substrates. These can be used in photocells either for light-harvesting or as transparent electrodes. Notably, the conductivity of thin films can be tremendously enhanced by doping with elements such as In, Al, and Co. Similarly, while undoped ZnO is only photosensitive in the ultraviolet, incorporating Co, Al, Ni, Mn, or V as dopants extends the absorption spectrum into the visible and even as far as the infrared. We will report the facile synthesis of cobalt-doped zinc oxide from the decomposition of a solid solution of zinc and cobalt pyruvic acid complexes. This precursor decomposes at a relatively low temperature, producing the metal oxide and releasing small organic fragments. In this study we will discuss the synthesis of cobalt/zinc pyruvic acid oxime complexes and their decomposition into the oxide species.

**Reeder, Raye\* and Estelle Levetin**

#### **A CORRELATION BETWEEN WINTER METEOROLOGICAL CONDITIONS AND SPRING POLLEN CONCENTRATIONS IN TULSA, OKLAHOMA**

The most prevalent allergy causing pollen in Tulsa, Oklahoma include those of oak trees (genus *Quercus*) and mulberry trees (genus *Morus*). The peak months for these two types of pollen are typically March for oak and April for mulberry. Both pollen types are abundant in the atmosphere during the spring. Since the concentrations of each pollen type are high, it would be advantageous for allergists to have a method of pollen prediction. It is known that the spring tree pollen season is related to winter weather. Due to the region's fluctuating meteorological conditions, the spring pollen concentrations vary from year to year. This study continued the examination of pollen concentrations and meteorological conditions to develop a statistical model for predicting the oak and mulberry pollen seasons. After examining air samples for the pollen types collected by the University of Tulsa's Burkard sampler, correlations between pollen concentrations and the meteorological conditions of the previous winter were determined. Pollen season start dates, cumulative pollen season totals, and the peak concentration of each pollen type were the main points of examination along with the preseason meteorological conditions such as growing degree days and average precipitation. These data have been analyzed for pollen seasons from 1988 to 2013 using multiple regression models as well as other statistical analyses to construct a usable prediction model. A negative correlation between the start date of the *Quercus* pollen season and the average temperature of the previous winter has been found, and other correlations continue to be investigated.

**Rezaei, Somayeh\* and Michael Keller**  
**THERMAL GRID DEVICE**

Understanding the mechanism and the measurements of the pain as well as its related psychological effects has been of great interest to many investigators. Pain is also a critical national health problem which costs this country hundreds of billions of dollars each year. This research is built on a previous collaborative project between the mechanical engineering and psychology departments. The goal is to design and manufacture a thermal grid device in smaller size to help in measuring pain and its relation to human mood. A thermal grid device is composed of an array of linear tubes that have warm and cold liquid flowing through them. When a body part, such as a hand, is placed in contact with the tubes, the mind interprets the temperature differential in a way that induces a burning pain. The advantage of this device is that no physical damage to the subject is possible from any actual temperature on the device. Using analytic and numerical heat transfer, the minimum size is determined. Based on the developed model, a range of tubing diameter and materials were investigated. Required flow rates and fluid temperatures were determined for each tubing material and size. A recommendation for a prototype is made based on these results.

**Ridgway, Anton\*, Michael Ripley\*, and Sandip Sen**  
**ADAPTIVE ALGORITHMS FOR FIXED-COST MULTI-ARMED BANDIT PROBLEMS WITH BUDGET CONSTRAINTS**

The multi-armed bandit problem is concerned with choosing from a row of slot-machine "arms" with distinct stochastic rewards; the goal is to maximize the total reward generated by the set of arms chosen in a given period of time. Application to various online settings, including bidding in ad exchanges, bid optimization in search, service provider selection in cloud computing, etc has recently driven the emergence of a budget-constrained variation of this problem, where each arm has a cost, fixed or variable, to be taken from an assigned budget. This version of the problem imposes a fixed constraint on the sampling performed by solutions, prioritizing short-term performance over potentially superior long-term performance. We address the Multi-armed Bandit Problem with Budget Constraint and Fixed Costs (MAB-BF), by proposing several adaptive arm-selection strategies that progressively eliminate arms that are found to be less rewarding over time. We argue for the use of these conservative schemes over previously-developed aggressive schemes that use a fixed exploration budget and uniform sampling, by examining how the exploration and exploitation phases can be best utilized. We present results from the use of these algorithms for task-based contracting decisions in a simulated supply chain.

**Riojas, Katherine**

## **THE MAGIC RIDER: A MOBILITY PLATFORM FOR CHILDREN WITH DISABILITIES**

Many children with disabilities are unable to develop depth perception and body control by crawling or walking. These children can be aided through therapy on a mobility platform, a small battery-powered vehicle. The University of Tulsa has developed a mobility platform called the Magic Rider. The Magic Rider helps children increase their sense of self-worth, independence, and spatial awareness at The Little Light House, a school for disabled children ages 2-6. The objective of the project for the summer of 2013 was to improve the aesthetics and functionality of the first generation Magic Rider while lowering costs. One goal of the project was to design and create a sturdier, more aesthetically pleasing body that was amendable to production in larger volumes. The chassis and powertrain were also modified to make the car look more realistic and allow outdoor use. The largest challenge was the creation of the new body. The new body was created using a ribbed cross section technique. This novel production technique proved successful and the modified Magic Rider has been returned to The Little Light House, where observations from staff and volunteers indicate it is meeting its therapeutic and recreational goals.

**Robinson, Shannon**

## **THE CULTURAL CODE-SWITCHING CONUNDRUM: TEACHING CULTURAL CODE-SWITCHING WITHOUT VIOLATING LIBERAL NEUTRALITY**

Cultural code-switching has been lauded as a teachable tool that will allow educators to equip young people from disadvantaged backgrounds with the cultural capital they need to thrive in the dominant culture. Some scholars hope to take cultural code-switching further, and package it as an instrument for social change. This would allow those students who have mastered cultural code-switching to enter into the dominant culture and alter its power structures from within. Yet, regardless of its aim, certain values lie entrenched in cultural code-switching that might unduly influence a student's sense of civic identity. While cultural code-switching for personal gain or for social change could potentially act as great a catalyst for civic empowerment and equality, educators must question the extent to which they can legitimately influence students' value systems. If educators care, as they should, about students' ability to freely form their own civic identities, then, in sending messages about the importance of the market culture, social responsibility and the like, educators must consider the diverse ways in which students might come to appreciate such values in their own lives. To address the above concerns, teachers should consider the principle of liberal neutrality, understood appropriately in the context of schooling, as they prepare students to participate in cultural code-switching. This will protect against undue influence, while still allowing cultural code-switching to have a positive impact on students' lives.

**Rudy, Rachel**

## **THE RELATIONSHIP BETWEEN ATHLETIC MOTIVATION AND ACADEMIC ACHIEVEMENT**

The purpose of this study is to examine the relationship between athletic motivation and academic achievement. This is important because certain motivational techniques in sport could transfer over to the classroom and, therefore, influence academic achievement. Research shows that task and mixed motivational orientations, in athletics and academics, have positive effects on academic strategies and achievement (Ryska & Vestal, 2004; Boiche et al., 2008; Greene & Miller, 1996). In addition, it shows that males tend to be more ego-oriented in sport and task-oriented in mathematics, whereas females are more task-oriented in sport and ego-oriented in mathematics (Monazami et al., 2012; Dweck, 1986). Task and ego orientation questionnaires for athletics and academics will be given to approximately 400 Division I athletes. It is expected that these questionnaires will show that athletes with task-oriented motivation will have high GPA's than athletes with ego-oriented motivation. Furthermore, mixed oriented athletes will have the highest GPA's overall. It is also expected that males and females will have different motivational orientations and that athletic and academic motivation orientations will parallel each other.

**Sandberg, Jill**

**THE RELATIONSHIP BETWEEN PARENTAL INVOLVEMENT AND ACADEMIC ACHIEVEMENT**

Regardless of socioeconomic status or ethnicity, parental involvement is a matter of showing interest (Snell, et al, 2009; Archer-Banks and Behar-Horenstein, 2008). Many factors affect academic achievement of schoolchildren. Researchers have found that the majority of students respond positively to parental involvement (Hoover-Dempsey et al, 2005; Sanders and Epstein, 1998). What is not clear is what type of involvement has better response. This study will survey parents on the type and amount of time are involved in their child's academic career as they transition from elementary to middle school. Results will be correlated with standardized math and reading scores of the students. This study will test the hypothesis that maximizing the involvement of parents will improvement of parents will improve their student's academic performance.

**Shewey, Megan and Katy Riojas**

**M.A.D.E. AT TU**

A new club here at the University of Tulsa is Make A Difference Engineering. This club is dedicated to designing and fabricating projects for children at The Little Light House, a local school for disabled children ages 2-6. These projects provide the children with a fun way of improving their motor skills, depth perception, self-esteem, and independence. MADE at TU members spent the summer of 2013 working to improve two of the past mechanical engineering senior design projects in operation at The Little Light House. In addition, we both volunteered at The Little Light House once a week during the summer and have continued to do so throughout the school year. MADE at TU is a distinct service organization in that it applies mechanical engineering to accelerate the rehabilitation and development of fine and gross motor skills of children at The Little Light House. Through our experiences in MADE at TU, we have not only increased our ability to apply our mechanical engineering knowledge in the real world, but have also had the opportunity to observe the positive impact that can be generated by this application. The experiences we have had working with the children have been priceless. Each week, interacting with them consistently inspires us to continue to work hard and create new projects that will enhance their lives.

**Shih, Susie\* and Tyler W. Johannes**

**TOXICITY ANALYSIS OF DIFFERENT ALCOHOLS ON MICROALGAE**

Algal biofuels are an attractive alternative to fossil fuels. Microalgae are currently being studied for their potential to produce ethanol and higher alcohols; however, like other microbes, microalgae is sensitive to increasing concentrations of alcohol. This research focuses on evaluating the toxicity of different on the microalgae strain, *Chlamydomonas reinhardtii*. This project involved adding different concentrations of alcohols such as methanol, ethanol, propanol, and butanol, to the microalgae cultures. The concentrations of different alcohols varied from 0% to 15%. During the course of the summer, each type of alcohol was tested to find the relation between the alcohol concentrations and the toxicity to the microalgae. This talk will highlight the key results of this summer project.

**Skinner, Leah\* and Anupama Narayan**

## **DETERMINING THE IMPACT OF CONTEXTUAL FACTORS AND STABLE DISPOSITIONS ON CREATIVITY IN INDIVIDUALS**

In the organizational world, creativity is becoming a critical component to maintain success in the dynamically changing environment. Scholarly research on creativity in organizations is flourishing (George, J.M., 2007), but unfortunately, while creativity obviously has a beneficial place in the organizational world, research has not yet been able to get a consistent grip of what factors may inhibit or promote creativity. Research has mixed findings regarding the role of contextual (or situation-specific) factors such as organizational climate, and stable individual dispositions, Big Five Personality Factors (i.e., Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism) in promoting creativity. The purpose of this study is to examine which of these has a stronger relationship with individual creativity. As a contextual factor we are interested in the construct of perceived stress or the degree to which situations in one's life are appraised as stressful by an individual. Previous research has indicated that stress has been shown to increase, decrease, and have a curvilinear relationship on creativity, depending on the type of stressor being perceived and the individual's reaction to the stress (Lazarus & Folkman, 1984). We propose that situational factors, or more specifically, perceived stress, in this situation, will have a stronger effect on creativity at than the personality characteristics of the Big Five. Results and implications of the present study, as well as potential future research will be discussed.

### **Smith, Justin D.\*, Daniel W. Crunkleton, and Selen Cremaschi** **AlGae Growth modeling Through THE USE of a Heuristic simulation technique**

Algae presents a source of biomass that avoids several problems for other biomass sources. It does not need to be grown on land used for food crops, and can grow using low quality brackish or salt water, while producing a much larger amount of oil per acre than several other alternative biomass sources. In this study, we simulate the growth of algae over the United States to determine which regions would allow the greatest amount of algae production for a packed photobioreactor. To accomplish this, we started with a CFD simulation of a packed bubble column that optimized algae production as a function of flow and geometry parameters. Then, the concentration field of algae was calculated by integrating several light/temperature models of algae growth. This process was repeated for several latitude/longitude positions in the US. By using this method on a sufficiently small grid with a small timestep, only a set of algebraic equations must be solved, rather than the full set of transport equations. Different kinetics models were compared, showing that including temperature in growth modeling presents a much clearer picture of the regions that could provide optimum algae production. The results of our modeling indicate that the most optimum regions for algae growth with the packed column are located in the Southwestern states.

### **Smith, Kirk\*, Jordan Hoyt, and Todd Otanicar** **DEVELOPMENT OF A LIQUID FILTER FOR SUBGAP ABSORPTION OF SOLAR ENERGY**

Advanced solar conversion systems going forward will require technologies that are capable of efficiently converting solar energy across the whole spectrum in an affordable manner while still efficiently providing electricity and dispatchable thermal energy. An attractive method for this is by coupling photovoltaic cells to a thermal energy system. These systems are often limited by the degradation of PV at high temperatures or the low conversion efficiency of thermal energy to electricity at low temperatures. A potential way to overcome this limitation and to enable so called PV/T hybrid systems to utilize concentration and operate at higher temperatures is through the use of spectral filtering. Spectral filtering can be achieved in a variety of methods in a hybrid solar conversion with the goal of filtering infrared (subgap) photons to the thermal system and photons at and above the bandgap to the PV cell. We have built a benchtop scale device capable of flowing different test fluids in front a PV cell to determine the efficiency of such a device by utilizing selected nanoparticles capable of absorbing subgap photons directly in the fluid and limiting the thermal energy gain at the PV cell. Our experiment is tested in a 1-sun solar simulator where it is possible to monitor the temperature rise of the fluid, temperature of the PV cell, and the cell efficiency.

**Steffen, Michael**

## **A NEW SPECIES OF PAEDOMORPHIC SALAMANDER FROM THE OUACHITA MOUNTAINS**

Species with truncated developmental patterns may go undetected if they resemble the juveniles of their close relatives. Herein we present an example of this phenomenon with the description of a highly divergent, relictual species of stream-dwelling plethodontid salamander from the Ouachita Mountains of North America. Both mitochondrial and nuclear sequence data show that this new species is most closely related to its syntopic relative, *Eurycea multiplicata*. Interestingly, *E. multiplicata* exhibits the ancestral biphasic (metamorphic) life cycle, whereas the new species maintains an aquatic larval form throughout life (paedomorphic) and superficially resembles larval *E. multiplicata*. The new species is the first known paedomorphic plethodontid from the Ouachita Mountains, and the most divergent paedomorphic salamander discovered in over seventy years. This species represents an independent instance of the evolution of paedomorphosis associated with a porous streambed, which may facilitate vertical seasonal movements. This new species currently has an extremely limited known distribution and is of immediate conservation concern.

**Stranford, Devin\*, Lindsey Schroeder<sup>1</sup>, Ian Campbell<sup>2</sup>, and Robert J. Sheaff<sup>1</sup>**

## **CHARACTERIZATION OF A NOVEL INHIBITOR OF EVOLUTIONARILY DISTINCT LUCIFERASES**

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Luciferase, the enzyme responsible for bioluminescence, is found across a wide range of organisms. The drug 12, 13-dihydro-N-methyl-6, 11, 13-trioxo-5H-benzo[4,5] cycloheptal[1,2-b] naphthalene-5, 12-imine (hereafter called TU100), has been shown to inhibit the luciferases of multiple species despite differences in the structure and substrates of the enzymes. TU100 inhibits luciferases from *Photinus pyralis* (fireflies) and *Renilla reniformis* (sea pansy) as well as the engineered luciferase NanoLuc. Previous work with firefly luciferase and TU100 has demonstrated the drug is competitive with respect to luciferin but uncompetitive with respect to ATP. The inhibition constant ( $K_i$ ) was determined to be  $2.5 \pm 0.7 \mu\text{M}$ . Current analysis of Lineweaver-Burk plots has shown that TU100 demonstrates competitive inhibition with respect to coelenterazine (*Renilla* substrate) but mixed inhibition with respect to furimazine (NanoLuc substrate). Dixon plots give  $K_i$ 's of  $270 \pm 20 \mu\text{M}$  for *Renilla* and  $10 \pm 3 \mu\text{M}$  for NanoLuc. TU100's ability to inhibit multiple types of luciferase despite inherent differences between the enzymes could be indicative of an ability to inhibit other oxygenases, which is potentially applicable to creating therapeutic drugs targeting such enzymes.

**Stritzel, Haley**

## **LIMITS OF ASSISTANCE: THE PERSPECTIVES OF SOCIAL SERVICE EMPLOYEES**

Building on prior qualitative sociological research on the experiences and attitudes of social workers, this paper explores the perspectives of a broader range of social service employees who work both in the governmental and non-profit sectors. Three major themes emerged from my in-depth interviewing. First, all research participants noted that many people comment that their clients are not deserving of help. Participants described three basic reasons people believed that others should not have access to public assistance: clients abuse the system, their situation is their fault, and they are lazy. Second, participants felt that social services in their present state are not sufficient to mitigate social problems that have complex and deeply rooted structural causes. In contrast to right-wing rhetoric that positions poverty and disease as the result of poor decisions made by individuals, my participants claimed that their clients' situations reflect structural and environmental factors that are beyond their control. Respondents called for change at the organizational level, in public policy, and in society at large that would help their clients and the efficacy of their organizations. Lastly, my participants confirmed, albeit hesitantly, that some clients do abuse the

social services. Instead of condemning these clients, however, participants continued to focus on the structural, social context that influences their clients' decisions. By positioning this sort of fraudulent behavior as a rational response to the inefficiency of social service organizations and other structural problems, my participants managed to avoid perpetuating the stereotypes of their clients that they hoped to dispel.

**Stuart, Hillary**

### **BACKs: PRETEEN ADOPTEE GROUP**

Children from the ages of 8-12 who have been internationally adopted meet once a month for discussion and community. In their formative years, it is important to address various issues that arise from being adopted, or looking different from the family they are growing up with. Each month, a different issue is tackled, ranging from birth families, race and identity, and experiencing bullying and prejudice. Each child is encouraged to share their stories and feelings, but none or required. Each facilitator is an adult who was also internationally adopted, creating a safe place where the children can feel free to speak their minds. Talking about these issues equips these students to be empowered in their identity as an adoptee, and continue to view adoption as a positive way to build a family. They have named themselves BACKs this year: Brave Adopted Cool Kids.

**Subhan Neyaz, Leena.\* and Mohamed K. Fakhr**

### **PFGE AS A TOOL TO DETECT LARGE PLASMIDS IN STAPHYLOCOCCUS AUREUS ISOLATED FROM RETAIL MEATS**

*Staphylococcus aureus* is one of the most common causes of infections both in humans and animals. Furthermore, *S. aureus* considered one of the top five pathogens causing domestically acquired foodborne illnesses according to the CDC, 2011. Studies that deal with the characterization of large plasmids of *S. aureus* are limited. The aim of this study is to determine the prevalence of plasmids particularly large ones in *S. aureus* and MRSA isolated from Oklahoma retail meats, and to determine the function of interesting genes found on those mega plasmids. The alkaline lysis method was used to isolate small to medium size plasmids. The prevalence of plasmids by the alkaline lysis method was very high at 96% (216/224). Applying PFGE for the isolation of large plasmids, out of the 149 strains screened so far, 52 carry plasmids  $\geq 60$  kb (35%) and the highest prevalence of these large plasmids was in the turkey isolates (55%). PFGE is an excellent tool in detecting mega plasmids in *S. aureus* that would have been missed by alkaline lysis. Screening the rest of the isolates by PFGE is currently underway. Molecular characterization to select variable plasmids for next generation sequencing and to analyze the sequenced plasmids for genes of interest will be the next step in this project.

**Tatum, Raven**

### **SCHOOL UNIFORMS: CURTAILING AUTONOMY FOR THE SAKE OF AUTONOMY**

Do uniforms policies – which increasingly are being implemented in public schools across the US – support children's personal autonomy, or undermine their autonomy by restricting their choices? In this paper, I argue that while uniform policies restrict students' clothing choices in the immediate term, such policies serve to expand children's life options in the long term, and thus should be regarded as autonomy-supporting. In reaching this conclusion, I draw from the work of philosopher Harry Brighouse, who argues that schools should establish and maintain an ethos that is "discontinuous" with that of the mainstream culture if they hope to promote their students' autonomy. I contend that implementing a uniform policy is consistent with the effort to establish a "discontinuous ethos" in the school. This is because the clothing that many children wear to school today – the latest fashions and trendy brands – is precisely what is being celebrated and promoted in the popular culture and mass media. Thus, if schools are serious about establishing a discontinuous ethos, and thereby promoting students' autonomy, they should not reinforce these trends but should instead offer an alternative to them. Ultimately, I agree that, in many cases,

children's freedom of expression ought to be respected; but in this particular instance I support minimal suppression because it better serves children's long-term autonomy.

**Tawaklna, Kenan**

#### **THE ROLE OF MINIMS IN LEAF CUTTER ANT TRAIL DEFENSE**

The role of minims, the smallest members of the caste system of *Atta cephalotes*, remains largely uncertain. After a number of observations on ant colonies at the La Selva Biological station, I hypothesized that minims served a defensive role in capturing foreign ants from a different colony. Foreign ants appeared to only be recognized after interacting with minims of the trail. To test my hypothesis, I brought ants from one colony and placed them on the trail of a second colony. I measured the time until the foreign ant was captured to set a baseline control. I then exposed the foreign ants to minims before putting them on a trail, and measured the time until capture. I also did a reciprocal translocation experiment. The data show that the ants pre-exposed to minims were captured more quickly than those that were not, but after statistical analysis the data did not prove significant. The determined P value was 0.065 for the first experiment and 0.08 for the reciprocal. The statistical analysis leads me to believe that more trials need to be conducted and more data needs to be collected to achieve a definitive result. Alternatively there may be behavioral variability among the minims used in different replicate trials.

**Telang, Chinmay M.\* and Todd P. Otonicar**

#### **SPECTRAL OPTICAL PROPERTIES OF THERMORESPONSIVE SPHERICAL CORE SHELL NANOPARTICLES**

Core-shell nanoparticles are widely studied due to the unique optical properties that arise due to surface Plasmon resonance and have been proposed for use in various applications from solar energy harvesting, to bio sensing to photo thermal tumor therapy. While chemical synthesis Methods have resulted in shells with full coverage, it is possible during the shell growth process to create shells with only partial coverage.

The primary objective of this paper is to analyze how partial coverage of gold nanoparticles used to grow a gold shell affect the optical properties of the overall particle. This is accomplished by modeling the geometry comprising gold nanoparticles used to build the shell and the dielectric polymer core, and solving the FEM model on COMSOL. A variety of partial coverage geometries are considered including different size cores, shell seed growth particle size, area coverage ratio, non-uniform and uniform partial coverage. This study shall help us design particles that would exhibit better optical properties and thereby accomplish model with enhanced heat transfer. The applications can be found in a number of areas ranging from Photo voltaic systems to phase changing materials and biomedical applications.

**Thomas, Kevin\*, Megan Elliott, and Robert Sheaff**

#### **DISCOVERY OF NOVEL PROTEASOME THERAPEUTICS FROM AN ENAMINONE LIBRARY**

The proteasome is a multi-subunit protein structure in eukaryotic cells that degrades misfolded or unwanted proteins. The proteasome uses caspase-like, trypsin-like, and chymotrypsin-like proteases to degrade critical cell proteins by cleaving the peptide bonds between amino acids. Since it plays such a major role in protein catabolism, the proteasome is a major target for novel chemotherapeutics. Bortezomib, for instance, is a proteasome inhibitor used for treating multiple myeloma. In order to identify novel proteasome inhibitors, a library of enaminones, some with functional groups similar to amino acids, was synthesized by Dr. Syed Hussaini. The 48 compounds were first screened using a cell-based proteasome assay to identify potential inhibitor candidates. This assay utilizes a small peptide containing the cleavage sequence of specific proteasomal proteases. Once interesting candidates were identified, they were tested for their

ability to prevent degradation of the well known proteasomal substrate p21 in HEK 293 cells. Some of the compounds were capable of inhibiting proteasomal degradation of a natural protein substrate inside cells, indicating therapeutic potential.

**Tindle, James**

### **NESSECITY IS THE MOTHER OF INVENTION:USING TRENCHES TO COPE WITH A UNIQUE WAR**

The most iconic images from the First World War involve men in the trenches, and part of the reason why trench warfare in World War I stands out is because no other war experienced such an extensive use of this particular tactic. Other wars had certainly seen the use of trenches, but no conflict prior to the Great War had experienced trench warfare on such a memorable scale. So why did this unique phenomenon occur? In this paper, I argue that the shockingly destructive power of new military technology produced an unparalleled use of trench warfare on the Great War's Western Front for two reasons. Military commanders on both sides observed the tactical failure of aggressive prewar strategies and wanted to find a better way to win the war, and common soldiers on both sides observed the psychological horror of mechanized, industrial combat and wanted to find a better way to survive the war. Extensive trench warfare presented a possible solution to these problems because it not only provided military commanders with time to develop improved strategies based on more effective tactics, but it also supplied soldiers with protection and shelter from the nightmarish fighting. In this way, two very different groups with very different motivations reached the same conclusion: trenches were certainly not ideal (commanders had to adjust to slow, costly strategic successes, and soldiers had to adjust to miserable conditions), but the fortifications did provide the opportunity to achieve more important goals like winning and staying alive.

**Tindle, John**

### **UNDERREPRESENTATION OF EELS IN CORAL REEF FISH SURVEYS**

The island of Bonaire in the Netherland Antilles has a large expanse of well-preserved reefs that are ideal for studying the marine communities that live there. Many researchers have come to Bonaire to conduct fish and coral surveys and the resulting databases are quite extensive. One thing Bonaire's reefs lack is large predatory fish. It has been postulated that eels fill the role of top predators in this type of system. It is very easy for researchers to overlook eels when they conduct fish surveys because of their hiding behavior. Therefore, the eel population may be underrepresented in the databases for reef fish. When I was in Bonaire for a study abroad semester with the Council for International Education Exchange (CIEE) I conducted an independent research project to determine if eels are being underrepresented. I conducted survey using two common methodologies and found that I was consistently able to find more eel species and individuals than the reported data for either survey method. The conclusion from this study was that both survey methods have strengths and weaknesses, but the researchers conducting these surveys need to take greater effort to count eels and other less visible species in order to improve the accuracy of the databases. This study was published in the student journal *Physis Vol. 13* that contains all the student's projects for that semester.

**Trafford, Mitchell A.\*, Grant A. Edwards, Alaina E. Hamilton, Audrey M. Buxton, Matthew C. Bardeaux, and Justin M. Chalker**

### **SUSTAINABLE SYNTHESIS AND CONTINUOUS PROCESSING WITH SUZUKI-MIYAURA CROSS-COUPLING**

The Suzuki-Miyaura cross-coupling is a valuable tool in organic synthesis for the formation carbon-carbon bonds that are generally difficult to form otherwise. The reaction is commonly employed in the large-scale synthesis of many compounds in the pharmaceutical, agricultural, and material industries. As such, any effort to make the reaction more efficient, economic, or environmentally friendly is well received by the scientific community. As part of our lab's commitment to Green Chemistry, we have shown that this reaction can be carried out in sustainable solvents – like water and ethyl acetate – without

a decrease in yield or efficiency. Despite the success of these experiments, it is difficult to recover the palladium catalyst after the reaction, which is an important factor because palladium is expensive and toxic. To address this issue, the water-soluble catalyst – melamine and palladium acetate in water – was polymerized to yield a melamine-palladium catalyst that is insoluble in water. This catalyst can be recovered and reused after each reaction, and can also be suspended on a solid support for flow chemistry applications. Flow chemistry is a continuous process where starting materials flow through a catalyst-lined reactor to provide a constant stream of the desired product. The potential for continuous processing in the Suzuki-Miyaura reaction offers many advantages over the batch processing currently used in large-scale synthesis. The procedure for creating these polymeric catalysts can, in theory, be extended to synthesize an entire library of catalyst reactors, allowing for a modular, next-generation method of chemical synthesis.

**Trafford, Mitchell, Matthew Vuong, and Timothy Brown**  
**ENGINEERING SOLUTIONS FOR BULK FOOD PROCESSING AND DISTRIBUTION**

The TU student chapter of Engineers Without Borders is working on a project to assist the Community Food Bank of Eastern Oklahoma. The food bank distributes thousands of food donations each month to those in need; such a large-scale operation is not without challenges. One of the main difficulties is processing and re-bagging bulk donations of bulk foods such as rice, beans, pasta, cereal, and crackers. These bulk donations arrive in large (4ft x 4ft x 4ft), 1-2 ton cardboard boxes, and this food has to be divided by volunteers into smaller 1-pound bags. The greatest problem faced by volunteers is reaching the bottom of the large boxes without damaging the container. Reaching over the sides of the box and then carrying the food over to a bench to be repackaged also introduces risks of contamination and spillage.

Our group has designed a vacuum system to safely and efficiently move the bulk food out of the tote to a centralized location where it can be immediately weighed and resealed without risk of contamination. This simple, effective design saves the food bank both time and resources, and minimizes the potential for spilling. Our group meets for at least two hours each week in order to improve upon our initial design. These improvements include reducing damage to food, improving vacuum efficiency, simplifying the design, and reducing vacuum noise. This project allows our group to draw upon our engineering background to provide valuable and immediate services to the surrounding community.

**Urquhart, Melissa<sup>\*</sup>, Amanda Barbosa, Rachel Giebel, Lexis Learmonth, Evelyn Gutierrez, Abigail Palmer, Christy Craig, William Potter, and John Caruso**  
**THE EFFECT OF PALM COOLING ON BLOOD LACTATE VALUES PRODUCED FROM RESISTIVE EXERCISE**

The blood lactate concentration ( $[BLa^-]$ ) increases in response to bouts of resistive exercise. It is associated with muscle fatigue and impaired exercise performance. Palm cooling is thought to mitigate denaturation of pyruvate kinase, an enzyme that precedes lactate formation within muscle cells. To examine the impact of palm cooling on  $[BLa^-]$  and exercise performance, 16 (eight men, eight women) healthy subjects gave informed consent. They performed three workouts in a randomized sequence. All workouts began with baseline (resting)  $[BLa^-]$  measurements, followed by a ten-minute low-intensity (75-90 watt) stationary bicycle ride, and concluded with a four-set eight-repetition seated leg press workout. One workout involved no palm cooling; a second entailed palm cooling between sets. Finally the third included palm cooling between sets and for 20 minutes post-exercise. A water bath (15° C) was placed beside our leg press device for the palm cooling workouts.  $[BLa^-]$  values were derived from a calibrated analyzer (Sports Resource Group; Hawthorne, NY); they were obtained at baseline and at 0-, 5-, 10-, 15- and 20-minutes post-exercise.  $[BLa^-]$  values were analyzed with a 3 (workout) x 6 (time) ANOVA with repeated measures per independent variable. With an  $\alpha = 0.05$ ,  $[BLa^-]$  results yielded a significant main effect for time (0-minutes post, 5-

minutes post > 10-minutes post, 15-minutes post, 20-minutes post > baseline). There was also a trend for a workout x time interaction, with comparatively lower [BLa<sup>-</sup>] values at 0-minutes post-exercise produced by the exercise bout that included palm cooling between sets and post-exercise. More data collection is required to affirm current results.

**Vieira, R. E.\*, S.A. Shirazi, and B.S. McLaury**

### **SAND EROSION MODELING FOR HORIZONTAL ANNULAR FLOW AND LOW-LIQUID LOADING CONDITIONS**

Being able to predict erosion of wellbores and pipelines producing oil, gas, brine and sand is of significant interest to the oil and gas industry. Solid particle erosion has been long recognized as a potential source of problems in production systems. The most vulnerable parts of pipeline systems tend to be components in which the flow direction changes suddenly such as elbows and tees. This work focuses on improving the one-dimensional erosion model that predicts erosion in elbows for annular and low-liquid loading conditions that can be used for horizontal upstream flow. The improvements are based on the understanding obtained after performing several flow measurements and new sand erosion experiments in elbows. Flow measurements are conducted with the aid of dual Wire Mesh Sensors (WMS). The dual WMS are utilized to measure void fraction distributions of the flow patterns upstream and downstream of elbows in horizontal pipe sections. Erosion experiments were conducted with state-of-the-art temperature compensated multiple non-intrusive ultrasonic sensors. In this work, the difference in the liquid film thickness from top to the bottom of the pipe occurring in annular flows is considered for erosion calculations. The model predictions are compared with the existing erosion data bank at the TU-Erosion/Corrosion Research Center. The data comprises the effect of particle characteristics, flow velocities, and pipe diameters. The modified annular flow model is successful in predicting the erosion for a variety of operating conditions, including changes in the superficial liquid and gas velocities.

**Walser, Benjamin**

### **CAREER INTERESTS AND EMOTIONAL INTELLIGENCE OF ADULTS WITH ASPERGER'S SYNDROME**

We examined relations among Asperger's Syndrome (AS), emotional intelligence (EI), and interest in 15 career areas. AS, a form of high-functioning autism, entails several symptoms relevant to the workplace (e.g., communication deficits, difficulties adapting to change). As hypothesized, results showed that adults with AS were especially interested in scientific and systematic careers and disinterested in personal service careers. Results also showed that AS significantly negatively predicted several core facets of EI, and that EI partially mediates the AS-career interest connection. Findings offer support for EI as a mediator between AS and career interests in science and personal service. We recommend further research into AS, career interests, and job and organizational engagement.

**Wang, Nian**

### **THE RELATIONSHIP BETWEEN PARENTAL INVOLVEMENT AND BELIEFS AND CHILDREN'S ACADEMIC DEVELOPMENT IN URBAN CHINESE FAMILIES**

The purpose of this research is to examine the relationship between parents' beliefs about academics and parents' involvement in their own children's academic affairs by observing a small group of urban Chinese families. Four families (two middle-class, two working-class) are observed and interviewed. Both specific parenting practices and parents' attitudes are noted and then analyzed in an effort to better understand how the parents' beliefs affect the parental involvement in children's study. Preliminary results show that all children in the sample devote three to four hours every day to their homework and review, while the kinds of parental involvement in the children's homework vary. Despite such variation, all the parents in the

sample believe that education is the most effective way to social and economic advancement and the success of their children.

**Ward, Arley**

### **ALLOYS OR ALLIES?: WORLD WAR II PRESS COVERAGE AND NATIVE AMERICANS**

World War II-era newspapers produced large amounts of copy highlighting the wartime efforts of American citizens, including those with different ethnic and national backgrounds. These articles portrayed Lady Liberty's melting pot as the nation's original defense plant: individuals with varied national origins went in and Americans came out. However, the press was divided on how best to cover the contributions of Native Americans. The inconsistency arose due to the difficulty of striking a balance between highlighting patriotism and/or ethnic heritage. As supported by their high levels of participation, Indians were fully committed to the war effort; even so, the 1940s press remained conflicted about how, or whether, to link these service members with their tribal affiliations. This presentation examines two Oklahoma periodicals: the Muskogean *Daily Phoenix*, and the Bacone *Indian*, and their placement of Indian service members on a continuum ranging from alloys to allies.

**Weber, Victoria**

### **ACHIEVING AUTONOMOUS FLIGHT WITH QUADCOPTERS**

Achieving autonomous flight has become a major goal of many institutions. The applications are nearly endless, from sending these autonomous vehicles into situations too dangerous for people (such as search and rescue situations), to gaining covert intelligence, to guiding lost students around campus. The goal of this project is to not only achieve autonomous flight, but to find the best implementation of closed loop control. We have found that using quadcopters provides maneuverability combined with stability that is unattainable by many other vehicles. Our ultimate goal is to find a control algorithm that will successfully utilize these capabilities. Using a 9 Degree of Freedom Attitude and Heading Reference System (9DoF AHRS) sensor, we have been able to implement a DCM filter combined with a PID control algorithm. In the future we will be working with other filters to find the most successful.

**West, Sasha\* and Estelle Levetin**

### **AEROBIOLOGY OF *JUNIPERUS ASHEI* POLLEN IN SONORA, TEXAS FIELD SITE**

*Juniperus ashei* (mountain cedar) pollen is a major aeroallergen affecting many people in the south-central United States. Accurate pollen forecasts help allergy sufferers anticipate and avoid exposure to high pollen levels.

In order to develop improved pollen forecasting for mountain cedar pollen, air sampling was carried out in *Juniperus* woodlands in Oklahoma and Texas. The objective of the current project was to analyze the air samples from the final year of sampling at Sonora, Texas. Pollen was collected with a Burkard sampler from 1 December 2012 to 31 January 2013. Samples were prepared using standard methods, and microscopic counts of pollen were made using twelve 2-hourly transverse transverses.

The peak day of the 2012-2013 season was 24 January 2013, where the average concentration reached over 11000 pollen grains/m<sup>3</sup>, and the peak hour was 2:00AM on 27 January 2013, in which the concentration exceeded 18400 pollen grains/m<sup>3</sup>. The daily average for this season was 771 pollen grains/m<sup>3</sup>. This was significantly higher than previously analyzed season averages.

Ongoing work is looking at the influence of weather on these pollen levels.

**Whittaker, Matthew\*, Richard Portman and Mark Buchheim**

### **IS MITOCHONDRIAL EXPULSION A COMMON PHENOMENA IN PROTOZOA?**

*Purpose*

Studies of a few eukaryotic organisms suggest that mitochondria undergo an extrusion process after they are no longer capable of ATP production. What internal cell signaling methods are involved in this process and how can we determine its evolutionary relevance? Since this topic is still highly debated within the scientific community, the following research aims to introduce supporting evidence on why and what causes this organelle to behave in such a fashion.

### *Methods*

Although much is known about how eukaryotic cells obtained their mitochondrial organelles, the behavior of the mitochondrial matrix following collapse of the Krebs cycle is poorly characterized. Bisharyan and Clark showed that exposing a ciliated protozoan to harsh environments induce mitochondrial exocytosis. Protocols were devised to recreate similar environments in an effort to test this theory. A ciliated protozoan, *Tetrahymena pyriformis*, was incubated at extreme temperatures (50°C for 10 minutes) in an effort to elicit and observe the extrusion phenomena. Using fluorescent staining methods specific to mtDNA, cell surface reactions and organelle movement were monitored.

### *Results*

*Tetrahymena pyriformis* contain GPI-anchored surface antigens (i-antigens) within the cell membrane that react to extreme temperatures by moving toward each other to form clusters. Electron microscopy revealed this to be a precursor to mitochondrial extrusion. Confocal imagery also provided data supporting the organelle expulsion theory by revealing the presence of mitochondria outside the protozoan membrane. The work presented here indicates that mitochondrial extrusion is not a taxonomically isolated phenomenon and confirms the role of environmental stress in its emergence.

## **Wood, Kaylen**

### **AFFECTIVE DISPOSITIONS AND ITS EFFECTS ON THE WEEKEND RECOVERY PROCESS**

Recovery experiences achieved during a weekend are presumed to be characteristics or outcomes of beneficial weekend activities. However, the boundary conditions of the relationships between recovery activities and recovery experiences have yet to be investigated. Personality affects not only the situations individuals choose, but how they react (Funder, 2010). The current study focused on *affective dispositions*, the characteristic emotional patterns displayed by individuals that are relatively stable across time and situations (Bowling & Jex, 2013). We examined the extent to which positive affect (PA) and negative affect (NA) interact with each other and time spent on weekend activities to predict weekend recovery experiences. Specifically, we expect that individuals with mercurial disposition (high PA/high NA dispositions) will demonstrate a negative relationship between time spent on weekend activities and recovery experiences. Employees from various work sectors ( $N = 183$ ) responded to online surveys during and after a weekend. The results demonstrated that the effectiveness of weekend recovery depends on interactions between weekend activities and affective disposition combinations. Although some argue that PA may negate the detrimental effects of NA (e.g., Fredrickson, 2001), we assume that the combination with high NA will result in a more conflicted emotional experience. Therefore, we expect that spending more time on a given weekend activity allows for greater emotional conflict throughout the duration of the activity, thus interfering with the recovery process. By considering affective disposition combinations, our results permit recommendations to help individuals maximize weekend recovery potential.

## **Wright, Alec**

### **EXPLORING MITOCHONDRIAL HETEROPLASMY IN THE HUMAN BED-BUG *CIMEX LECTULARIS***

The mitochondria are the “powerhouses” of eukaryotic cells that provide energy through the process of aerobic respiration. A unique feature about mitochondria is that they possess their own genome, which is separate from the nuclear genome of the cell. This DNA is unusual in that it is circular, and replicates in a fashion similar to bacterial DNA. Traditional thought holds that all mitochondria in a cell have the same genome and are inherited along the maternal lineage, due to the highly reduced nature of the male gamete. However, it has been demonstrated in several taxa that an individual can possess sets of mitochondria that have differences in their genomes, a phenomenon known as heteroplasmy. A number of mechanisms have

been identified that can contribute to heteroplasmy including: paternal leakage, spontaneous mutations, and inherited heteroplasmy. Our ongoing research has been to explore this effect in the bed bug *Cimex lectularis*. Our project seeks to identify heteroplasmy within this bed bug species and then identify how different factors contribute to mitochondrial heteroplasmy. Our ultimate goal would be to develop *Cimex lectularis* as a model organism for the study of mitochondrial DNA and inheritance so that it could be utilized for probing the effects of mitochondrial DNA across all taxa.

**Wright, Alec**

#### **TESTING THE “DEAR ENEMY EFFECT” IN THE LEAFCUTTER ANT *ATTA CEPHALOTES***

Some animals that demonstrate territorial behavior are less likely to behave aggressively towards their near neighbors than other non-neighbors, a phenomenon termed the “dear enemy effect”. Although the effect has been demonstrated previously in several ant species, including the invasive Argentine ant *Linepithema humile*, there has also been research that suggests that others, such as the leaf cutter ant *Camponotus cruentatus*, fail to engage in “dear enemy” behavior. My study was carried out at the La Selva Biological Research Center, where I found a total of 3 *Atta cephalotes* colonies, two neighboring colonies which were in close proximity to each other and had assumed territorial overlap, and a third non-neighboring colony that was significantly further away across a large river. I hypothesized that ants transplanted from the non-neighboring colony would elicit more aggressive responses when transplanted to a foreign colony than ants from a nearby colony would. Ants were transplanted from one colony to another and aggression responses were scored by timing how long transplanted ants could freely move on the trail of the new colony before being attacked. The two neighboring colonies showed a significant difference in survival time when ants were transported to them, however the average survival time was no different if ants were transplanted from a neighboring or non-neighboring colony. The results of this study fail to support the hypothesis that *Atta cephalotes* engages in dear enemy territorial behavior.

**Xing, Alvin\* and Estelle Levetin**

#### **METHODS FOR RAGWEED POLLEN ANALYSIS**

Ragweed (*Ambrosia*) is a major cause of allergies and is also hypothesized to cause asthma attacks in many Americans. Ragweed is one of the most prevalent allergens in the Tulsa, Oklahoma area. The pollen of two species of ragweed are extremely common in the Tulsa atmosphere starting the third week of August until late October. Research on allergens requires accurate counting of daily air sampling slides containing a variety of fungal spores, debris, and pollen. This research entails counting ragweed pollen grains for three months per year, using a three longitudinal traverse method. Also, previous count data collected with a different method is verified.

The data gathered in this research focused on ragweed counts from 2000, 2010-2011. Counts indicated that in 2000, there were 30 of 92 days counted where mean counts differed between the three longitudinal transverse and twelve transverse count. Total concentration were analyzed using Paired T-tests ( $P < 0.05$ ). Though the T-test indicates the means are significantly different, the Pearson T-test shows a highly significant relationship. It is likely different counting methods yield varying counts, so meteorological models must choose which method of data analysis to use and accept certain degrees of error. Addition analysis was done to increase the power of the data for 2010 and 2011.

This research will help develop statistical models that can be used to better predict pollen levels in the atmosphere. These models will aid those allergic to pollen take medication or avoid exposure when pollen levels are high.

**Xue, Sha\*, Yingdi Liu, Hongli Dang, Dale Teeters, Daniel W. Crunkleton, and Sanwu Wang**  
**AB INITIO CALCULATIONS OF THE STRUCTURE OF CRYSTALLINE  $\text{PEO}_3 \cdot \text{LiCF}_3\text{SO}_3$  ELECTROLYTES**

With the advent of high conductivity polymer batteries, a great deal of research interest has been generated in the study of PEO: LiCF<sub>3</sub>SO<sub>3</sub> polymer electrolyte, because of its enhanced stability at the lithium/polymer interface. Experimental studies have concluded that both the PEO<sub>3</sub>:LiCF<sub>3</sub>SO<sub>3</sub> crystalline complex and the PEO<sub>3</sub>:LiCF<sub>3</sub>SO<sub>3</sub> amorphous phase are both present when PEO/Li ratio is greater than 3. However, most theoretical investigations to date are concerned about the short chain amorphous PEO<sub>3</sub>:LiCF<sub>3</sub>SO<sub>3</sub> system. We report first-principles density-functional-theory calculations of crystalline PEO<sub>3</sub>:LiCF<sub>3</sub>SO<sub>3</sub>. In particular, we provide the atomic-scale characteristics and electronic structures. The calculated results about the bonding configuration, electronic structures, and conductivity properties are in good agreement with the experimental measurements.

Simulations and calculations were performed on the supercomputer resources of the XSEDE, the NERSC, and the Tandy Supercomputing Center.

**Xue, Wenhua\***, **Hongli Dang**, **Friederike C. Jentoft** (*University of Oklahoma*), **Daniel E. Resasco** (*University of Oklahoma*), and **Sanwu Wang**  
**THE ROLE OF HYDROGEN IN CATALYTIC REACTIONS FOR BIO-OIL PRODUCE**

In the study of catalytic reactions of biomass, furfural conversion over metal catalysts with the presence of hydrogen has attracted wide attention. We report ab initio molecular dynamics simulations for furfural and hydrogen on the Pd(111) surface at finite temperatures. The simulations demonstrate that the presence of hydrogen is important in promoting furfural conversion. In particular, hydrogen molecules dissociate rapidly on the Pd(111) surface. As a result of such dissociation, atomic hydrogen participates in the reactions with furfural. The simulations also provide detailed information about the possible reactions of hydrogen with furfural.

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**Yang, Yalin**

**A COMPARATIVE STUDY OF CLASSROOM DISCOURSE IN DIFFERENT AGE GROUPS: CHINESE LANGUAGE TEACHING AND LEARNING IN AN AMERICAN ELEMENTARY SCHOOL**

This microethnographic study explores and compares a teacher's use of classroom discourse in teaching 3<sup>rd</sup> graders and 6<sup>th</sup> graders foreign language (Chinese) at a private elementary school in Oklahoma. The temporary result shows that the teacher's talk varies significantly according to ages of learners. The discourse variation reflects and sets up— social and instructional dynamics in the two classrooms. From a socio-linguistic perspective, the teacher's talk in the two classrooms differs in terms of imposition, power, and social distance. From an educational perspective, the teacher's teaching pace and scaffolding strategies differ noticeably in the two classrooms. An interview with the teacher reveals that the teacher's implicit belief about how to teach optimally to learners at different ages can affect both social and cognitive dynamics in classrooms. The impact of teacher's awareness of learners' age on teaching and learning second language is further discussed.

**Youngren, Westley\* and Anupama Narayan**

**THE EFFECTS OF COMMUNICATION ON CONFLICT WITHIN A TEAM**

Imagine observing two separate teams working on a collaborative project. While viewing one group you notice the members have excellent communication and exchange information freely with each other, which allows them to solve any problems that occur. You also notice the other group does not share their information well with one another and when they do communicate it is awkward and unsuccessful. There is a high likelihood that the first group would experience less conflict due to their effective communication.

This idea of communication benefiting interactions within groups led us to our research, which examined the effect of communication on conflict within a team. Next, what would happen if one member in the team was favored by the supervisor/leader? To explore these questions, in this study we had a team of two, performing a collaborative project during which one member got preferential treatment from the experimenter. We assessed communication and perceived conflict within the team. We found that teams who communicated well had a reduced perception of conflict, and within the unjust setting we found that one's own communication lowered their perception of conflict but not their partners. Results highlight the importance of leader-team interaction and the role that this interaction has within team by affecting the interaction between team members. This finding has both practical and theoretical implications.

**Zhang, Feifei**

### **APPLICATION OF REAL-TIME SOLIDS MONITORING IN WELL DESIGN, ANNULUS PRESSURE CONTROL AND MANAGED PRESSURE DRILLING**

The key to successful drilling through narrow operating window zone and MPD operations is to apply proper annular backpressure to get the desired bottom hole pressure. This requires accurate knowledge of the pressure loss in the wellbore. Solids have important effects on annulus pressure profile, which must be considered in drilling through narrow operating window zone and MPD. This paper focuses on the effects of real-time solids monitoring on the wellbore pressure profile. A practical approach is proposed to determine the solids concentration and solids behavior in different positions of the wellbore at any time during drilling, which can give accurate real-time annulus pressure profile in the well.

To study the solids behavior in the wellbore, a series of experiments were conducted on a 90-ft-long, 4.5"×8" full-scale flow loop to simulate the field conditions. Solids concentration, bed development and pressure gradient as a function of time were recorded. A solid-liquid moving pattern map including fluid velocity, ROP, inclination angle and fluid properties has been developed for practical applications. Engineering formulas have been proposed to account for the complex solids behaviors in calculating real-time annulus pressure profile in the wellbore.

Results of this work can be used to precisely control the annulus pressure profile, guide the setting of annular backpressure in MPD, operation parameters optimization and well path design. Examples of applications of this method are shown in the paper.

**Zhao, Tianyu**

### **STUDIES ON INCREMENTAL STEP TEST**

Cylindrical specimens of 17-4 ph stainless steel and aluminum were tested using an MTS 810 22 kip closed loop servo-hydraulic testing machine in order to determine the material properties that define its cyclic stress-strain curve. Two methods were used: companion specimen test method and incremental step test method.

In companion specimen test, a number of specimens were tested, each at a different strain ranges until the hysteresis loops become stabilized. The stabilized half-life hysteresis loops are then superimposed and the cyclic stress-strain curve can be obtained by connecting the tips of hysteresis loops. This method requires a large number of specimens with confidence and is time consuming.

In an incremental step test, a specimen is subjected to repeated strain blocks, in which the amplitude of the strain increases linearly with time up to a maximum value in the first half of a strain block, and then decreases linearly in the second half of the strain block. The specimen reaches stabilization after a number of strain blocks. By connecting the tips of the stabilized hysteresis loops, the cyclic stress-strain curve can be determined with a single sample.

These two methods were compared by analyzing the cyclic stress-strain properties and cyclic stress-strain curves obtained from each. Several materials were tested to observe tendencies an empirical approach are proposed for relating the curves from the two approaches.

**Zwierko, Elizabeth**

### **THE ROLE OF COMMUNICATION CONTENT IN WEEKEND RECOVERY OF SELF-REGULATORY RESOURCES**

Recovery from occupational stress is crucial to preventing poor health. Seeking socialization experiences is one way individuals can restore their resources, however it is unclear what factors of social support are important in weekend recovery. The current study examines employees' self-regulatory resources and the role of weekend communication content and co-rumination in its replenishment. Analyses were based on 118 full-time employees from numerous organizations and occupations, who worked traditional hours (9 a.m. – 5 p.m.), Monday through Friday. Participants were recruited by communicating directly through the Study Response Project. Participation involved completing measures at three time points; in the middle of the workweek, Wednesday morning (Time 1), at the end of the weekend, Sunday evening (Time 2), and again at the start of the workweek, Monday morning (Time 3).

The findings from this study provide support for the notion that generally having social support is helpful in recovering from occupational stress. However, the findings regarding the various dimensions of communication content were mixed. As expected positive work-related communication content has beneficial effects on self-regulatory recovery, while negative, non-job related communication content and co-rumination did not. Contrary to our expectations greater co-rumination appears to attenuate the positive effects of weekend social support on Monday self-regulatory resources. These findings suggest that the valence of employees' conversations over the weekend may not matter; rather it is important that there be a problem-solving nature to their conversations in order to restore their self-regulatory resource for the start of the workweek.

**Zwierko, Elizabeth**

### **TESTING CONSERVATION OF RESOURCES THEORY: THE ROLE OF EXTRAVERSION AND NEUROTICISM**

Adequate recovery from occupational stress has health and well-being benefits for employees. Conservation of resources (COR) theory suggests that individuals are motivated to retain and protect resources which are used to deal with stress effectively. Further, individuals who have more resources (e.g., stress resistant personality traits) will have an easier time building up their resource pools. The current study extends previous research by investigating the role of two personality traits (neuroticism and extraversion). We expect that extraversion will be associated with resource gain, whereas neuroticism will be associated with resource loss. Resources in the present study are associated with an individual's self-concept (self-esteem, self-regulation, and self-efficacy).

Participants consisted of 136 full-time employees from numerous organizations and occupations. Employees worked traditional hours (9 a.m. – 5 p.m.), Monday through Friday. Participants were recruited in two ways: (1) directly through the Study Response Project and (2) through undergraduate referrals. Participation involved completing measures at three time points; in the middle of the workweek, Wednesday morning (Time 1), at the end of the weekend, Sunday evening (Time 2), and again at the start of the workweek, Monday morning (Time 3). Results found significant main effect for both neuroticism and extraversion in predicting employees' self-orientated resources. Such that when controlling for baseline self-oriented resources, neuroticism was significant predictor of resource depletion and extraversion was a significant predictor of resource replenishment. This strongly supports one of the main propositions of COR theory.

