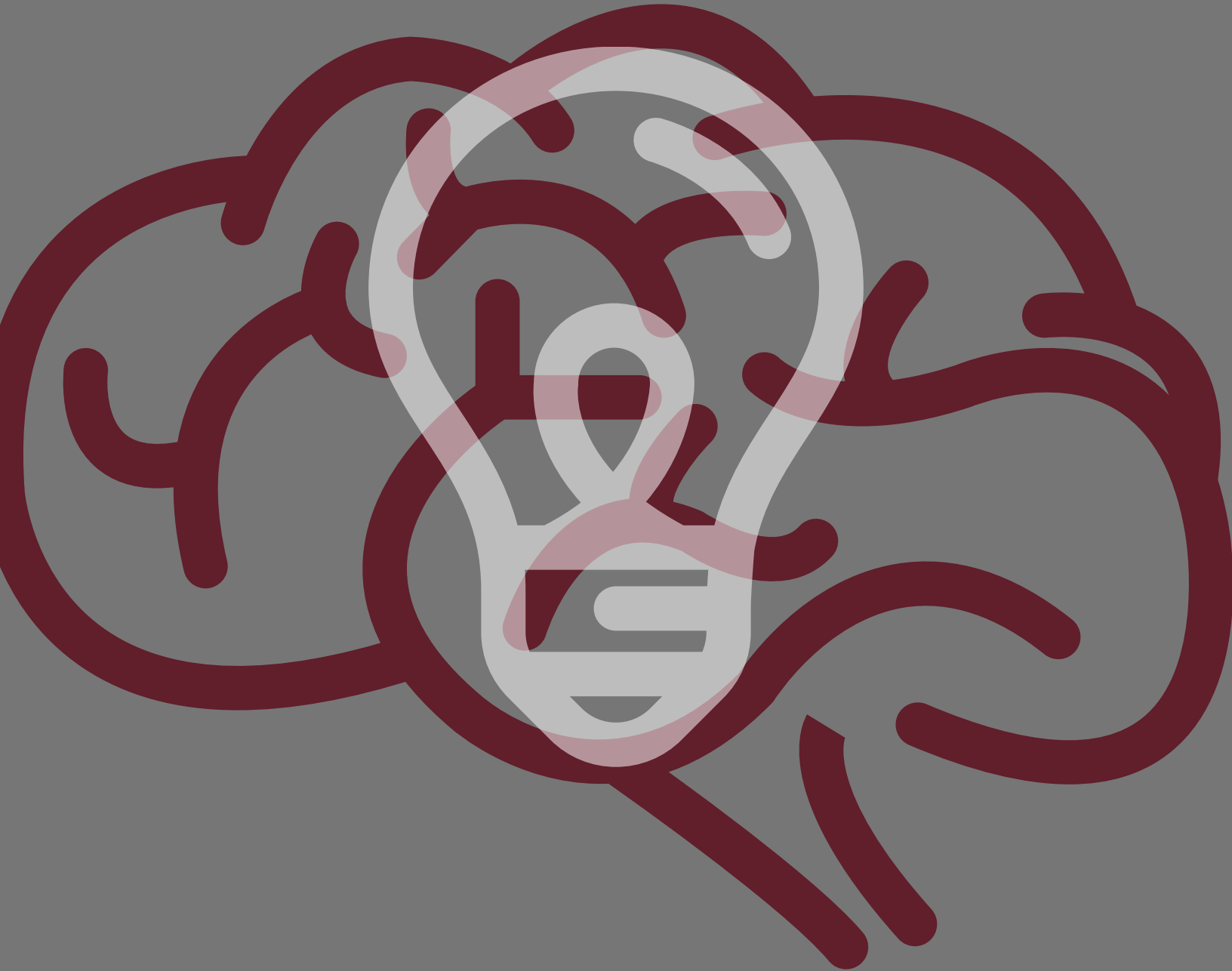


Summer Undergraduate Research
Symposium
2016



MISSISSIPPI STATE UNIVERSITY™
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HONORS COLLEGE

Welcome

The Shackouls Honors College is pleased to sponsor the summer 2016 Mississippi State University Undergraduate Research Symposium. Prizes are being provided by Phi Kappa Phi. The Shackouls Honors College has provided summer research support to some of the students presenting with additional funding from the Mississippi State University Office of Research and The National Strategic Planning & Analysis Research Center (nSPARC). Other students are being supported by the National Science Foundation and the National Institutes of Health. We view the encouragement and support of undergraduate research for all students to be part of our core mission. Just as a good liberal education broadens the mind, provides students with a common core of knowledge, and familiarizes them with the basic methodologies of the various academic disciplines, undergraduate research allows students to dive deeply into important ideas and topics in a rigorous and creative way, paving the way for future intellectual work and exploration whether in the academy, business, or other life arena. Enjoy the student posters and presentations and come away knowing more than when you entered our doors.

Dr. Seth F. Oppenheimer
Professor of Mathematics and Director of Undergraduate Research
Shackouls Honors College



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Mississippi State University: Our State's Land-Grant Research Flagship

We are honored to welcome you to Mississippi State University's 2016 Undergraduate Research Symposium. Undergraduate students are an integral part of the multi-faceted research underway at Mississippi State.

Every day, our faculty, staff, and students are conducting fundamental to applied research that provide innovative solutions, creative works, and new scholarship that address pressing local, state, regional, national, and global needs.

As a result of this work, MSU is the flagship institution in our state for research that falls within its land-grant mission. Strengths across all colleges and research centers have led to our institution being categorized by the Carnegie Foundation as a "high research activity" institution. The Carnegie Foundation has also recognized Mississippi State with its Community Engagement Classification.

Pursuing research opportunities is a critical part of academic life on our campus, and our students are recognized for their commitment to discovery, creation, and exploration in our labs, studios, library, research farms, and beyond. We are pleased that members of our faculty are committed to providing undergraduates with meaningful roles in the overall research enterprise, and promoting interdisciplinary research as an important component of scholarly activity.

Undergraduate research gives our students opportunities to apply classroom knowledge to new areas of interest, and helps them develop skills, collaborate with faculty and peers, and gain confidence. It is exciting to see the results of their efforts on display at today's symposium.

Again, welcome to the symposium, and thank you for your contributions to and interest in research at Mississippi State University.

David R. Shaw, Ph.D.

Vice President for Research and Economic Development



THE HONOR SOCIETY OF
PHI KAPPA PHI

The Honor Society of Phi Kappa Phi (PKP) has a long and distinguished history. Currently, there are over 300 chapters of PKP scattered all across the world, from Maine to Hawaii and the Philippines, and from Alaska to Puerto Rico and beyond. During the 1996-97 academic year, PKP celebrated the 100th anniversary of the founding of The Honor Society of Phi Kappa Phi, and we are now in the second century of its recognition of - and service to - learning. The MSU chapter is in its 65th year of membership. Due to PKP's prestigious recognition and support of learning, the MSU Chapter is proud to also financially support the Spring 2016 Undergraduate Research Symposium in Griffis Hall at Mississippi State University. As President, I am honored that Phi Kappa Phi has been asked and is able to support this event as I have tremendous respect for undergraduate research at MSU. This symposium displays that research at its best!

Thanks,
Dr. Dave Dampier
President

Summer 2016 Undergraduate Research Symposium Schedule

Poster Session

1:00 PM - 3:30 PM

Griffis Hall (2nd, 3rd, & 4th floors)

Concurrent Talks

(* indicates technology is needed)

These are 10 minute talks. One or two questions are allowed but time needs to be left for the next speaker to set up.

Arts and Humanities: Room C401

1:00 PM — Hebert, Lily: *Multifaceted Objectification in The Duchess of Malfi*

1:15 PM — Haywood, Cooper: *Comparative Studies between Singing and Playing the Trombone* *

3:45 pm — Awards Ceremony in 4th Floor Forum: Room C401

Moderator: Dr. Seth F. Oppenheimer

Featured speaker: Dr. Judith Bonner, Provost & Executive Vice President

Subject Area Awards: Dr. Donald Grebner, Professor, FWRC-Forestry, Phi Kappa Phi

This symposium would not be possible without the hard work of the judges who work under time pressure to try to determine which excellent project is just a bit more excellent than the others. If you see a judge, thank him or her.

Abstracts

BSE-01

Name: Chiappetta, Austin

Project Title: *Epigenetic Regulation of Male Fertility through Sperm H3*

Major: Biochemistry

Faculty Advisor, Affiliation: ErdoŶan Memili, Animal and Dairy Sciences

Project Type: Poster

Project Category: Biological Sciences and Engineering

Abstract: Male fertility, the ability of the spermatozoon to fertilize and active the egg and support embryo development is vital for mammalian reproduction and development. Because of the significant similarities between the bull and other mammals and the availability of fertility phenotypic data, the bull was used as a model for the study of mammalian fertility. Histone 3 (H3) nuclear protein is retained during spermiogenesis at loci associated with genes important to sperm function and embryogenesis. Posttranslational modifications of H3, affects gene expression important for fertilization and early embryonic development. However, expression dynamics of the post-translationally modified H3 in the spermatozoa and evolutionary conservation as well as the biological networks that H3 interacts with are not well defined. The objectives of this study were to determine the conservation and interactome of H3, and ascertain the expression dynamics of acetylated and methylated H3 in sperm from Holstein bulls with different fertility. To accomplish these objectives, computational biology methods and software, including Clustal Omega and Cytoscape, were applied in order to determine the conservation and interactome of histone H3. Results of the bioinformatics experiments showed that H3 protein is 96.32-100% conserved across mammals and that it interacts with proteins such as chromatin assembly factor 1, centromere protein A, codanin 1, PHD finger protein 1, hepatoma-derived growth factor, and integrin. These proteins are involved in subcellular processes such as regulation of H3K27 methylation, nucleosome assembly, regulation of DNA replication, and chromatin assembly. The results are significant because they help advance fundamental science and biotechnology of mammalian reproduction. Partial funding was provided by Mississippi Agricultural and Forestry Experiment Station, and by the National Science Foundation (REU-Computational Biology DBI-1262901).

BSE-02

Name: Clements, James

Project Title: *Does mosquito saliva contain DNA that could be epidemiologically relevant?*

Major: Biochemistry

Faculty Advisor, Affiliation: Jonas King, BCH-EPP

Project Type: Poster

Project Category: Biological Sciences and Engineering

Abstract: Emerging mosquito-vectored diseases, such as Zika virus, remain a worldwide threat. Novel tools that facilitate the tracking of such diseases could help us understand their spread and possibly help save lives. One such tool that was recently pioneered is the use of sugar-bated FTA cards, coupled with real-time RT-PCR, for the detection of viral particles that are secreted in the saliva of wild *Aedes* mosquitoes. Here, we aim to expand this technology to also give a measure of the types and relative numbers of mosquito species that have visited such a trap. We hypothesize that if apocrine secretion occurs at a sufficient rate in the mosquito salivary glands, as reported in *Drosophila*, that we will be able to detect mitochondrial DNA in the saliva via real-time PCR. To test this hypothesis we used artificially-induced salivation and "bite-blot" assays using FTA cards coupled with real-time PCR to begin testing for the secretion of mitochondrial DNA in the two major viral vector mosquitoes in Mississippi, *Aedes albopictus* and *Culex quinquefasciatus*. Results from our ongoing experiments will be shown along with a discussion of experiments we have planned for the coming academic year.

SS-01**Name:** Coccoaro, Patrick**Project Title:** *Efficiency of Youth Conservation and Education Camps for Raising Interests in Conservation - Related Activities and Processions***Major:** Forestry/Forest Management**Faculty Advisor, Affiliation:** Leslie Burger, Wildlife, Fisheries, and Aquaculture**Project Type:** Poster**Project Category:** Social Sciences

Abstract: Mississippi State University's College of Forest Resources offers a variety of youth conservation education opportunities such as summer camps, hunting events, and youth development programs. These programs are designed to introduce youth to natural science and wildlife management and promote outdoor engagement and conservation careers. This project assessed the efficacy of these programs in meeting these objectives. Past participants (n=405) were asked to complete a 24-item survey distributed via Qualtrics® online survey program and/or mail. Responses were received from 35 past participants. Results indicate these outreach programs are successful in recruiting new conservationists, outdoor enthusiasts and natural resource professionals.

BSE-03**Name:** Colmenarez, Micaela**Project Title:** *Is Mycobacterium Ulcerans DNA found on Human skin swabs?***Major:** Biological Sciences**Faculty Advisor, Affiliation:** Heather Jordan, Biological Sciences**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Mycobacterium ulcerans is found in West Africa and causes buruli ulcers if the subject is infected. An earlier study of Mycobacterium ulcerans showed that a guinea pig would need to be injected with M.ulcerans in order to see a buruli ulcer formation. In contrast with other related bacterium such as Staphylococcus aureus, the pathogen did not spread, nor was there Buruli ulcer pathology when Mycobacterium ulcerans DNA was applied to an open wound, thus making this particular bacterium intriguing. These results were interesting with respect to transmission, suggesting that direct inoculation was necessary to establish disease pathology. From this data, we hypothesized that infection could occur by injection of M. ulcerans contaminated skin following exposure from a M. ulcerans contaminated environment. However, our first objective was to determine if M. ulcerans could be detected on human skin. To begin this experiment, skin swab samples were collected from the Rafia Forest, the Old Rice Field, Tchahoué Ladies bathing area, and Tchahoué Men's bathing area because the M.ulcerans DNA has frequently been detected in aquatic areas. In Dr. Jordan's laboratory, other researchers including myself, have been testing human skin swab samples (hand and feet) which were collected from Dr. Jordan and her colleagues to see if samples from each location are positive or negative for M.ulcerans DNA. To test whether or not bacterial DNA was found in the various locations, DNA isolation and ER qPCR targeting specific M.ulcerans toxin genes were used. The study is ongoing but so far results have suggested low positivity of M.ulcerans DNA.

SS-02**Name:** Damm, Emily**Project Title:** *The Disinformation Divide: RT and the News Agenda of Russia and the West***Major:** Communications/Broadcasting**Faculty Advisor, Affiliation:** Skye Cooley, Communication**Project Type:** Poster**Project Category:** Social Sciences

Abstract: The following is a comparative analysis of the news coverage of events on the Russian 24/7 English news channel RT and that of Russian news coverage on Russian language broadcasts and web news channels. A Russian government-funded news channel designed for foreign audiences, RT launched in December of 2005. It now consists of three 24-hour news channels that broadcast in multiple languages to more than 700 million people in over 100 countries. The station offers what it describes on its own website as, “an alternative perspective on major global events, and acquaints international audience(s) with a Russian viewpoint” (RT, 2016). Two facts of importance are that RT is used by the Russian government to present a selective view of world events to an international audience; also, the United States and other world governments monitor RT to glean insight to Russian understanding of global politics. The study is novel because it utilized a technology that allows for unprecedented cross-comparisons of foreign media channels in the M3S OSINT platform, access to which was provided by Texas A&M University. Furthermore, the project is timely in that it examines information put forth by the Russian state to Western audiences during a time of heightened tension in the Baltics and Northern Europe between NATO and the Russian Federation. The ultimate purpose is to determine whether RT is reflective of other Russian news channels and those news stories directed toward the Russian population; whether RT presents news to Western audiences with Russian perspectives that are shared, or at least understood through exposure, by Russian citizens attentive to Russian news; or whether the news presented to Western audiences with “Russian” perspectives are simply organized disinformation of Western news topics with no relation to anything other than the political agenda of the Russian state.

PSE-01**Name:** Dawit, Ezana**Project Title:** *The Effect of Build Orientation of Powder Bed Fusion on Maximum Tensile Strength***Major:** Mechanical Engineering**Faculty Advisor, Affiliation:** Nima Shamsaei, Mechanical Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: The demand for additive manufacturing (AM) has increased significantly over the past few decades. As a result, it is imperative to understand the mechanical behaviors of the resulting specimen. Powder bed fusion (PBF) is an AM method that provides specimens with special resolution very near net shape. The maximum tensile strength of PBF specimens with various build orientations will be compared in this investigations. The PBF specimens are constructed via a Renishaw AM 250 machine which uses grade 23 Ti-6Al-4V powder. The tensile strength of the specimens is then tested and compared to determine how the layer orientation affects mechanical strength.

SS-03**Name:** Duke, Harmon**Project Title:** *Promoting Undergraduate Research in Residential Scale Vegetable Garden GETTS: Garden for Education Teaching and Training Site***Major:** Landscape Architecture**Faculty Advisor, Affiliation:** Elizabeth Payne Tofte, Landscape Architecture**Project Type:** Poster**Project Category:** Social Sciences

Abstract: The purpose of the GETTS is to research and promote the home food production garden as the most local and secure source of food for families. The GETTS project is a collaborative effort led by the MSU Extension Service and the MSU Department of Landscape Architecture with support from the Department of Food Science, Nutrition, and Health Promotion. To date, undergraduate students have constructed two garden structures, and designed and built vertical garden prototypes. They have assisted in preparing for public outreach and gathered data for presentations at international conferences. Undergraduates in the Department of Landscape Architecture and in the Horticulture Club have planted and maintained the prototypical garden. The new 10,500 SF GETTS project site is located immediately west of the Ammerman-Hearnberger Pilot Food Processing Lab adjacent to the landscape architecture facility. It has been funded through a SEED Grant from the MSU Extension Service. Three demonstration spaces are being designed and constructed to replicate residential-scale vegetable gardens capable of feeding a family of four. We believe the most secure food chain is a wholly contained and controlled single source where the food is produced, processed, prepared, and consumed on site. The GETTS project aims to demonstrate and promote the proliferation of aesthetically pleasing implementation of such sites. Each garden will be unique in character, but similar in square footage of food production area.

PSE-02**Name:** Ellis, Breanna**Project Title:** *Vapor-Liquid Coexistence Curves for Argon Using First Principles Monte Carlo Method***Faculty Advisor, Affiliation:** Dr. Neeraj Rai, Chemical Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Simulations in the First Principles Monte Carlo Gibbs ensemble were performed to compute the vapor-liquid coexistence curves (VLCCs) for argon. These representations were mapped by the BLYP, PBE, and RVV10 functionals. The Grimme dispersion corrected term, D3, was added to the BLYP and PBE simulations. Our results show that the saturated densities are more accurate with BLYP, but it has the largest discrepancies in terms of the saturated vapor pressures computed. Opposed to RVV10, PBE values for the saturated densities and vapor pressures increased in accuracy as the temperature of the system increased. For the values computed with PBE at 85 K with a system size variation of 72, 128, and 256, the 128-molecule system proved to have the most accurate results in both saturated densities and vapor pressures of the three computations. Simulations ran with the PBE and BLYP functionals appear to produce more accurate values across the board, which is due to D3 that was added, rather than RVV10 that didn't contain any correction terms.

BSE-04**Name:** Enge, Daniel**Project Title:** *Quantifying the Biaxial Biomechanical Properties of Fetal Porcine Myocardium***Major:** Biological Sciences/Biological Sciences**Faculty Advisor, Affiliation:** Raj Prabhu, Agricultural and Biological Engineering**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Heart disease is a leading cause of death in the US. This is being combated by engineered cardiovascular tissues that are used to replace or repair damaged tissue inside the body. Towards this end, the biomechanical properties of it must be fully documented and understood, so that the replacement tissue mimics those properties closely and functions properly in the host. Fetal porcine myocardium is characterized in a biaxial experimental setup so that it can be used to treat problems in human infantile hearts. The tensile stress and strain results of the myocardium tissue show that they are viscoelastic and anisotropic along the fiber preferred direction.

PSE-03**Name:** Foster, Awbrey**Project Title:** *Determining the Applicability of using KNIME as a Data Mining Module for Big Data Analytics***Major:** Mechanical Engineering**Faculty Advisor, Affiliation:** Michael Hamilton, Institute for System of Engineering Research**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Big data analytics is the process of examining large data sets containing a variety of data types to uncover hidden patterns, unknown correlations, and trends. Mississippi State Institute for System Engineering Research (ISER) is developing a data analytic and surrogate modeling package for the Army Engineered Resilient System (ERS) TradeSpace tool. The ERS toolkit has the ability to evaluate millions of datasets representing many variations of possible military solutions to meet a specified requirement. Due to the size of the datasets, developing algorithms that can handle the extraction, transformation and loading of the datasets for modeling, data analysis and efficient visualization is very important. The ERS TradeSpace analytics platform is currently being developed using R programming for managing, assessing, and storing big data. KNIME is an open sourced data analytics integration platform. It incorporates various components for machine learning and data mining using a modular data pipelining approach. These capabilities will assist in making the data more adaptable and accessible. The computational capabilities of the KNIME were tested through executing various statistical procedures like: clustering, linear correlation, linear and polynomial regression, Supported Vector Machine (SVM), and etc. These procedures help give the user a better understanding of the data and create a connection between the input data points and the output. If KNIME is considered to be a useful platform, R-based integration modules will be developed to include the platform in the ERS data analytics toolkit.

BSE-05**Name:** Gomes Almeida, Izabella**Project Title:** *Detection of relaxin and its receptors in canine spermatozoa***Major:** Animal & Dairy Sciences**Faculty Advisor, Affiliation:** Jean M. Feugang, Animal and Dairy Sciences**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Although the production, action and effects of relaxin in the female reproduction are well defined, not much is known about this hormone in the male reproductive system. Being a peptide hormone, relaxin binds to membrane receptors, known as RXFP1 and RXFP2 and the binding leads to signaling cascades that end in the action of relaxin in various reproductive and non-reproductive tissues. Relaxin can influence sperm function in other species such as pigs, but its roles in dogs remains unclear. In our previous studies, testes and epididymal spermatozoa of neutered dogs (1.5 years old average) were collected for protein detection of relaxin, RXFP1 and RXFP2 using Western immunoblotting (WIB) and immunohistochemistry (IHC). Here, we investigated the presence of relaxin and its receptors in mature dog spermatozoa using similar techniques. Mature spermatozoa were collected from 4 dogs (≥ 4 years old) and submitted to WIB, IHC and flow cytometry analyses. Both protein receptors were detected by WIB in epididymal and mature spermatozoa, and RXFP2 band signal intensities were generally stronger than their RXFP1 counterparts. These detections were confirmed by the IHC technique showing the presence of receptors in tissue samples, as well as in mature spermatozoa. Detection of relaxin and RXFP1 was faint in all tissues and spermatozoa, which were further confirmed by flow cytometry analyses, showing low mean fluorescence intensities and proportions of spermatozoa (<35% out of 10,000 cells) immunolabeled with relaxin and RXFP1 antibodies. These results suggest a limited physiological function of relaxin in dog spermatozoa. However, the higher detection of RXFP2 in both tissues and spermatozoa indicate a major role of this receptor through its primary ligand, known as insulin-like factor 3 (INSL-3). Further investigations are needed to clarify how relaxin and INSL-3 may affect sperm function in dogs.

BSE-06**Name:** Greene, Ashley**Project Title:** *Effect of body condition score on fatty acid composition of equine visceral adipose tissues***Major:** Animal and Dairy Sciences**Faculty Advisor, Affiliation:** Thu Dinh, Animal and Dairy Sciences**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Body condition score (BCS) is used to assess overall fat coverage in horses. However, it has not been associated with fatty acid (FA) composition of visceral adipose tissues. This study was aimed to determine FA composition of abdominal (leaf – LF) and mesenteric (MF) adipose tissues. Twenty horses with BCS of 4 (n = 5), 5 (n = 9), and 6 (n = 5) were slaughtered and LF (N = 19) and MF (N = 20) samples were collected, directly derivatized to FA methyl esters, and analyzed by gas chromatography (Agilent Technologies, Santa Clara, CA) with internal standard calibration. Statistical analysis was performed by the GLIMMIX procedure of SAS 9.4 (SAS Institute Inc., Cary, NC.) and statistical significance was determined at $P \leq 0.05$. Percentage of 18:2 n6 in MF was 13.52% for BCS4 horses, greater than those of BCS5 and BCS6 ($P \leq 0.051$). The percentage of 16:1 n7 in BCS6 horses (4.69%) was greatest ($P \leq 0.030$), so was that of 18:0 in BCS5 horses (6.21%, $P \leq 0.013$). In the LF of BCS5, percentages of 17:0, 17:1 n8, and 18:0 were 0.65, 0.88, and 7.1%, respectively, greater than those of BCS4 and BCS6 ($P \leq 0.037$). Percentage of 16:1 n7 in LF was similarly greatest for BCS6 horses (4.02%; $P = 0.018$). Collectively, saturated FA (SFA) percentage (37.6%) was greater in LF than in MF (35%; $P = 0.018$), leading to greater SFA (37.60%) than monounsaturated FA (MUFA; 32.72%; $P \leq 0.001$) in LF but not in MF (MUFA = 34.72%, SFA = 35%; $P = 0.596$). Both LF and MF had more SFA and MUFA than polyunsaturated FA (PUFA; 29.69 and 30.28%, respectively; $P < 0.001$). These data indicates that greater BCS increases the saturation of LF more than it does that of MF.

PSE-04**Name:** Gruich, Cameron**Project Title:** *A Kinetic and Thermodynamic Study of Microwave/Ultrasound-assisted Transesterification of Rapeseed Oil for Biodiesel Production***Major:** Chemical Engineering**Faculty Advisor, Affiliation:** Veera Ganeswar Gude, Civil and Environmental Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Researchers are looking at biodiesel as an environmentally sound deterrent to increasing global carbon emissions. Biodiesel can be made by transesterification between oil and an alcohol. Research on microwave and ultrasound heating elements show that these elements can dramatically decrease transesterification reaction times and that these elements mutually assist each other by microwave radiation's efficient heating and ultrasound's effective mass transfer. This study endeavors to find values to kinetic and thermodynamic variables while using these heating elements in hopes of scaling up this process. Reaction rate constants, activation energy, pre-exponential factor, and changes in Gibbs free energy, enthalpy, and entropy are sought to be determined. Transesterification of rapeseed oil was performed with methanol, .5% by oil weight sodium hydroxide catalyst, and a 9:1 methanol to oil molar ratio. Microwave only, ultrasound only, and combined microwave/ultrasound trials were performed. A sample size of 13.8 mL (10 mL oil, 3.8 mL methanol) was used for each trial. Trials were tested at 35, 45, and 55 degrees Celsius for each heating element. For each temperature, trials were performed for 30 second interval reaction times all the way up to two minutes. As determined at the time of this submission, biodiesel yields are to be back calculated using glycerol yields that were determined by separating the glycerol phase, salting out the soap, centrifuging, and evaporating off the methanol. Biodiesel purity is to be determined by gas chromatography. Integrated rate laws are to be used to determine reaction rate constants over time. The Arrhenius equation is to be used to calculate pre-exponential factor and activation energy. Temperature data and $\Delta G = \Delta H - T\Delta S$ is to be used to determine change in Gibb's free energy, enthalpy, and entropy.

AH-01**Name:** Haywood, Cooper**Project Title:** *Comparative Studies between Singing and Playing the Trombone***Major:** Music Education/Instrumental**Faculty Advisor, Department:** Richard Human, Music**Project Type:** Performance**Project Category:** Arts and Humanities

Abstract: The voice has been referred to as the ‘sacred harp’ or the natural instrument. We use it to communicate and we use it to make music. I was fortunate enough to grow up with a background in voice when I started playing the trombone, which gave me an advantage in the musicality of my playing. When I came to MSU, I started out as strictly an instrumental major but soon added a voice concentration shortly thereafter. In my studies, I found ways to improve my musicianship by adding vocal exercises to my warm up and daily routine. Over time, these exercises helped improve my tone and helped me come to the conclusion that singing helps instrumentalists in their practicing by connecting the natural flow of the voice to the medium of an instrument. In my performance/presentation, I will demonstrate these techniques that I have discovered to show how singing has a strong correlation to playing not just the trombone but to all instruments as well. I have prepared the second movement of the “Concerto” by Eric Ewazen to help me demonstrate the expressive qualities singing allows me to make on this instrument. This is a beautiful movement that can prove to be tricky if not practiced correctly. I will show sections of this piece where doing my vocal exercises helped me in overcoming the obstacles of tricky passages and allowed my sound to resonate.

AH-02**Name:** Hebert, Lily**Project Title:** *Multifaceted Objectification in The Duchess of Malfi***Major:** English**Faculty Advisor, Department:** Thomas Anderson, English**Project Type:** Talk**Project Category:** Arts and Humanities

Abstract: As a female political leader in the sixteenth century, the titular Duchess in John Webster’s Jacobean drama *The Duchess of Malfi* is thrust into a dangerously complicated situation. She is principally a woman regardless of her sovereign status, and she is viewed as an unnatural ruler by her jealous and slightly manic brothers. Her twin brother Ferdinand, specifically, makes violent threats against her life, fixating on her body and utilizing a form of the blazon – a poetic trope that describes an object of affection in disjointed parts. In *The Duchess of Malfi*, the blazon is more subtle than comparing the Duchess’s eyes to the sun; instead, the blazon can be found in the recurring symbol of the diamond. The historically significant jewel has sexually discriminatory implications tracing back to the 1500s, so it is a powerful literary image with a weighted purpose. This paper studies that purpose, considers the scholarship of critics such as Sarah Morrison, and concludes that the diamond reflects the play’s nihilistic message. As summarized by Morrison, the Duchess’s own use of the blazon “hardens her flesh into a diamond’s contours...while shielding it with blazonic metaphor” (69). However, the diamond fails to protect the Duchess and is instead adapted by other characters, shattering her defense. This essay challenges the efficacy of the overdetermined diamond and argues that the Duchess’s use of the blazon only further incorporates her into the objectifying patriarchy of court culture.

BSE-07**Name:** Hubbard, Kristen**Project Title:** *Fabrication of Gelatin Hydrogel Microfluidic Device for Sickle Cell Disease Modeling***Major:** Chemical Engineering**Faculty Advisor, Affiliation:** Renita Horton, Agricultural and Biological Engineering**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Sickle cell disease affects approximately 100,000 individuals in the United States. Abnormal hemoglobin polymerization that causes red blood cells to morph from typical bi-concave discs to rigid, sickle-like shapes is a central feature of the disease. Sickle cell patients suffer from a number of complications including vaso-occlusive crises, strokes, and acute chest syndrome. Many of these complications stem from vaso-occlusions, blockages within the vessels. Unfortunately, the mechanisms that trigger these occlusion events remain poorly understood. We will create an in vitro model to probe vaso-occlusion formation mechanisms. We propose to fabricate a mechanically tunable gelatin based microfluidic device to investigate the vaso-occlusion mechanism within sickle cell disease. We hypothesize that we can design, build, and test an in vitro model of sickle cell disease and probe the role of microenvironmental cues in vaso-occlusion formation. Our platform is an enzymatically crosslinked gelatin microfluidic chip. The chip contains a series of micro-channels ranging from 25 to 200 μm in diameter that will serve as our model vascular network. We are currently optimizing chip fabrication methods to improve efficiency and production yields. Future studies will investigate the role of microenvironmental cues in sickle cell pathophysiology. While our current focus is sickle cell disease, we can also expand to other vasculopathies such as atherosclerosis using our chip platform.

BSE-08**Name:** Humphrey, Rebecca**Project Title:** *Effect of body condition score on fatty acid composition of equine subcutaneous and intermuscular adipose tissues***Major:** Animal and Dairy Sciences**Faculty Advisor, Affiliation:** Thu Dinh, Meat Science**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Body condition score (BCS) serves as an indicator of fat covering in horses; however, it does not take into account the fatty acid (FA) composition of adipose tissues (AT). This study was aimed to determine FA percentages of subcutaneous (SC) and intermuscular (IM) AT. Nineteen horses with BCS of 4 ($n = 5$), 5 ($n = 9$), and 6 ($n = 5$) were slaughtered and the SC ($N = 17$) and IM ($N = 19$) fat samples were collected and directly derivatized to FA methyl esters for determination on a gas chromatography system (Agilent Technologies, Santa Clara, CA) with internal standard calibration. Statistical analysis of FA percentages was performed by the GLIMMIX procedure of SAS 9.4 (SAS Institute Inc., Cary, NC.) and statistical significance was determined at $P \leq 0.05$. Overall, SC and IM fat had greater proportions of monounsaturated FA (36.40 and 36.22 %) and saturated FA (35.59 and 35.75 %) than polyunsaturated FA (28.01 and 28.04 %, respectively; $P \leq 0.001$), which were markedly distinguishable from FA percentages of ruminants and other monogastric species. In SC, 10:0 was greater in BCS4 than BCS6 horses ($P \leq 0.01$). In IM, percentages of 10:0 (0.07 %) and 18:2 trans (.044 %) were greatest in BCS 4 ($P \leq 0.04$). Percentages of 17:0 (0.68 %) and 17:1 n8 (0.98 %) were greatest in BCS 5 ($P \leq 0.04$). The percentage of 18:0 was highest in BCS 4 and 5 compared to BCS 6 ($P \leq 0.03$). These data indicated that equine BCS did not influence FA percentage of the SC but did that of the IM.

BSE-09**Name:** Jackson, Anna**Project Title:** *Another Piece Added to the Puzzle: Filling in the Gaps of the Cyclura cyclura Population Structure with Molecular and Ecological Data***Major:** Biological Sciences**Faculty Advisor, Affiliation:** Mark Welch, Biological Sciences**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Small, isolated populations tend to be characterized by reduced genetic diversity as a result of both natural and anthropogenic stresses. Animal translocation serves as one conservation strategy aimed at bolstering numbers of individuals within a declining population. For this and other conservation methods to be successful, formally recognized taxonomic management units are required. Geographical isolation, molecular makeup, and locally co-adapted parasitic species all contribute to the distinction of one population from the next. *Cyclura cyclura* is an iguana species endemic to the Bahama Islands. Categorized as "Vulnerable" by the IUCN Red List of Threatened Species, these iguanas are further partitioned into three allopatric subspecies: *C. c. cyclura* on Andros Island, *C.c. figginsi* in the Central and Southern Exumas, and *C. c. inornata* in the Northern Exumas. Rising sea levels following the last glacial maximum led to the segregation of the once conjoined Bahama Islands resulting in separation of its Rock Iguana inhabitants. Microsatellite data has proven useful in uncovering differentiation within this species. In accordance with the iguanas' high degree of geographical isolation and localized presence of unique tick ectoparasites, secluded populations are likely to present further divergence. For this project, we utilize microsatellite data and patterns of concordance in DNA sequences to better understand how genetic variation is divided within and between subspecies. Found evidence supports the designation of multiple management units within each subspecies. Furthermore, we have identified the presence of unique and geographically restricted species of ticks on particular islands indicating that isolated iguana populations may have evolved under significantly distinct selective constraints. For an effective translocation, it would be unwise to expose new and possibly detrimental parasites to naïve iguanas. This current understanding of *Cyclura cyclura* population structure and parasitic distribution can help dictate future conservation efforts all while clarifying the specie's genetic and taxonomic boundaries.

PSE-05**Name:** Jackson, Romario**Project Title:** *Dilatometric analysis of thermal expansion of additive manufactured Ti-6Al-4V***Major:** Chemical Engineering**Faculty Advisor, Affiliation:** Scott Thompson, Mechanical Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Additive manufacturing (AM) or 3D printing of metals has successfully broken through industries such as aerospace. One of the major goals of AM is to make sure the AM parts mechanical properties are on par with the traditional made parts. Thermal properties of AM parts are usually overlook which in certain cases can integral to design .Thermal expansion of additive manufactured Ti-6Al-4V is examined in this study. Ti-6Al-4V cylinders were fabricated via two different additive manufacturing methods; Grade 23 cylinders made through Powder Bed Fusion (PBF) in two different orientations and Grade 5 made by Laser Engineering Net Shaping. The thermal expansions of the additive manufactured Ti-6Al-4V cylinders along with wrought 23 grade titanium were measured by Unitherm 1161v Dilatometer in temperature range of 25 C to 1000C. It was found that Thermal expansion from 25 C to 1000 C of the AM cylinders were similar to the wrought cylinder. There were slight differences between the AM cylinders and wrought Ti in negative thermal expansion from the phase transformation region. The coefficient of thermal expansion of the cylinders varied from 12.6 to 5.48(x10⁻⁶/C).

PSE-06**Name:** Keck, Phillip**Project Title:** *Gold Nanoparticle Interaction with Ionic Liquids***Major:** Chemistry**Faculty Advisor, Affiliation:** Dongmao Zhang, Chemistry**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Citrate-reduced 13nm Gold Nanoparticles (AuNP) interact with Ionic liquids [BMIM]Br,[HMIM]Br,[PMIM]Br,[OMIM]Br, [2-MBI]Br,[BBIB]Br₂, and [Am]Br. SERS measurements are used to make comparisons between the absorption activity of the different cations. Concentration, order of addition, and the washing technique seek to differentiate cation bonding priority on the surface of aggregated AuNPs to further the theory of ion pair bonding. Stronger cations are thought to displace weaker cations on the surface, while more electronegative anions displace less electronegative anions.

PSE-07**Name:** Ladner, Connor**Project Title:** *Determining the Octanol-Water Partition Coefficient of Nitrosodimethylamine***Major:** Chemical Engineering**Faculty Advisor, Affiliation:** Neeraj Rai, Dave C. Swalm School of Chemical Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Nitroso-dimethylamine is a hazardous organic contaminant in the environment affecting groundwater resources. The accurate estimation of octanol-water partition coefficient plays an important role in prediction of solute partitioning thus the environmental impact of these pollutants. The present study involves the prediction of octanol-water partition coefficient of nitroso-dimethylamine (NDMA) by molecular simulation methodology. In this study, the TraPPE force field for nitroso-dimethylamine is developed. Configurational-bias-Monte Carlo simulations in the Gibbs ensemble are carried out to determine the partitioning of NDMA.

BSE-10**Name:** Martin, Logan**Project Title:** *A Fundamental Thermodynamic Study of the Interaction of Magnesium with ATP, ADP, and AMP***Faculty Advisor, Affiliation:** Ed Lewis, Chemistry**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: ATP is the energy currency of the cell and plays a key role in many chemical reactions. The body requires certain metal ions in order to carry out these biochemical reactions, and without them life cannot be sustained. ATP can be converted to either ADP or AMP in vivo. Magnesium only minimally stabilizes AMP, as noted by its low association constant, but provides greater stabilization for ATP and ADP. The MgATP complex has been extensively studied because of its biological relevance to many reactions. A fundamental thermodynamic study was done of the interaction of magnesium with ATP, ADP, and AMP using isothermal titration calorimetry because of its direct measurement of core binding thermodynamics parameters in biological reactions. The thermodynamic values were found directly through microtitrations of magnesium into ATP, ADP, or AMP. Current studies have been aimed at understanding the metals associated with biochemical reactions in the iron(II) rich, oxygen poor prebiotic Earth. Crick was among the first to argue that adenine was likely abundant on the Earth before the great oxidation event, given its ease of synthesis in model prebiotic reactions. Magnesium's coordination chemistry is similar to iron(II) so further studies will demonstrate a continuation of the thermodynamic examination of the adenine nucleotides to include iron (II).

BSE-11**Name:** Mathys, Elena**Project Title:** *Optimization of Antigen Removal in Porcine Osteochondral Cores***Major:** Chemical Engineering**Faculty Advisor, Affiliation:** Steve Elder, Agricultural and Biological Engineering**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: A porcine osteochondral xenograft is a possible inexpensive treatment for cartilage lesions, but must undergo a rigorous process to extract antigens to combat immune rejection of the graft. Although these treatments remove most of the antigens they are time and resource consuming. The purpose of this investigation is to optimize the process of removing DNA and glycosaminoglycan (GAG), in terms of minimizing reagents and the duration of processing, and also to determine the effect of the optimal process on the cartilage's compressive resistance. Throughout the investigation, 72 porcine osteochondral plugs [5.0mm] from the pig stifle joint will be placed in different concentrations of sodium dodecyl sulfate [0.5%, 1.0%, 2.0%] (to extract GAG) or DNase [2.0 mg/mL, 4.0 mg/mL, 6.0 mg/mL] (to eliminate DNA) over a period of 72 hours. Samples will be periodically removed every 24 hours and tested for remaining DNA and GAG by the Hoechst and dimethylmethylene blue dye-binding assays, respectively, and will be compared to untreated porcine osteochondral plugs. Minimal effective concentration/duration combinations for each reagent will then be combined to determine if there are any interactions between the SDS and DNase, and the impact of this optimal protocol on the mechanical properties determined by unconfined compression testing. It is expected that the treatment in the SDS and DNase should be successful in removing a majority of the DNA and GAG, which is expected to significantly lower the tissue's compressive resistance.

BSE-12**Name:** McArthur, Kelsey**Project Title:** *Phenotypic Switch of Vascular Smooth Muscle Cells in Vascular Calcification***Major:** Biochemistry**Faculty Advisor, Affiliation:** C. LaShan Simpson, Biological Sciences**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: One of the leading causes of death in patients with kidney disease or diabetes is cardiovascular complications. Past studies considered vascular calcification a passive process that resulted from elevated calcium-phosphate interactions. However, it is now considered an active cell-mediated process. This occurs through competition of proteins that promote calcification and inhibitors which cause arteries to harden. Current research has shown that these arteries harden analogously to bone development. It has been suggested that smooth muscle cells (SMC) in healthy arteries experience a genetic switch to osteoblast-like cells when exposed to high levels of glucose, calcium, phosphate, and cholesterol. While many researchers have recognized this anomaly, the molecular and cellular mechanisms that facilitate calcification remains unclear. Our in vitro model was developed to prompt vascular calcification and distinguish the phenotypic switching from healthy smooth muscle cells to osteoblast-like cells. Our goal is to use this in vitro model to examine the increase of bone markers like osteopontin and BMP-2 through western blotting. Future studies include examining the signaling pathways that lead to this phenotype switch and exploring interventions to prevent this phenomenon.

PSE-08**Name:** McCandless, Martin**Project Title:** *A Balloon Payload for the Observation of a Solar Eclipse***Major:** Aerospace Engineering**Faculty Advisor, Affiliation:** Keith Koenig, Aerospace Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

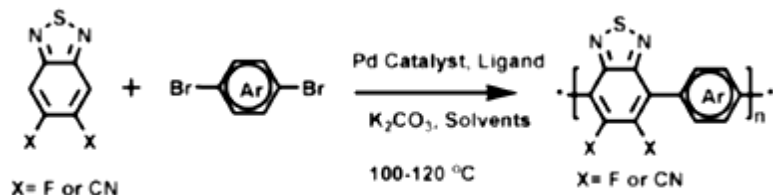
Abstract: The poster describes a balloon-satellite system (balloon-sat) whose mission is to take photographs of the 2017 Solar Eclipse. The balloon-sat design is based on the CubeSat pico-satellite standard in order that it may serve as a prototype for a future orbital vehicle. The structure and many of the components are 3-D printed in-house, and the electronics subsystems are also assembled in-house. The vehicle is arranged in the form and size of a 2U CubeSat design, that is, it has a 10 cm by 10 cm cross-section and is 20 cm tall. The lower 1.5 U section (15 cm height) serves as the service module and houses the communication, computer and data handling, navigation, attitude control, thermal control, descent control, power and payload support subsystems. Fixed and deployable solar cell array panels are mounted on the outside of the service module. This section also contains sensors to monitor internal and external environmental properties. The upper 0.5 U section is the payload module. The payload module housing is a rotating turret that permits a camera to be pointed at the Sun, independent of the orientation of the service module. The payload module contains two cameras, an adjustable optical filter system, the turret rotation drive, sun sensors and auxiliary power and electronics. A release mechanism is integrated in the second section allowing for immediate separation from the balloon and parachute in the event of an emergency. Prior to launch, tracking software will be used to predict the location of the balloon's path based on atmospheric sounding data gathered by the National Oceanographic and Atmospheric Administration from specific locations across the United States. The objectives and justification of the mission are outlined in the poster containing mission scenario, simulations confirming feasibility and discussions on assumptions made for the mechanical design.

PSE-09**Name:** McDonald, Tyrone**Project Title:** *Molecular Dynamics Fatigue Simulation of Polyethylene: Irreversible Damage using an Energy Based Approach***Major:** Mechanical Engineering**Faculty Advisor, Affiliation:** Dr. Tonya Stone, Mechanical Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Molecular Dynamics (MD) simulations were performed to study the effect of external loading on the cyclic stress strain responses and the dissipated strain energy in polyethylene (PE) polymer for fatigue life prediction. Because the mechanical properties of polymers are sensitive to the morphology of their molecular chains during loading, MD simulations provide an excellent opportunity to investigate the small scale phenomena within their internal structure due to fatigue. In this work the amorphous PE models contained ten chains consisting of 1000 monomers each and were subjected to a four-step thermal relaxation process including a final hold temperature at 100 K. Following relaxation, fatigue simulations consisting of strain-controlled sinusoidal loading at strain amplitudes up to 0.15 were performed on the models. Preliminary MD studies confirmed the simulations were able to produce similar behavior to experimental results, like hysteresis loops in the stress-strain curve. By measuring the area within the hysteresis loops, the plastic strain energy density dissipated (which is proportional to irreversible damage) in each cycle of loading was determined and compared with experimental results.

PSE-10**Name:** Mckinnon, Sam**Project Title:** *Synthesis of Silole monomers for use in the Direct Arylation Polycondensation with Benzothiadiazole.***Major:** Chemistry**Faculty Advisor, Affiliation:** Colleen Scott, Chemistry**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: The field of material science has shown an interest in π -conjugated polymers with electron poor moieties. These species have exhibited good optoelectrical properties and show promise for new research as photovoltaic devices. The synthesis of highly conjugated compounds requires the ability to bond two or more aromatic systems together, commonly achieved by transition metal based cross coupling reactions. These methods are typically not only lengthy and cumbersome, but low yielding in the case where one substituent is an electron withdrawing group. Direct arylation provides a new way form a bond between two aryl species as a means to generate a conjugated polymer without the need for multiple reaction and purification steps or the generation of toxic byproducts. Even more advantageous is the ability to use one activated and one deactivated monomer with efficient conversion to the polymer. This summer, we will synthesize a silole compound for use as a monomer in the direct arylation polycondensation reaction with the electron deficient difluorobenzothiadiazole (DFBT) to form polymers. The starting material for the synthesis of the silole is diethyl malonate which will be built up to the silole moiety containing thiophenes at the 2,5- positions. The synthesis will employ several different organic synthetic transformations and the products will be purified using the corresponding isolation techniques. Following this synthesis of the silole ring, containing thiophenes at the 2,5 positions, the thiophene moieties will be further brominated for participation in the Direct Arylation Polycondensation (DARp) reaction with the electron deficient DFBT to yield the polymer for use in research.

**BSE-13****Name:** Mendis, John**Project Title:** *Characterization of the Unique Viscoelastic Property of Aortic and Pulmonary Valve Leaflets***Major:** Chemical Engineering**Faculty Advisor, Affiliation:** Jun Liao, Agricultural and Biological Engineering**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Understanding the biomechanical behavior of aortic and pulmonary valve leaflets can provide solid groundwork for surgical repairing and creating better models of the heart. This investigation will characterize the viscoelastic properties of aortic and pulmonary valve leaflets via uniaxial testing. Both types of leaflets were from hearts of ~6 month old pigs and obtained from a local abattoir. The leaflets were dissected into 18mm x 4mm dog-bone shapes. Using a uniaxial mechanical testing machine submerged in a 1X PBS solution, the leaflets were loaded to 200 grams. After preconditioning, the samples were subject to stress relaxation, creep, and failure testing. Preliminary results show that both pulmonary and aortic valves, as previously seen in mitral valve leaflets, have typical stress relaxation behavior, while exhibiting extremely low levels of creep. This investigation is ongoing and additional testing be conducted in order to refine conclusions.

BSE-14**Name:** Mooney, Colt**Project Title:** *Activity Patterns and Emergence Times of Cavity Dwelling Bats***Major:** Wildlife & Fisheries Science/Conservation Law Enforcement**Faculty Advisor, Affiliation:** Scott A. Rush, Wildlife, Fisheries, and Aquaculture**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Bats are an important component of biodiversity and play a significant role in the health of an ecosystem. Basal tree cavity dwelling bat species (*Myotis austroriparius* and *Corynorhinus rafinesquii*) maintain the ecosystem by consuming insects and distributing nutrients. To better understand what factors drive bat activity, we investigated bat roost emergence and return times from April to June 2016 at Sam D. Hamilton Noxubee National Wildlife Refuge using ultrasonic echolocation recorders. We used linear models of environmental factors (sunrise, sunset, twilight, lunar phase, and precipitation) as possible predictors of emergence and return times. We found evening emergences and morning return times were influenced by lunar phase (illumination). Our findings indicate bats emerged earlier in the evening and returned to roost earlier in the morning when the moon was at full, compared to less illumination at new moon. We conclude that emergence and roosting activity are likely influenced by food availability, predator avoidance, and demands of raising offspring which are affected by moon illumination.

PSE-11**Name:** Myers, Jaylin**Project Title:** *Investigation of bainitic advanced high strength steel heat treatments***Major:** Chemical Engineering**Faculty Advisor, Affiliation:** Hongjoo Rhee, Associate Director at CAVS**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: The automotive industry's constant evolution challenges engineers to produce new materials to meet safety and fuel economy standards from the National Highway Traffic Safety Administration (NHTSA) and the Department of Energy (DOE), respectively. The development of next generation advanced high-strength steel (AHSS) will enable engineers to meet the requirements for safety, emissions, efficiency, manufacturability, durability, and affordability. Next generation AHSS will provide materials that are highly formable for stamping procedures but manufacturable at a low cost. A novel bainitic grade alloy was cast using a vacuum induction melt furnace to provide clean steel with precise alloy content. The cast ingot was processed with two heat treatments to compare the effect of the treatments on the resulting steel properties. Mechanical testing was completed as well as metallographic assessment to determine the mechanical properties and microstructure of the steel. Results show success in producing steel with properties near the government's goals of 1500 MPa tensile strength and 25% elongation.

BSE-15**Name:** Nunes, Lydia**Project Title:** *Quantitative analysis of retrograde signaling in select Rtg2p mutants of S. cerevisiae***Major:** Microbiology**Faculty Advisor, Affiliation:** Donna Gordon, Biological Sciences**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: In the budding yeast *Saccharomyces cerevisiae*, dysfunctional mitochondria can initiate a mitochondria-to-nuclear signaling cascade known as retrograde signaling. This pathway offers a means to compensate for mitochondrial deficiencies by initiating the transcriptional upregulation of select genes, such as *CIT2*. *CIT2* codes for a peroxisomal isoform of citrate synthase and is transcribed at an elevated level in cells with mitochondrial defects. *CIT2* expression is regulated by the activity of several cytosolic proteins including Mks1p, Rtg1p, Rtg2p, and Rtg3p. Rtg2p functions as the cytosolic sensor that, when bound to Mks1p, allows the Rtg1p/3p complex to enter into the nucleus. Nuclear localized Rtg1p/3p then functions as a transcriptional activator, binding to a conserved DNA sequence found in the promoter of select genes including *CIT2* and *ACO1*. Using a random chemical mutagenesis approach, our lab has generated four *RTG2* mutants that each contain a single amino acid change that results in reduced retrograde signaling. To expand on the qualitative differences in Rtg2p signaling function identified through the use of growth on selective plates, quantitative data will be obtained using classic promoter driven β -galactosidase liquid expression assays. For these studies, the β -galactosidase gene, *lacZ*, will be placed under the *CIT2* promoter in strains that express each of the Rtg2p mutations. Cells will be grown in non-inducing (+ glutamate) and inducing (-glutamate) conditions and the impact of each mutation on Rtg1p/3p transcription will be quantified. The resulting β -galactosidase activity will be normalized to the wild-type Rtg2p expressing strain under non-inducing conditions. Differences in transcriptional activities will be confirmed by real-time PCR targeting known retrograde signaling transcripts.

BSE-16**Name:** Nutter, Chris**Project Title:** *Investigating a role for cellular iron in Saccharomyces cerevisiae sensitivity to the antifungal occidiofungin***Major:** Biochemistry**Faculty Advisor, Affiliation:** Donna M Gordon, Biological Sciences**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Occidiofungin is a novel antifungal compound that is secreted by the microbe *Burkholderia contaminans* MS14. Occidiofungin has been shown to have fungicidal properties against various fungi including the nonpathogenic budding yeast, *Saccharomyces cerevisiae*. Previous work in the lab has shown that altered environmental conditions can influence *S. cerevisiae* sensitivity to occidiofungin. For example, phosphate depleted conditions or elevated calcium levels induce occidiofungin resistance while limiting carbon conditions result in enhanced occidiofungin sensitivity. Since iron plays an essential role in fungal cell growth and phosphate levels have been shown to influence iron uptake, we were interested in investigating the impact of altered environmental iron levels on occidiofungin bioresponse. To monitor cellular response to iron, an epitope tagged version of Fre2p was generated using homologous recombination. *FRE2* codes for a multispinning transmembrane protein with iron reductase activity. Free extracellular Fe(III) are typically bound in siderophores, and reduced to Fe(II) by Fre2p activity for cellular uptake by the Fet3p/Ftr1p transporter. Low intracellular iron conditions have been shown to induce *FRE2* expression, with *FRE2* transcription dropping once the level of bioavailable iron has increased. Using Fre2p:HA3 protein levels as a reporter for iron sensing, the impact of altered iron availability on occidiofungin response will be examined by monitoring minimum inhibitory concentration (MIC) and colony forming units (CFU). Results from this work will increase our understanding of cellular pathways that, when altered, induce changes in occidiofungin sensitivity. This information will be useful in characterizing the fungal response to occidiofungin in addition to assisting with the identification its cellular target.

BSE-17**Name:** Offiah, Ursula**Project Title:** *Fluorescent Imaging of Calcifying Vascular Smooth Muscle Cells***Major:** Biological Engineering**Faculty Advisor, Department:** C. Lashun Simpson, Agricultural and Biological Engineering**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: The deposition of calcium into the blood vessel structure known as vascular calcification occurs when vascular smooth muscle cells (VSMCs) take on the characteristics of Osteoblast cells. Vascular calcification has not been fully understood. The need to study prevention and/or reversal methods of vascular calcification is of prime importance. The fluorescent stain, Xylenol orange stains calcium mineral and could distinguish new osteoblast-like cells from normal Vascular smooth muscle cells. Cells will be grown in a calcification media containing dibasic sodium phosphate, a calcification inducer. The xylenol orange fluorescent stain will then be used to identify mineral deposits. The stain will highlight the calcified areas in the cell culture, as well as show how quickly the phenotypic change occurs once the calcification media is added. In future studies we will use our findings to understand the factors that play a role in changes of vascular smooth muscle cells to osteoblast-like cells.

BSE-18**Name:** Parrish, Megan**Project Title:** *Induced Variations in Nanometer-Scale Features and Crystal Morphology in Calcium Carbonate Precipitates***Major:** Chemical Engineering**Faculty Advisor, Affiliation:** Brenda Kirkland, Geosciences**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

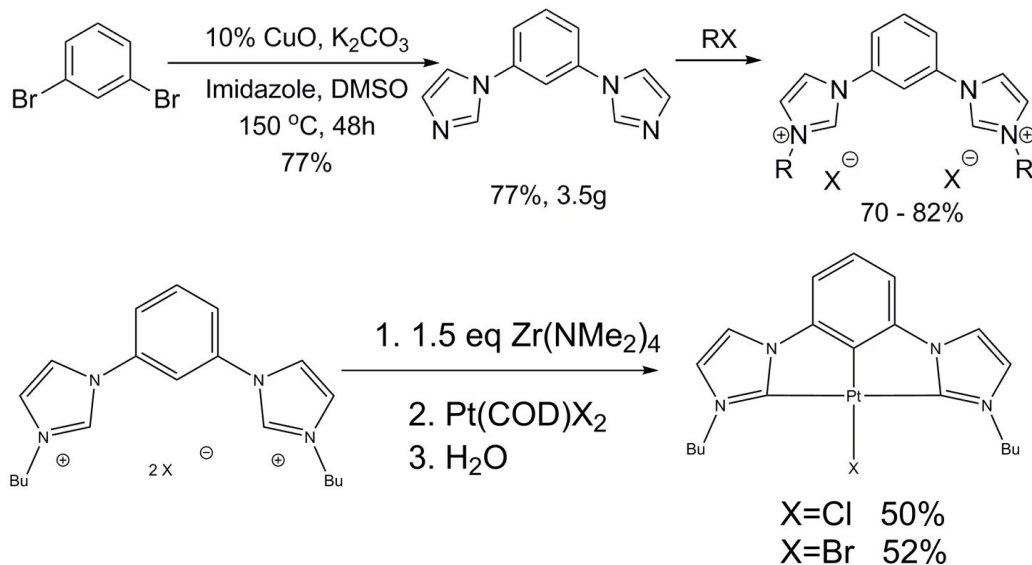
Abstract: This research explores the relationship between calcium carbonate and organic compounds. The objective is to create carefully controlled precipitates in the lab and use them to identify similar structures found in nature in rocks and other precipitates. The hypothesis tested was that organic compounds would influence the morphology of crystals in the early stages of precipitation. Separate sterilized beakers containing calcium carbonate and sterile water were placed in an Air Clean hood with different organic compounds (palmitic acid and urease in separate beakers) for 12, 24, 48, 72 and 96 hour durations to allow the growth of CaCO_3 crystals in the form of calcite (rhombohedral crystals) or aragonite (acicular, needle-like crystals). After 12 hours, samples containing palmitic acid showed 2-micron long crystal shapes termed fuzzy dumbbells. After 24 hours, control samples showed rhombohedral calcite crystals and abundant spherical proto crystals; samples containing urease showed inter-grown rhombohedral calcite and acicular aragonite needles, composed of nanometer-scale spherical structures, sometimes dendritically branched, forming fan shapes or large botryoidal mineral shapes. Samples containing palmitic acid showed larger, 200- micron, rectangular elongate shapes and large calcite crystals with organic material scattered on the surface. After 48 hours, one control sample showed smooth surfaces on rhombohedral crystals with no visible proto crystals. Samples containing palmitic acid showed rhombohedral crystals and abundant irregular textures unlike any mineral. One sample containing urease showed clusters of rhombohedral structures coated in organic material. One 72-hour and one 96-hour control sample showed abundant proto crystals collected into rhombohedral-shaped clusters. The images created will be used to interpret rocks formed in natural environments from the Caribbean and hot spring precipitates. A greater understanding of the relationship between organic compounds and CaCO_3 precipitates has potential applications in many industries, medicine, and the search for extra-terrestrial life.

PSE-12**Name:** Paul, Allyssa**Project Title:** A Comparison Study of Hierarchical Connectivity in Multilevel Design Optimization**Major:** Mechanical Engineering**Faculty Advisor, Affiliation:** Masoud Rais-Rohani, Aerospace Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: The task of designing and optimizing modern large-scale engineering systems composed of numerous design variables and design constraints is often too complex to be approached as a single monolithic problem. In multi-level design optimization, large-scale design problems are made more readily solvable by decomposing the original problem into a multi-level hierarchy of smaller sub-design problems. Here the original set of design variables and constraints are distributed amongst sub-problems, reducing the design problem dimensionality on a per sub-problem basis. How to efficiently develop and coordinate hierarchal arrangements of sub-problems is the focus of this study. This research examines the computational performance of alternatively formatted, multilevel hierarchical structures utilizing Analytic Target Cascading (ATC) coordination for solving large-scale optimization problems. Numerical behavior is studied (via MATLAB) by solving an analytical optimization problem that is restructured so as to take the form of several different hierarchical configurations. By assessing and comparing the numerical behavior and solution process across hierarchies, increased insight into effects of connectivity on the optimization solution process are determined. In addition, this study shows that the ATC coordination methodology is versatile and able to perform coordination for uniquely formatted hierarchies, thereby increasing its applicability to a broader range of complex engineering design problems.

PSE-13**Name:** Pearlman, Reid**Project Title:** metalation/transmetalation of the pincer CCC-bis(NHC) ligand**Major:** Chemistry**Faculty Advisor, Affiliation:** Charles Webster, Chemistry**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: The metalation/transmetalation of the pincer CCC-bis(NHC) ligand has proven highly successful for almost every group in the transition metal series. These organometallic compounds show promising potential as engineering materials for the improvement of photovoltaic efficiency. The CCC-NHC platinum complexes are of particular interest as they emit blue light, a much needed color for organic light emitting diodes (OLEDs). Organic LEDs are composed of thin films of organic molecules which emit light upon the application of electricity. Organic LED screens boast brighter, crisper displays on electronic devices and additionally they consume less power than conventional light-emitting diodes (LEDs) and liquid crystal displays (LCDs). These compounds have been relatively easy to synthesize in the lab and are possible to produce in high yields.



BSE-19**Name:** Price, Cody**Project Title:** *Elucidating Structure in the Early Stages of Aggregation in Elastin-Like Proteins***Major:** Chemistry**Faculty Advisor, Affiliation:** Nick Fitzkee, Chemistry**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Elastin-Like Proteins (ELPs) have been proposed as a novel drug delivery vector for treating cancer. These proteins aggregate reversibly above a specific temperature, allowing ELPs to be thermally targeted to cancerous tumors. Though proven successful in mouse models, without a molecular understanding of how ELPs aggregate, it remains extremely difficult to optimize these molecules for drug delivery in humans. Our hypothesis is that ELPs have a close interaction between the Nitrogen/Carbon-termini in the ELP's aggregated phase. Using dynamic light scattering, Electron Paramagnetic Resonance (EPR) and multi-dimensional Nuclear Magnetic Resonance (NMR) we have begun characterization of the temperature dependent transition in our ELPs. In addition, we have labeled our protein using MTSL, a paramagnetic spin label that allows us to monitor protein association at a genetically specified cysteine location. Our dynamic light scattering experiments confirm that aggregation is occurring on the macromolecular scale for each variant. Preliminary EPR results indicate that the protein termini are associating at the early stages of aggregation. This is supported by the observation that the EPR spectra of a mixture of terminal cysteine-MTSL variants A4C+A4C, T204C+T204C, and A4C+T204C each possess an additional peak by which Markham et. al.¹ state is indicative of electronic dipolar interactions. Other mixtures of variants including T44C+A84C, and A84C+A84C do not show this additional peak. In the near future we intend to complete EPR and NMR experiments on every mixture of variants, and draw conclusions based on these results. 1: Markham G. D., Myers C. B., Harris K. A., Volin M., Jaffe E. K. *Protein Science*. 1993; 2(1): 71-9.

PSE-14**Name:** Quinn, Thomas**Project Title:** *Effects of Agitation on Crystal Size and Aspect Ratio***Major:** Chemical Engineering**Faculty Advisor, Department:** Priscilla Hill, Chemical Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Many pharmaceutical industries utilize stirred crystallization vessels as the primary method of solid production. Agitation allows for better heat transfer and greater levels of uniformity with regards to crystalline structure and size—thus a more consistent product. For crystals with higher aspect ratios, agitation can result in breakage that can affect the physical properties by changing the size and shape distribution of the product. Given the precision required by pharmaceutical industries, it is necessary to understand the effect of agitation on crystal breakage. This research investigates these effects by first producing paracetamol crystals with aspect ratios higher than two. The major axis, minor axis, aspect ratio, and perimeter are measured using a microscope and image analysis software. Once crystals are produced and characterized, the crystals are stirred in a non-solvent at an agitation rate scaled to mimic industrial impeller tip speeds. Post-agitation characterization of crystals is performed to investigate and quantify the fracturing and breakage of the paracetamol crystals.

PSE-15**Name:** Qusialah, Abdullah**Project Title:** *stimuli responsive polymers***Major:** Chemical Engineering**Faculty Advisor, Affiliation:** Keisha Walters, Chemical Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Chemical has been involved in many applications and have helped people to solve many problems that they are facing every day. One of these chemicals are polymers. Polymers are chemical compound that are formed from two or more polymeric compounds. Polymers are formed by a chemical process that is called polymerization, which is a process that occurs when having repetitive chemical bonds of monomers. Polymerization process occurs in many forms. For example, some polymers are formed when the entire monomers are joined together while others are formed when some portions of monomers are connected as chains. Also, polymers can react with other polymers forming a new type of polymers which is called co-polymers. Co-polymers are important in people's life and they are used in many applications such as Tissue engineering scaffolds, wound dressing, homeostatic devices, sensor devices, electrical conductor, optical applications, martial reinforcement, productive clothing, and filter media. They are also used in medical application. Purpose of the project The purpose of this project is to synthesis a stimuli respond polymer- which responds to temperature and pH variations-that would be used in biomedical applications. What are stimuli-Responsive polymers and how are they used in medicine? Stimuli-Responsive polymers or smart polymers are high-performance polymers that are affected by the surroundings. They can change according to their pH, temperature around, humidity, magnetic field and the intensity of light. The properties of these smarts polymers are so sensitive to the environment. Based on the article of Polymers for Drug Delivery, "Stimuli-responsive polymers have been widely employed to enable targeted delivery and controlled release in response to changes in their environment. Stimuli-responsive polymers undergo rapid changes in their microstructure from a hydrophilic to hydrophobic state, triggered by external stimuli, including heat, pH, and ionic strength. Drug delivery systems (micelles, microgels, and hydrogels) composed of responsive polymers release the drug during the collapse and expansion of the network in the aqueous environment. Fig.5 Smart Polymers and their different response to different environmental trigger One of the medical diseases that people has been suffering from is Heart attack. Heart attack is caused by a block in the heart artery that is caused by a chemical component-CaP. . Heart attack is caused when the flow path of the oxygen becomes blocked and the oxygen cannot reach to the heart muscles. This block is usually caused by damage of the blood vessel, and these vessels are damaged by calcium phosphate (Cap). Fetuin-A is a blood protein, which is made in the liver and secreted into the bloodstream. Fetuin-A is a multifunctional liver-derived protein found in high concentrations in human serum. Fetuin-A can slow down the uptake of CaP crystals by blood vessel cells, reducing the release of calcium ions and protecting against damage. . This block can be broken down by Fetuin-A. By reacting a SRPs and Fetuin-A, it would be easy to deliver the Protein to the right site. In this project we have synthesized polyitaconic acid (PIA), PtBA-2NH₂, and we are going to extend this work to synthesized PNIPAM-PIA-PNIPAM

BSE-20**Name:** Recinos, Ruth**Project Title:** *Sterilization Effects of Osteochondral Xenografts***Major:** Biological Engineering**Faculty Advisor, Affiliation:** Steve Elder, Agricultural and Biological Engineering**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: The purpose of this research was to investigate and compare two different methods of sterilizing osteochondral xenografts. There were two main parts to the research, the first part investigated the effect that the sterilization agents had on the cross linking of osteochondral xenografts. Crosslinking is important for osteochondral xenografts because it will have greater mechanical strength, resistant to enzymatic degradation, and reduced immunogenicity. This study used genepin and epigallocatechin gallate to crosslink decellularized porcine articular cartilage plugs. Genepin is a chemical found in Gardenia jasminoides Ellis fruit, and epigallocatechin gallate is found in green tea. The second part waste see the sterilization capabilities of each method. The methods used in this research were a peracetic acid/ethanol mixture and hypochlorous acid (HOCl) dissolved in water. Paracetic acid/ethanol mixture is inexpensive and easily obtained in any laboratory, but our preliminary studies suggested that it interfered with crosslinking. Hypochlorous acid is typically associated with superoxidize water produced by passing low-voltage electricity through saltwater. In our case a special solid formulation obtained from ECA Water Systems (ECA 100) dissolves to form HOCl in aqueous solutions. Degree of croslliking after sterilization was investigated using the ninhydrin assay. Results show that peracetic acid/ethanol interferes with crosslinking to a much greater extent than ECA 100. A experiment to determine the efficacy of the sterilization methods to eliminate e. coli from osteochondral tissue is in progress. The results of this research could be used to find the optimal method of sterilizing osteochondral xenografts without affecting crosslinking.

PSE-16**Name:** Riley, Kathleen**Project Title:** *Transition Metal Catalyzed Nitrene Transfer Reactions of Olefins using PhINTs***Major:** Chemistry**Faculty Advisor, Affiliation:** Joseph P. Emerson, Chemistry**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Transition metal-catalyzed nitrene transfer reactions of olefins provide efficient ways to construct new carbon–nitrogen bonds. Herein we report several transition metal complex's [(PMDETA)Cu(O3SCF3)2] (1), [(PMDETA)Fe(O3SCF3)2] (2), and [(PMDETA)Cu(O2CCF3)2] (3) which mediate nitrene transfer from PhINT's to olefins to form N-tosylaziridines in good yields. The catalytic amounts of complex's 1-3 (0.5 mol %) are on the order of magnitude less than is required for other copper catalysts, such as [Cu(acac)2]. Nitrene transfer reactivity has also been observed with substituted styrenes, internal and terminal aliphatic olefins, suggesting that complex 1-3 may be a general nitrene transfer catalyst for use on organic synthesis.

SS-04**Name:** Roshelli, Elizabeth**Project Title:** *Populations in Flux: An Analysis of Broadcast and Web-based News Presentations of the Migration Crisis in Russia***Major:** Communications/Public Relations**Faculty Advisor, Affiliation:** Skye Cooley, Communications**Project Type:** Poster**Project Category:** Social Sciences

Abstract: This paper explores Russian web-based and broadcast news media sources using the Broadcast Monitoring System (BMS) and the Web Monitoring System (WMS) from Texas A&M University. This paper examines the way in which the Russian media portrays the migrant crisis and the effect this portrayal of the crisis has on the Russian populace. For this analysis framing theory and rhetorical theory are referenced when developing the narrative formed out of the web-based and broadcast news media. This paper was written as part of a larger collaborative effort on the Russian "Gray Zone" with the Department of Defense and in collaboration with Texas A&M University. This paper identifies the way in which the Russian news media has utilized framing theory and rhetorical theory to effectively shape the conversation had amongst the Russian populace regarding the nature of the migrant crisis in relation to the strength of the ruling regime in Russia for the benefit of the Russian government.

PSE-17**Name:** Saucier, David**Project Title:** *Multi-UAV Path Planning and Random Map Generation***Major:** Computer Engineering**Faculty Advisor, Affiliation:** Chris Archibald, Computer Science and Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Path planning algorithms for multiple UAVs have been explored for various disaster relief situations. One particular application is scanning every road in a designated area to see if there are any potential hazards. This issue is investigated in the context of the k-Rural Postman Problem, where there are a set of required edges to visit by a "k" amount of agents, but any edge can be traversed by any agent for the sake of optimization. The agents, which represent UAVs, are coordinated to traverse across each required edge in the graph in the shortest amount of time. In particular, a clustering algorithm was used in combination with several path optimization algorithms to navigate a given map. Part of this research also entailed investigating random map generation through application of the Erdos–Renyi model.

PSE-18**Name:** Scoggin, Aaron**Project Title:** *Nanoprecipitation of a Poorly Water Soluble Compound: Oil Red O Nanocrystals***Major:** Chemical Engineering**Faculty Advisor, Affiliation:** Priscilla Hill, Chemical Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Nanoprecipitation of a Poorly Water Soluble Compound: Oil Red O Nanocrystals Abstract: Many pharmaceuticals are poorly water soluble compounds that are difficult to formulate. Poorly water soluble drugs are less investigated than water soluble drugs because they are more difficult to work with. One solution is to create nanoparticles of a poorly water soluble compound so that it can be formulated as a dispersion. Nanoparticles are also getting more interest because they increase the bioavailability of poorly water soluble drugs. Oil Red O (ORO) was used as a model compound in these studies because it is poorly water soluble. The process used was the bottom-up method of solvent – non-solvent (S:NS) precipitation, more specifically nanoprecipitation, using PVP as a stabilizer. Various operating parameters were studied including the choice of solvent, the S:NS ratio, the ORO concentration in the solvent, the PVP molecular weight, and the ORO to PVP ratio. TEM images show how these operating parameters affected the particle size and shape.

BSE-21**Name:** Seibold, Nicole**Project Title:** *Gelatin Hydrogel Fabrication for Vascular Disease Models***Major:** Chemistry**Faculty Advisor, Affiliation:** Renita Horton. Biomedical Engineering**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: *In vitro* models must adequately recapitulate *in vivo* microenvironment features such as cellular composition, biomolecules, and mechanical properties of organ tissues in the body. Mechanotransductive cues between cells and the cellular environment influence cellular behavior. In this study, we fabricated and tested the mechanical properties of gelatin hydrogels with the goal of matching the *in vivo* modulus of specific organs such as the heart and lungs for use in *in vitro* models of cardiovascular diseases. The mechanically tunable hydrogel scaffolds are fabricated by cross-linking gelatin with microbial transglutaminase at a 10:1 ratio in phosphate buffered saline. This solution is then poured into polyvinyl chloride molds and allowed to crosslink at 4 °C and 37 °C. The Mach 1 Micromechanical System is used to perform a stress relaxation test on the gels, and the stress, strain, and modulus are calculated using the raw data obtained from the Mach 1. The hydrogels are tested at 0, 24, 48, and 96 hours of exposure at 4 °C or 37 °C. Polydimethylsiloxane is also tested and compared to its literature value, acting as the control group for the experiment. We will determine the effects of gelatin concentration and temperature exposure time on the gel modulus. Because gelatin is a derivative of collagen, these hydrogels are suitable for cell culture and can be used in a variety of applications such as microfluidic-based cardiovascular models.

PSE-19**Name:** Shepherd, Brandon**Project Title:** VALIDATION OF A FITLIGHT SHOOTING PROTOCOL TO IDENTIFY OFFICER RESPONSE TO FATIGUE**Major:** Physical Education/Kinesiology**Faculty Advisor, Affiliation:** John Eric Smith, Exercise Physiology**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: This study was created to establish a Target Assessment, Action, and Accuracy Protocol (TAAAP) to assess police officer's decision making and shot accuracy in a more dynamic environment than the traditional qualification protocol. Five firing lanes, 1.22x6.09m were arranged with three illuminated targets in each bay, placed at various distances (1.82m, 2.13m, 2.44m, 4.27m, 4.88m, and 6.09m), each .20m or .30m from the sides of the bay, with a signaling light to assess progress prior to each bay. The target lights had a possibility of illuminating five different colors, of which yellow and purple were classified as hostile. At the end of the fifth bay the officers were instructed to perform a magazine change and change directions, engaging bays again as they returned to the start position of the protocol. This created a total of nine shooting bays. Each bay had the possibility of having one, two, or no hostile targets. Two alternative illuminations also occurred where one bay would present itself as non-hostile and quickly change to including a hostile target, and where one bay would illuminate one hostile target, that when engaged, would reilluminate as hostile as if it still presented a threat. A general shooting qualification test was also given. Time penalties were distributed for misses, latent responses, and non-hostile targets hit. Participants took part in five trials. Two visits included a fatiguing protocol; one for the TAAAP sequences and one for a general shooting test. The fatiguing protocol occurred on a treadmill where speed and grade were increased until volitional fatigue was reached. Officers were evaluated on decision-making, speed of engagement, and accuracy. Our hope for this study is to create a more dynamic protocol design that stresses the multifactorial situation officers are faced with during qualification.

BSE-22**Name:** Simpson, William Tigrett**Project Title:** Growth phase dependent sensitivity of *C. albicans* to the novel antifungal occidiofungin**Faculty Advisor, Affiliation:** Donna M Gordon, Biological Science**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: There has been a major push to educate the public, and physicians alike to the present and future dangers of antibiotic resistant bacteria. However, the potential for resistance to the current first-line antifungals is just as real. Several fungal species (e.g. *Aspergillus* and *Candida*) no longer respond to antifungal treatments currently being used. This emerging phenomenon is known as antifungal resistance, and it is of considerable concern when treating invasive infections. The aim of this project was to build upon the current findings related to the characterization of the novel antifungal occidiofungin with the goal of better understanding its mechanism of action against *C. albicans*. Occidiofungin is a cyclic glycolipopeptide that was isolated from the gram-negative bacteria *Burkholderia contaminans*. Unlike the current antifungals compounds, occidiofungin does not bind to ergosterol, inhibit the activity of enzymes involved in ergosterol biosynthesis, or target glucan synthase. Through an unknown mechanism, occidiofungin has been shown to induce apoptotic death. Previous work in the lab using the nonpathogenic yeast *Saccharomyces cerevisiae*, had shown that cells that had entered quiescence were resistant to the fungicidal activity of occidiofungin. The present research aims to extend these findings into the pathogenic fungi *C. albicans*. Although *C. albicans* have not been shown to have a quiescent stage of growth, after 2 days of growth in liquid cultures, *C. albicans* acquires both thermotolerance and resistance to hydrogen peroxide stress, both hallmarks of a quiescent state for *S. cerevisiae*. The sensitivity of these cells to occidiofungin will be determined using both spotting assays and colony forming unit (CFU) measurements. By identifying cellular pathways and environmental condition that result in altered sensitivity to occidiofungin, potential pathways of resistance to this antifungal can be identified.

BSE-23**Name:** Smith, Ciarra**Project Title:** *Episodic Memory Disruption Induced by T. Gondii Infection on Nurr1 Transgenic Mice***Major:** Biochemistry**Faculty Advisor, Affiliation:** Jeffrey Eels, Basic Sciences**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Infection with the protozoan parasite *Toxoplasma gondii* as well as alterations in the transcription factor Nurr1, necessary for mesencephalic dopamine neuron development, have both been linked with an increased risk of schizophrenia and other mental illnesses. This protozoa forms bradyzoite cysts in the central nervous system where it is believed to have some affect in altering neurotransmitters, including dopamine. Previously, we have shown that nurr1-null heterozygous (+/-) mice have altered dopamine related behaviors which are enhanced by infection with *T. gondii*. As schizophrenia appears to involve an interaction between genetic predisposition and environmental factors, we are investigating the effects on *T. gondii* infection in +/- and nurr1 wildtype (+/+) mice. The mice were tested on open field activity, attraction/aversion to bobcat urine, novel object recognition, prepulse inhibition, spatial memory in the Barnes maze, anxiety in an elevated zero maze and spontaneous alternation in a Y maze. The results for the elevated zero maze and novel object recognition will be discussed here. In the elevated zero maze, both genotypes of *T. gondii* treated mice spent about the same amount of time out in the open as their control counterparts. All groups averaged the same number of entries into the open space but the *T. gondii* treated mice averaged a larger number of head dips out of the closed space. The novel objection recognition tests episodic memory by measuring the time a mouse explores a novel object relative to a familiar object that was presented to the mouse five hours earlier. We found the *T. gondii* infected mice spent less time interacting with the novel object relative to the familiar object, suggesting a memory deficit with *T. gondii* infection. The results from these test suggests *T. gondii* infection can cause cognitive deficits similar to those expressed by individuals with schizophrenia.

AH-03**Name:** Smith, Jessica**Project Title:** *Determining Communications Needs for Mississippi's Agricultural and Natural Resources Organizations***Major:** Agricultural Information Science**Faculty Advisor, Affiliation:** Quisto Settle, School of Human Sciences**Project Type:** Poster**Project Category:** Arts and Humanities

Abstract: Introduction: Agriculture and natural resources are economically vital for Mississippi's financial livelihood. Communication is essential for the growth of the agriculture industry. An increasing gap exists between the agricultural and natural resources industries and the general public, policy makers, media organizations, and local communities. If there is a privation of understanding from these audiences, the achievements of agriculture and natural resources will be negatively impacted through misunderstandings that may unintentionally harm the industry.

Objectives: A unique opportunity exists within the state to cultivate a network of communicators within the agriculture industry who can share their knowledge and experiences to foster agricultural growth through communication across all sectors. The objective of this project is to gain insight on the communications needs within our organizations in the agriculture and natural resource industries, so we can find a solution to eliminating the communication gap that exists between producers and consumers.

Methods: A needs assessment survey was conducted of major agricultural and natural resource organizations throughout the state to determine the standing of communications needs in the industry. The survey was performed using Qualtrics and made available to 50 possible participants, with 13 valid respondents. The purpose of the survey was to qualitatively assess personal from these organizations on the value of communication within the industry and with the public.

Results: Respondents ranked audiences that their organizations communicated with the most: 61.5% (n = 8) of respondents communicate with other agricultural and natural resource organizations the most, followed by policymakers with 53.8% (n = 7) of respondents ranking it second. Regarding their organization's main communication goal, 61.5% (n = 8) of respondents answered internal audiences, while 46.1% (n = 6) respondents claimed the general public. Respondents also answered questions about the biggest issues and threats facing the industry, as well as the biggest opportunities for communication success.

Conclusion: Based on the results of the study, agriculture and natural resource organizations deem all issues important, and communication with all audiences need improvement. When comparing the greatest opportunities for communication success to each other, consumer education had the most responses. By educating the general public and consumers about the agriculture industry, the gaps in communication will slowly diminish.

BSE-24**Name:** Thompson, Robyn**Project Title:** *Effect of Body Condition Score on Expression of Regulatory MicroRNAs Involved in Skeletal Muscle Development and Composition in the Gluteus medius Muscle of Horses***Major:** Animal and Dairy Sciences**Faculty Advisor, Affiliation:** Derris Burnett, Animal and Dairy Sciences**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Body condition score (BCS) is an indicator of fat cover in horses and is used as a proxy for nutritional status and metabolic disposition. Muscle is a dynamic tissue involved in energy metabolism and overall metabolic flux. As such the tissue level activity of regulatory genes may be responsive to, or reflective of the overall metabolic disposition as determined by BCS. MicroRNA (miRNA) are small, non-coding RNA that regulate muscle growth and composition through the modulation of regulatory gene expression. Muscle is composed of muscle, fat, and connective tissue cells, and the relative proportions of these cell types determines the overall composition and metabolic activity of a given muscle. The objective of this study was to determine the relationship between BCS and expression of regulatory microRNAs in the gluteal muscle of horses. Samples of the Gluteus medius (GM) muscle were collected from 22 horses and subjected to total RNA isolation. Relative expression of the myogenic miRNAs miR-143 and miR-206, and the adipogenic miRNAs miR-133 and miR-130 was determined. Statistical analysis was performed using the GLIMMIX procedure of SAS 9.4 (SAS Institute Inc., Cary, NC.) and statistical significance was determined at $P \leq 0.05$. There were no differences ($P > 0.05$) in relative expression of the miRNAs investigated in the current study. The data indicated that within BCS group there was substantial variation which may have led to the lack of differences between groups. Future studies will investigate additional miRNAs related to energy and protein metabolism and determine if a relationship exists between their expression profile and BCS in horses.

PSE-20**Name:** Trinh, Kevin**Project Title:** *Rheology of Multi Wall Carbon Nanotubes Containing Fumed Silica Solutions***Major:** Mechanical Engineering**Faculty Advisor, Affiliation:** Santanu Kundu, Dave C. Swalm School of Chemical Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Shear-thickening Fluid (STF) has interesting properties including its sharp increase in viscosity beyond a critical shear rate. This shear-thickening property can be utilized in light-weight body armors or in shielding space crafts from high-velocity, micro meteorites. In previous studies, fumed silica dispersed in certain polymers has shown shear-thickening behavior. In this study, multi-wall carbon nanotubes (MWCNTs) are also added to the fumed silica solutions. MWCNTs are rod-shaped hollow tubes with notable tensile strength, which influence the mechanical properties of the solution. This study reports rheological behavior of both pristine and OH-functionalized, short and long MWCNTs in fumed-silica suspensions with various mass fractions (MFs). The preliminary results suggest that the addition of MWCNT in the fumed silica suspensions increases its initial viscosity; nonetheless, the addition of the tubes effect the shear-thickening responses significantly.

PSE-21**Name:** Voges-Haupt, C. Flannery**Project Title:** *Hydration of transition metal and biologically important ions***Major:** Chemistry**Faculty Advisor, Affiliation:** Joseph P. Emerson, Inorganic and Bioinorganic Chemistry**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: The hydration of specific ions is caused by interactions between the solute and solvent, where a certain number of water molecules coordinate to each molecule of an ion or compound. Each chemical compound differs in its respective affinity for water, allowing compounds to have their own unique hydration number, or the number of tightly bound water molecules to each compound. Using a Sephadex G-10 size exclusion chromatography column, compounds and ions of known molecular weight are eluted through and collected into fractions based on relative molecular weight. By examining these fractions, the hydration number for a specific compound or ion can be estimated by the relative change in molecular weight, due to a number of water molecules attaching to the compound. By analyzing the interaction of water molecules to these compounds, we are able to further understand the role and behaviors of water, which plays an imperative role in molecule interactions and biological functions.

BSE-25**Name:** Wall, Jacob**Project Title:** *Comparison of Methods for Differential Gene Expression with Small Sample Sizes***Major:** Computer Science**Faculty Advisor, Affiliation:** Andy Perkins, Computer Science and Engineering**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Identifying differentially expressed genes—that is, determining which genes are transcribed at different rates in a case compared to a control—is a central activity in bioinformatics. A significant challenge in identifying differentially expressed genes is that most mainstream methods require a large number of replicates for accuracy. Other researchers recently developed a program, f-divergence Cutoff Index (fCI), to identify differentially expressed genes with as few as two replicates. We compare this new approach, fCI, to existing methods (Cuffdiff, EdgeR, and DESeq2) to determine its relative usefulness in studies with small sample sizes. In order to perform this comparison, we compute the Jaccard index for the differentially expressed genes from each of the four methods, yielding a measure of their similarity. We further investigate the function of each of the differentially expressed genes via the Gene Ontology and compare the overlap in functions, again by the Jaccard index. We also present a software pipeline for performing the differential expression with the four methods and for comparing the resulting information.

PSE-22**Name:** Williams, James**Project Title:** *Computation of Rigid Wheel-Soil Interaction in Unsaturated Soils Using Slip Line Fields***Major:** Civil Engineering**Faculty Advisor, Affiliation:** Farshid Vahedifard, Civil and Environmental Engineering**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: This study proposes an extension of an existing wheel-soil interaction model to include the effect of variably saturated soils. The existing model relies on total stress in order to provide an estimation of the wheel's performance. By modifying the existing approach to use effective stress, the effect of suction in a partially saturated soil on the wheels performance can be included. The proposed modification considers a single fitting parameter in both the soil water characteristic curve and the hydraulic conductivity function. This modification allows the model to be used on a variety of soil types and degrees of saturation.

BSE-26**Name:** Wright, Emily**Project Title:** *Coefficient of Friction Values for Decellularized, Crosslinked Porcine Osteochondral Xenografts***Major:** Biological Engineering**Faculty Advisor, Affiliation:** Steve Elder, Agricultural and Biological Engineering**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: This research aims to determine and analyze the coefficient of friction values for decellularized, crosslinked porcine osteochondral xenografts and determine what effect crosslinking has on these coefficient of friction values. These osteochondral xenografts provide an alternative to conventional treatments for patients experiencing articular cartilage lesions. Crosslinking the collagenous tissue results in greater mechanical strength, more resistance to enzymatic degradation, and reduced immunogenicity. This study used different concentrations of genipin, a chemical substance from the Gardenia jasminoides Ellis fruit, and Epigallocatechin gallate (EGCG), a polyphenol from green tea, to crosslink the collagenous tissue. Three different concentrations of crosslinking were tested along with control samples and decellularized samples. The method used to quantify the coefficient of friction involved a constant normal force applied on each cartilage sample. The cartilage samples were lubricated with a mixture of fetal bovine serum and phosphate buffered saline. A load cell measured the friction force and the coefficient of friction was then determined. The results show that the coefficient of friction values increased with the degree of crosslinking.

BSE-27**Name:** Xia, Donna**Project Title:** *Structure-Property Relationships of Multi-layered Scalp***Major:** Chemical Engineering**Faculty Advisor, Affiliation:** Lakiesha Williams, Agricultural and Biological Engineering**Project Type:** Poster**Project Category:** Biological Sciences and Engineering

Abstract: Though the human scalp is a five-layered barrier around the human head, protective technologies incorrectly treat the scalp as a singular entity. Each scalp layer has their individual microstructure and mechanical behavior. Together, these layers work together to aid in mitigating stresses that may transfer through the skull and ultimately into the brain. In cases of head injury, the scalp helps prevent loading spikes that could result in skull fractures or brain injury. In order to accurately model Traumatic Brain Injury (TBI) in a Finite Element (FE) environment, scalp tissue must be quantified in order to understand the energy absorption capability of each individual layer. In this study, mechanical testing was performed to obtain the correlating stress-strain responses of a combined four-layered scalp from a porcine model. This information will be utilized in the development of a constitutive scalp tissue model to create a preliminary FE model that includes skin, connective tissue, aponeurosis, and loose connective tissue.

PSE-23**Name:** Yrle, Brandon**Project Title:** *Cavitation Rheology in Polymer Gels***Faculty Advisor, Affiliation:** Santanu Kundu, University of Southern Mississippi**Project Type:** Poster**Project Category:** Physical Sciences and Engineering

Abstract: Pluronic systems are lower critical solution temperature (LCST) systems, where the components of a mixture are miscible below a certain temperature. Conversely, acrylic systems are considered upper critical solution temperature (UCST) systems and are miscible above a certain temperature. When either of these systems breach the critical temperature, a gel forms. The differences in properties of these gels can be contributed to the nature of each system. A pluronic F127 system at 18% and 20% was compared against an acrylic system at 15% and 20%. Shear modulus, fracture strain, and critical pressure of each gel were tested using temperature ramp, large amplitude oscillatory shear (LAOS), and cavitation rheology respectively. Results showed that the modulus of the pluronic gel is higher than that of the acrylic gel, but the critical pressure for the fracture is much lower.

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