# PHYSICAL SCIENCES & ENGINEERING 800 CALSCIENCES & ENGINEERING UNDERGRADUATE RESEARCH SYMPOSIUM

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SOCIAL SCIENCES

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ARTS & HUMANITIES

Griffis Hall | April 13, 2018



JUDY AND BOBBY SHACKOULS HONORS COLLEGE



MISSISSIPPI STATE UNIVERSITY JUDY AND BOBBY SHACKOULS HONORS COLLEGE

# WELCOME

The Shackouls Honors College is pleased to sponsor the spring 2018 Mississippi State University Undergraduate Research Symposium. Prizes for academic areas are being partially supported 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).

In recognition of Mississippi State University's Carnegie Community Engagement Classification, the Undergraduate Research Symposium is pleased to be continuing to include Community Engagement track in the symposium. We also have new competitions in Public Health Research sponsored by the Department of Food Science, Nutrition, and Health Promotion and the Thesis Research Competition, sponsored by the Graduate School. We are particularly happy to have a student organization, the Theta Tau Professional Engineering Fraternity, giving an award.

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.

- test Oppenh

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



# MISSISSIPPI STATE

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

We are honored to welcome you to Mississippi State University's Spring, 2018 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 leading 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.

Daniel Shaw

**David R. Shaw, Ph.D.** Vice President for Research and Economic Development



# **MISSISSIPPI STATE UNIVERSITY** CENTER FOR COMMUNITY-ENGAGED LEARNING

Since our founding as a land-grant institution in 1878, Mississippi State University has collaboratively partnered with individuals and organizations beyond our campus to discover, develop, and disseminate knowledge that ultimately improves the learning, lives, and conditions of individuals and communities across Mississippi and around the globe. These mutually beneficial partnerships between external collaborators and MSU scholars are one of MSU's greatest assets and serve as the nucleus of community-engaged research, learning, and service.

On behalf of the Center for Community-Engaged Learning, I commend the students and faculty mentors for their community-engaged research and scholarship. The Community Engagement Track of the Undergraduate Research Symposium highlights these efforts and celebrates the work accomplished through Mississippi State's partnerships with external collaborators.

Congratulations on your outstanding accomplishments! We look forward to continuing to work with you transforming knowledge into action that drives meaningful change.

M. Cacle Smith

**Dr. M. Cade Smith** Director, Center for Community-Engaged Learning



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 66th year of membership. Due to PKP's prestigious recognition and support of learning, the MSU Chapter is proud to also financially support the Spring 2018 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. Jessica Tegt President



## **MISSISSIPPI STATE UNIVERSITY** DEPARTMENT OF FOOD SCIENCE, NUTRITION AND HEALTH PROMOTION

Everyone deserves to live a long and healthy life in a safe environment" (American Public Health Association, 2018). The collective public health efforts in Mississippi and the nation, aid in the achievement of this goal. It is with the support of Mississippi State University faculty, staff, and students in diverse disciplines that we can identify and better understand factors that will lead to optimal health for all Mississippians. In celebration of National Public Health Week 2018, we are pleased to sponsor the second annual Public Health Research Competition to recognize outstanding student research in a public health-related field.

The scholarly contributions of student researchers and faculty mentors who dedicate their time to public health research are recognized and appreciated, and we thank the sponsors who have made this competition possible: the MSU Department of Food Science, Nutrition and Health Promotion, the MSU Department of Communication, the Mississippi Public Health Association, and the Myrlie Evers-Williams Institute for the Elimination of Health Disparities.

Congratulations on your achievements!

**Brittney D. Oliver, PhD, CHES** Assistant Professor of Health Promotion Department of Food Science, Nutrition and Health Promotion Chair, MSU National Public Health Week Committee







# MISSISSIPPI STATE UNIVERSITY THE GRADUATE SCHOOL

I commend each of you on your accomplishments. You have shown a commitment to research and creative discovery in your respective fields of study, an achievement worth recognition. As researchers you are gaining valuable experience, whether it be theoretical or experimental, and you are helping to expand the body of knowledge in your field. These are experiences can provide glimpses into the world of post-baccalaureate studies and can be crucial when it comes time to apply for admission to graduate school. I hope that when the time comes you will consider continuing your studies here at Mississippi State University. I can say with confidence your work is being noticed. You should all be very proud of what you have accomplished thus far in your academic careers.

Best,

Joi Mom Bruce

**Lori Mann Bruce, Ph.D.** Giles Distinguished Professor of Electrical & Computer Engineering Associate Vice President and Dean of the Graduate School Mississippi State University



Theta Tau Professional Engineering Fraternity is a co-ed student organization that promotes service, professional development, and brotherhood. Our members are a diverse group from every major in the Bagley College of Engineering, and we strive to become the engineering leaders of the future. We are excited to support an individual in this year's research symposium to receive the Tomorrow Builder Award, which aims to recognize an engineering undergraduate student who uses their skills and research to help solve complex problems of critical importance to society.

## Spring 2018 Undergraduate Research Symposium Schedule

### Poster Session: Griffis Hall (1st, 2nd, 3rd, and 4th Floors)

1:00 pm - 3:30 pm

#### Arts and Humanities Oral Presentations: Room 401

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

- 1:15 pm Joy Cariño (AH-01): Language Ideologies: Gender Inclusivity in Language Policy\*
- 1:30 pm William Jordan (AH-04): Working Hand in Hand\*
- 1:45 pm Benjamin Kroman (AH-05): The Fundamentality of Causation and Experience
- 2:00 pm Lucia Lang (AH-06): The Ethics of Advancement
- 2:15 pm Break
- 2:30 pm Samuel Lucas (AH-08): The Power of the Firstborn: J.R.R. Tolkien's Reimagining of Elves
- 2:45 pm Arielle Striplin (AH-10): Organic Cotton Apparel and Consumers\*
- **3:00 pm** Emily Turner (AH-13): *Eileen Gray and Lina Bo Bardi: Modernism and the Patriarchal Tendencies of Architecture*\*

### **Thesis Research Competition (TRC): Room 405**

- **1:30 pm** William Acuff (BSE-01): Reactivation Effects of 2-PAM and Novel Oxime Combinations on Rat Brain Acetylcholinesterase Inhibited by Organophosphates.
- **1:35 pm** Aaron Albee (BSE-02): Characterizing the Impact of the Antifungal Occidiofungin on the Pathogenic Yeast C. albicans
- **1:40 pm** Geneva Catlett (PSE-06): *Temporal and Spatial Analysis of Water Quality for Catalpa Creek Watershed*
- **1:45 pm** Caroline Douglass (SS-08): *De-Mystifying the Word Problem: Is Reading Comprehension the Key?*
- **1:50 pm** Emerald Ford (BSE-20): Characterization of Antifungal Activity of Endophytic Bacteria Associated with Soybean
- **1:55 pm** Jeffrey Headley (PSE-15): A Novel Combustion Platform for the Study of Microwave Plasma -Assisted Combustion
- **2:00 pm** Rebecca Keefer (BSE-29): Evaluating the effects of Vista Pre-T on feed efficiency in heatstressed dairy cattle
- **2:05 pm** Christina Loftin (BSE-33): *Prevalence of gastrointestinal parasites in northern Mississippi shelter cats*

- **2:10 pm** Alec Mau (PSE-22): Obtaining a Climatology of Extratropical Transition Tornado Events Associated with Atlantic Basin US Landfalling Tropical Cyclones
- **2:15 pm** Randall Niffenegger (PSE-27): Comparing Photometric Flicker and Radial Velocity Jitter of M Dwarf Stars for Earth-mass Planet Detection
- **2:20 pm** Janiece Pigg (SS-25): *Is it worth it? A case study exploring volunteer leaders' perceptions of leadership training*
- 2:25 pm Arielle Striplin (AH-10): Organic Cotton Apparel and Consumers
- 2:30 pm Feifei Zeng (SS-42): China's One Belt One Road and its implications to the U.S.

## 4:00 pm: Award Ceremony - 4th Floor Forum, Room 401

**Moderator:** Dr. Seth F. Oppenheimer, Professor of Mathematics, Director of Undergraduate Research, Shackouls Honors College, Mentor, Provost Scholars, Mississippi State University

**Featured speaker:** John Bickle, Ph.D., Professor of Philosophy, Adjunct Professor of Psychology, Head of the Department of Philosophy and Religion, Fellow at the Institute for Imaging and Analytical Technologies (I\*2AT), Mississippi State University

**Community Engagement Awards:** Dr. M. Cade Smith, Assistant Dean of Students and Director, The Office of Student Leadership and Community Engagement, The Center for Community-Engaged Learning, The Mississippi Racial Equality Community of Practice, Mississippi State University

Public Health Research Awards: Brittney Oliver, Assistant Professor, Food Science, Nutrition and Health Promotion, Mississippi State University

**Thesis Research Competition Awards:** George Dunn, Enrollment Management Coordinator, The Graduate School, Mississippi State University

Theta Tau TomorrowBuilder Award: Representative of Theta Tau Professional Engineering Fraternity

**Subject Area Awards:** Dr. Jessica Tegt, Assistant Research Professor, Vice President for Research, President of The Honor Society of Phi Kappa Phi; Dr. Christopher Snyder, Professor of History and Dean of the Shackouls Honors College, Mississippi State University

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.

## **Student Presenters**

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Malik Barakat	<b>Biological Sciences and Engineering</b>	BSE-04	15
William Bell	Physical Sciences and Engineering	PSE-01	16
Kelvin Blade	<b>Biological Sciences and Engineering</b>	BSE-05	16
Karrigan Bowers	Biological Sciences and Engineering	BSE-06	17
Charles Boyd	Physical Sciences and Engineering	PSE-02	17
Frank Brinkley	Physical Sciences and Engineering	PSE-03	18
Meredith Brock	<b>Biological Sciences and Engineering</b>	<b>BSE-07</b>	18
Hal Bronson	Social Sciences	SS-01	19
Allie Brown	Physical Sciences and Engineering	PSE-04	19
Anna Danya Brown	<b>Biological Sciences and Engineering</b>	BSE-08	20
Melanie Brumfield	Social Sciences	SS-02	20
Jacob Burkett	Social Sciences	SS-03	21
Destiny Burns	Social Sciences	SS-04	21
Madeline Burton	<b>Biological Sciences and Engineering</b>	BSE-09	22
Brandon Butler	Physical Sciences and Engineering	PSE-05	22
Rosevone Byrd, III	<b>Biological Sciences and Engineering</b>	BSE-10	23
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Geneva Catlett	Physical Sciences and Engineering	PSE-06	24
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Deepak Chapagain	Physical Sciences and Engineering	PSE-07	25
Kelly Coble	Social Sciences	SS-06	25
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Germaine Cooley	Physical Sciences and Engineering	PSE-08	26
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Sarah Darrow	Physical Sciences and Engineering	PSE-09	28
Meenakshi Das	Physical Sciences and Engineering	PSE-10	28
Mayukh Datta	Physical Sciences and Engineering	PSE-11	28
Lloyd Dedeaux	Social Sciences	SS-07	29
Christopher Denney	Physical Sciences and Engineering	PSE-12	29
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Morgan Duvic	<b>Biological Sciences and Engineering</b>	BSE-18	32
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**First Floor - Arts and Humanities and Social Sciences** 



## **Second Floor - Social Sciences**



**Third Floor - Biological Sciences & Engineering** 



## **Fourth Floor - Physical Sciences and Engineering**



## Abstracts

BSE-01 Name: William Acuff Major: Biological Engineering Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Janice Chambers, Department of Basic Sciences, Center for Environmental Health Science Other Competitions: Thesis Research Competition (TRC), Public Health Research Competition

# Reactivation Effects of 2-PAM and Novel Oxime Combinations on Rat Brain Acetylcholinesterase Inhibited by Organophosphates.

Exposure to organophosphates (OPs), such as the nerve agents sarin and VX, is a threat to military personnel and civilians alike due to their deadly use in militant and terrorist activities today. Traditionally, the oxime drug 2-PAM has been used to treat OP exposure, as it is an effective reactivator of OP-inhibited acetylcholinesterase (AChE), which restores nerve cells to normal function after exposure. However, 2-PAM is particularly ineffective in the brain, as it fails to penetrate the blood-brain barrier. This can lead to brain damage in the victims of OP exposure, even after 2-PAM therapy. Recently, however, MSU's novel substituted phenoxyalkyl pyridinium oximes (US patent 9,277,937) have been shown to reactivate inhibited AChE in the brain. Unfortunately, these novel oximes are not as effective as 2-PAM at AChE reactivation. A cocktail of 2-PAM plus novel oxime could be used to treat both the brain and body of a nerve agent victim. In vitro tests of oximes alone and in binary mixtures were tested for reactivation efficacy in rat brain preparations. Our in vitro results show that the equimolar combinations of 2-PAM and a novel oxime (numbers 15, 20, or 55) remain as successful reactivators as compared to the reactivation efficacy of 2-PAM alone. This indicates that a cocktail of 2-PAM and a novel oxime did not result in competition between the two oximes that decreased the therapeutic potential of the more effective reactivator (2-PAM). These results in turn support the concept of the development of an antidote cocktail that could be used to treat the lethal effects of OP exposure as effectively as 2-PAM while also providing protection to the brain via novel oximes. (Supported by NIH U01 NS083430).

#### **BSE-02**

Name: Aaron Albee Major: Biological Sciences/Microbiology Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Dr. Donna M Gordon, Biological Sciences Other Competitions: Thesis Research Competition (TRC)

#### Characterizing the Impact of the Antifungal Occidiofungin on the Pathogenic Yeast C. albicans

Candida albicans is a medically significant polymorphic fungal pathogen. Occidiofungin is a cyclic glyco-lipopeptide shown to have antifungal properties against this yeast, however its molecular target is not known. Past work focused on the yeast form of C. albicans, however a switch to a filamentous morphology is required for pathogenesis. Therefore, the aim of this work was to determine whether occidiofungin was effective against cells undergoing morphogenic switching. Known triggers for inducing hyphal formation were utilized to switch cells immediately prior to the addition of occidiofungin. Cell morphology and cell viability were determined by microscopy, CFU analysis, viability, and spotting assays. Data support a 25-45% decrease in live cells following occidiofungin exposure with cells prevented from morphogenic switching. To examine the impact of occidiofungin on cell wall components, Calcofluor white and concanavalinA staining was carried out. No changes to the distribution of chitin or cell wall glycoproteins were found. Actin has been linked to the establishment of cell polarity crucial for hyphae formation. To determine whether actin organization was altered in occidiofungin treated cells, phalloidin-TRITC was used in fluorescence microscopy and compared to that of untreated cells. As previously reported, actin localized to cortical patches at the apical tip of elongating hyphae in untreated cells, however no such localization for occidiofungin treated cells was found. This disruption in actin structures may explain the lack of switching and suggests that the molecular target for occidiofungin activity is likely involved in actin organization.

#### BSE-03 Name: Courtney Ashmore Major: Educational Psychology Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Kasia Gallo, Educational Psychology

#### Apert Syndrome: A Chronological Review of Research Strategies, Diagnostic Methodology, and Surgical Procedures

Apert syndrome (AS) is a rare genetic disorder characterized by premature synostosis and syndactyly. Premature synostosis leads to swelling in the brain as a result of excess cerebral fluid, and syndactyly severely restricts the use of the hands and fingers. A review of current literature revealed numerous changes in the understanding of this disorder and its treatment over time. In early years, physicians relied solely on physical observations for diagnosis and research, and correction of abnormalities involved only surgeries that relieve cranial pressure and gain minimal hand function. Ninety years after Dr. Apert described the syndrome, the two most common mutations were discovered - p.P253R and p.S252W. Recent technological advances, such as sonograms and other body scans, allow for detection of previously-unknown underlying abnormalities that result from AS. Thanks to these advances, it is now understood that lifelong multidisciplinary collaboration and maintenance are critical for optimizing health in AS patients. In addition to a physician and/or surgeon, AS treatment and maintenance now involve a team of researchers, geneticists, specialized surgeons, genetic counselors, and others. Future research will likely focus on locating the uncommon mutations linked to Apert syndrome. Approximately 99% of cases result from two the mutations mentioned above but determining the cause of the other 1% is important for fully understanding this disorder. Although craniosynostosis begins very early in fetal development, it will be important to determine if genetic splicing could be an option for preventing the disorder altogether.

BSE-04 Name: Malik Barakat Major: Physical Education/Kinesiology Project Category: Biological Sciences and Engineering Faculty Mentor, Department: JohnEric W. Smith, Kinesiology

#### Effects of carbohydrate timing and concurrent training while low carbohydrate dieting on body composition

The purpose of this investigation was to examine the effects of carbohydrate (CHO) timing during a four- week concurrent exercise training program on body composition while consuming a low CHO, high fat diet. Resistance trained males were randomized into two experimental groups: consumed 30 g of CHO during exercise and 40 g immediately after exercise (SUPP; n = 9) and consumed a non-caloric placebo during exercise and no CHO after exercise (NONSUPP; n = 9). Each group completed four weeks of 3 days per week resistance training and 2 days per week high intensity interval training (HIIT). The participants also consumed a low CHO, high fat diet (~50% fat, ~25% protein, and ~25% carbohydrate) over the course of the four weeks with the only difference between experimental groupings being the timing of 70 g of CHO. Participants completed pre- and post-body composition analyses. Fat mass, fat free mass, and % body fat were measured using the air displacement plethysmography method. Muscle thickness was measured via ultrasound on the biceps, triceps, hamstrings, quadriceps, and calf musculature. Data was analyzed using a mixed effects two-way repeated measures analysis of variance [(pre- intervention x post-intervention) x (SUPP group x NONSUPP group)]. There were no group x time interaction effects or group effects for any body composition variable (p > 0.05). Biceps muscle thickness significantly increased from pre- to post-intervention (4.36 ± 0.50 vs. 4.54 ± 0.45 cm, p = 0.02). There were no other time differences for muscle thickness or %body fat. Independent of dietary composition and timing of CHO, concurrent training is effective in increasing muscle thickness of the biceps, without significantly altering fat mass.

#### PSE-01

Name: William Bell Major: Aerospace Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Donghoon Kim, Aerospace Engineering Co-Author: Jichul Kim

#### Innovative Type of Unmanned Aerial Vehicle Design and Control Algorithm Development

Spherical unmanned aerial vehicles (SUAVs) are a subject of intense research; they are robust and maneuverable. The design of the team's SUAV seeks to minimize the use of control surfaces if not eliminate their use entirely. Using control surfaces is one conventional method of maintaining an aircraft's attitude in flight, but a spherical UAV would require four independently moving control surface to maintain attitude. To miniaturize the design, the team is attempting to control the SUAV's attitude by manipulating the position of its center of mass. At the same time, the team wants the SUAV to be capable of rolling on the ground. These design goals can be achieved using a pendulum system. A combination of a microcontroller unit, an Arduino MEGA, and a micro servo motor will control the actuation of the pendulum system. If the drone begins in a stable condition, a moment about the drone's center of mass will be generated as the pendulum system is actuated, its magnitude being a function of the pendulum system's displacement. This torque is the input for the SUAV's control. Mechanically, this method of control poses a few challenges that the team is aware of. One, by Newton's third law, rotating the pendulum system will result in an equal and opposite torque, the pendulum system applying a torque on the drone. Two, controlling the input, the location of the center of mass, will require accurate and frequent determination of the micro servo's position and the ability to actuate it quickly. These challenges will be addressed in multiple tests of the SUAV's pendulum system long before a prototype ever flies. One test in the near future will use a potentiometer to manipulate the pendulum's angle and confirm the accuracy of the system.

BSE-05

Name: Kelvin Blade Major: Microbiology Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Larry Hanson, Basic Sciences, College of Veterinary Medicine Other Competitions: Public Health Research Competition

#### Evaluation of natural challenge model of Zebrafish with influenza A virus

Influenza A virus (IAV) presents as a global health concern, resulting in an extensive burden on morbidity and mortality rates. IAV has high mutation rates, influencing new strains of the virus, which leads to increased antiviral resistivity and altered virulence. Although prevention and treatment have improved, further understanding of host response and the pathogenesis of IAV infection is reliant on animal models. Zebrafish are useful host models for evaluating infectious diseases processes. The ability to manipulate the genome of zebrafish makes it potentially useful as a host model of IAV infection. In this study, we aim to determine if viral host adaptation or mucosal perturbation will provide a more useful model by allowing routes of infection through reparatory epithelium. Strain APR8, an H1N1 IAV human isolate that can be efficiently propagated in MDCK cells was used. To host adapt the virus we attempted to propagate it in two zebrafish cell lines and by infecting zebrafish embryos at 24-48 hours post-fertilization. In the process, we found that the zebrafish embryos and cell lines were very sensitive to the antibiotics and trypsin used to propagate the original stock of virus. We have therefore modified virus propagation procedures to optimize cell line production and embryo challenges. Once the adaption is successful, we will do comparative challenges of zebrafish embryos with parent strain and adapted virus, with and without mucosal perturbation. If successful, the zebrafish adapted virus can be used to pathogenesis, and innate defense research and comparative research will reveal the critical requirement for IAV adapting to a distant host.

#### BSE-06

Name: Karrigan Bowers Major: Animal and Dairy Sciences Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Caleb Lemley, Animal and Dairy Sciences Co-Authors: Kalisha C. Yankey, Maggie L. Tu, Caitlin G. Hart, Christy S. Steadman, Keelee J. McCarty

#### Effects of Vasoactive Compounds on Ovine Placentome Blood Perfusion using Doppler Ultrasonography

Increasing ovine placentome blood perfusion improves placental efficiency while increasing the likelihood of healthier birth weights and lower mortality in offspring. Compromised pregnancies can lead to insufficient placental blood flow. Our objectives were to validate Doppler ultrasonography for examining placentome blood perfusion in ewes administered vasoactive compounds. For experiment 1 (day 82 of pregnancy) placentome perfusion was determined pre-infusion (PRE1; n=8) and 3–5 minutes post i.v. infusion with sodium nitroprusside at 5  $\mu$ g/kg of body weight (SNP1; n=4) or 10 ug/kg of body weight (SNP2; n=4). Immediately after ultrasonography all ewes were administered N(G)-Nitro-L-arginine methyl ester (L-NAME) at 12.5 mg/kg of body weight (n=8) and imaged for placentome perfusion 30 minutes post i.v. infusion. For experiment 2 (day 89 of pregnancy), ewes (n=15) were first imaged for perfusion prior to the administration of antioxidants (PRE2) and then 30 minutes following i.v. infusion of melatonin (MEL; 100 ug/kg of body weight), ascorbate (ASC; 10 mg/kg of body weight), or vehicle (VEH; 50% ethanol solution). Data for experiment 1 and 2 were analyzed separately by ANOVA with least significant difference test. For experiment 1, the percent area of placentome perfusion was not different (P>0.05) between SNP and L-NAME infusions. However, the summation and average integrated pixel density was increased (P<0.05) in SNP2 versus PRE1 and L-NAME. For experiment 2, the percent area was increased (P<0.05) in both MEL and ASC versus VEH. However, the summation and average integrated pixel density were not different. In summary, power flow Doppler ultrasonography can be used to detect fluctuations in placentome blood perfusion as indicated by changes in integrated pixel density following administration of nitric oxide agonist and antagonist. In addition, acute infusions of antioxidants increased percent area of placentome blood perfusion, which could be used to screen novel therapeutics that would improve placental efficiency.

PSE-02 Name: Charles Boyd Major: Software Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Byron Williams, Computer Science and Engineering Co-Author: Zadia Codabux

#### Examining the Relationship of Code Smells with Software Vulnerabilities

Software vulnerabilities are exploitable security defects introduced during the software's development. When a vulnerability is introduced, software developers currently have little to no indication that the vulnerability is present. This research project applies software analytics to the detection and analysis of security vulnerabilities in software. Software analytics is a methodology that enables decision-making using statistical and machine learning techniques as applied to historical datasets.

This study builds upon existing research by students and faculty at MSU that uncovered a correlation between known vulnerabilities and specific code structures in an open-source software codebase. Prior research has also found a correlation between vulnerabilities and patterns in metadata generated during software development, such as a file's edit frequency.

We aim to build tools that will allow researchers to analyze larger datasets for patterns. We also aim to uncover new patterns that lead to vulnerabilities by combining multiple metrics, introducing new signals, and expanding the dataset. Ultimately, this information will be used to create tools that provide useful information to developers to decrease the likelihood of a vulnerability being introduced and therefore improve software quality.

#### PSE-03

Name: Frank Brinkley Major: Mechanical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Matthew Priddy, Mechanical Engineering Co-Author: Wenmeng Tian

#### Thermodynamic Efficiency of Additive Manufacturing of Poly Lactic Acid by Fused Deposition Modeling

Additive manufacturing (AM), commonly referred to as 3D printing, is the process of creating an object by building a material onto itself to create a desired structure. AM processes use less material and can produce a variety of parts more easily than traditional subtractive manufacturing processes (e.g., milling). However, the specific energy consumption (SEC) of AM is higher than most subtractive manufacturing processes. Several empirical studies have been performed on energy consumption of the AM process, but little work has been done regarding efficiency. This project's goal is to create a mathematical model that evaluates the thermodynamic efficiency of the Fused Deposition Modeling (FDM) process (most common desktop 3D printers) based on different boundary conditions. The current objective is modeling the heat transfer through the extrusion nozzle to determine the efficiency of the material melting process. The analysis performs an energy balance using the 1st law of thermodynamics; the model is written in Python. Values for the model have been obtained from experiments performed on a MakerGear M2 courtesy of the Industrial and System Engineering Department. Eventually, this model can be expanded to include the efficiency of the stepper motors, fans, and other devices present in the entire system. A future goal for this research is to use the model created to predict energy consumption for a desired build path, and then validate the predictions using the MakerGear printer. This data can then be used to optimize the extrusion process and eventually the build parameters based on part geometry and material. The general approach of this research can be used to model metal-based AM processes such as Selective Laser Sintering (SLS).

#### BSE-07

Name: Meredith Brock Major: Biological Engineering Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Dr. Mary Love Tagert, Agricultural and Biological Engineering

#### Salinity Effects from Treated Effluent as Irrigation

Around the world, increasing and sometimes competing demands on water for irrigation, industrial processes, aquifer recharge, drinking and other systems require investigation into non-traditional water sources. By receiving further treatment beyond wastewater treatment systems, reclaimed or recycled effluent has been developed as a viable source of water for irrigation. Risk factors that must be addressed include pathogens, nutrients, and salinity. This study assesses the effects of salinity and other factors such as nitrates in wastewater effluent and examines the potential to use treated effluent for irrigation. A potential solution combines effluent with other water sources to reduce salinity risks to soil. Using samples from Starkville Wastewater Plant, electrical conductivity and total dissolved solids of the effluent are tested and compared to values established by the Food and Agriculture Organization as water quality restrictions to irrigation. Effluent is diluted at rates of 100%, 50%, and 0% treated effluent and applied to two crops, soybean and corn. In the greenhouse, six of each crop are tested per dilution and periodically measured for effects on growth and plant mass. Results will provide a basis for potential application of treated effluent for irrigation in Mississippi or demonstrate a need for additional treatment of wastewater to meet standards adopted by current reclaimed water facilities.

#### SS-01 Name: Hal Bronson Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Colleen Sinclair, Psychology Co-Authors: Dr. Rebecca Goldberg, Ms. Chelsea Ellithorpe, Mrs. Jessica Utley

#### Preference or Prejudice? Examining Norms and Attitudes about Intergroup Dating

Intergroup marriages are on the rise, possibly due to improving attitudes toward intergroup dating; still, intragroup dating remains far more common (U.S. Census Bureau, 2012). Couple homogamy could be due to segregation within one's own social networks limiting one's access to different social groups, but this does not explain why same-group dating prevails online, where diverse dating partners abound. Some have suggested that the preference to data within one's own demographic group is a form of bias (e.g., "sexual racism," Callander et al., 2015). Yet few have analyzed the role of prejudicial attitudes with regard to intergroup dating. We are addressing this gap in the research. Extending the methods of Crandall et al. (2002) participants will rate 114 potential targets (e.g., blacks, illegal immigrants, Republicans, welfare recipients) of prejudice as to who is least vs. most acceptable to express dislike towards. Next, participants will answer questions on the personal perceptions of the dateability of 55 of these targets. The data from this present study will be used to analyze how attitudes toward intergroup dating are influenced by perceived social norms and prejudice.

#### PSE-04

Name: Allie Brown Major: Mechanical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Omid Askari, Mechanical Engineering

#### Design and Development of a Combustor for Plasma-Enhanced Combustion

Recent studies have shown that using plasma in conjunction with combustion systems improves certain characteristics of combustion such as flame stability, controlled ignition, and reduced emissions. Most combustion devices such as gas turbines or industrial burners operate at initial temperatures that are much higher than autoignition temperature. These devices need to operate at much lower temperatures and leaner conditions to reduce emissions. Combustion under these conditions is called moderate or intense low-oxygen dilution (MILD) combustion. While MILD combustion can significantly reduce emissions, ignition is much harder to control, and flame instability becomes a concern. In order to take advantage of the MILD combustion in future generations of combustion devices, an externally low powered stabilization and enhancement system is required. Low-temperature, or non-equilibrium, plasma is a promising technology that has shown potential in stabilizing flames, enhancing ignition, reducing emissions and increasing the efficiency of combustion due to its very strong reduced electric field. Low-temperature plasma introduces new reaction pathways and changes fuel oxidation timescales due to the fast production of active radicals and excited species. In this study, repetitive nanosecond pulsed (RNP) discharge will be examined to better understand the stabilization mechanisms of plasma on MILD combustion. To do this, well-defined experiments supported by kinetic analysis and advanced diagnostics are needed. In this research, a single-element co-flow combustor was designed for studying the laminar non-premixed lifted flame. The combustor was designed to optimize the ease of assembly and manufacturability. In addition, the designed system took into consideration the necessary parameters for use with the RNP discharge. This study resulted in a combustion system capable of utilizing the plasma discharge to enhance combustion.

#### BSE-08

Name: Anna Danya Brown Major: Poultry Science Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Pratima Adhikari, DVM, PhD, Poultry Science Co-Authors: T. Fulton, C. D. McDaniel

#### Effect of house type and strain on hen-day egg production and egg quality in commercial egg layers

There are limited studies evaluating differences among housing types for production and egg quality across the late production cycle of laying hens. Thus, the aim of our study was to investigate effects of conventional cage (CC) and enriched colony cage (EC) systems as well as hen age on both egg quality parameters and egg production in two commercial laying hen strains, Hyline Brown (HB) and White Leghorns (WL). Egg production and egg quality data were collected from 53 until 74 weeks of age for both hen strains and house types. Hens were provided ad libitum a commercial laying hen ration and water and were housed in 16L/ 8D light. Four groups of hens were assigned as WL in CC (120), HB in CC (120), WL in EC (355) and HB in EC (311) system. Once a month, a total of 120 eggs were collected, 30 from each group to analyze egg weight (EW), yolk weight (YW), Haugh unit (HU), albumen weight (AW), shell thickness (ST), shell weight (SW), ST%, AW%, and Y%. Both strains of hens in CC had better egg production at 60, 61, 63, 65, 66, 67, 70 and 74 weeks of age (all P < 0.05). At 55, 56, 57, 58, 59, 64, 71 and 72 weeks of age, WL had significantly better egg production compared to HB (all P < 0.05). Eggshells got thinner as hens aged in both house types. For EW and AW, CC eggs had higher weight and increased as hens aged (both P < 0.05). There was no any effect of either house type, strain or age on Y%, S% or AW%. In general, the egg production and egg size in hens housed in the CC system were greater than that of hens in the EC system.

Key Words: conventional cage, enriched colony cage, laying hen, egg quality, production

#### SS-02

Name: Melanie Brumfield Major: Biochemistry Project Category: Social Sciences Faculty Mentor, Department: Kevin J. Armstrong, Ph.D., Psychology Co-Author: Joanna C. Hatchel, M.S. Other Competitions: Public Health Research Competition

#### Illicit Use of Prescription Stimulants: Gender X Greek Status Interaction

Over the past two decades, the number of ADHD diagnoses has increased dramatically resulting in significantly higher amounts of prescription stimulant medication in circulation. Not surprisingly, illicit use of prescription stimulants (IUPS) has seen a parallel increase, especially in the college population. IUPS is characterized by using prescription stimulant medication without a prescription. An additional rising concern is polysubstance use characterized by using a prescription stimulant medication in conjunction with other psychoactive substances (e.g., energy drinks, alcohol, other drugs). Multiple studies have separately shown that IUPS tends to be reported more commonly for men than women and more commonly for Greek-affiliated students.

This study investigated potential interactions between Greek-affiliation status and gender. Participants were recruited through the MSU psychology research program. Data collection occurred in two different years (n = 1,714). Participants completed a 159-item questionnaire on-line which included items measuring IUPS behaviors, ADHD diagnosis and medication history, stimulant medication risk and benefit beliefs, and demographic information.

The results revealed that Greek-affiliated men were more likely to report IUPS alone (43.9%), as well as combined with alcohol (25.0%), energy drinks (23.2%), and other drugs (12.2%) than Greek-affiliated women (25.3%, 8.8%, 8.0%, and 4%, respectively) and non-affiliated men (19.4%, 6.8%, 4.7%, and 6.3%, respectively). A new finding from this study was that Greek-affiliated women were more likely to report IUPS alone and with energy drinks than non-affiliated men showing that an interaction between Greek status and gender existed. Non-affiliated men were less likely to report IUPS alone, with alcohol, energy drinks, and other drugs than either Greek-affiliated men and Greek-affiliated women.

IUPS continues to be a concern on college campuses. These data can be utilized to prioritize target populations on campus for prevention and reduction programs with a special emphasis on Greek-affiliated men and women, in that order.

#### SS-03 Name: Jacob Burkett Major: Fashion Design and Merchandising Project Category: Social Sciences Faculty Mentor, Department: Charles Freeman, Human Sciences

#### Cultural Competency and How it Affects the Parenting Style of a Transracial Adoptive Parent

Studies have shown that 84% of international adoptions are likely to be transracial. In the United States, 28% of foster care adoptions are transracial in nature. With these kinds of numbers we have to wonder how parents are choosing to raise their adoptive children. Do they choose to educate their adoptive child on the child's birth culture and if so, do they have the resources they need to do this? Through this project, we hope to discover any correlations between an interracial adoptive parent's cultural competency and their desire to educate their child on the child's birth culture. Many surveys have been done to test a person's cultural competency, but a survey showing the relationship between a parent's cultural competency and their parenting choices seem to be missing. We plan to survey interracial adoptive parents using a quantitative study. The survey will first test the adoptive parent's cultural competency. Then the survey will move to questions concerning how the adoptive parent chooses to raise their child. These questions will help us draw any correlation between the two factors: cultural competency and parenting. Through the help of an interracial adoptive parent we are planning to circulate this survey through the local community of interracial adoptive parents. We also plan to post our survey to adoptive parent Facebook groups to help us increase the number of responses. This survey will help shed light on interracial adoption as a whole and will hopefully help parents to be more conscious of their parenting concerning their adoptive child's birth culture.

SS-04 Name: Destiny Burns Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Deborah K. Eakin, Ph.D., Psychology

#### Familiarity Contributes More than Recollection to the False Memories of Older Adults

The false memory effect occurs when people are more likely to falsely state that the false-target word pairs was studied. The Payne-Eakin (Payne & Eakin, in preparation) paradigm uses associations among words to examine false memories. People studied cue-target word pairs (e.g., FROG-TOAD; TABLE-CHAIR) and were given an old/new recognition test consisting of studied pairs and two types of new word pairs: false-target pairs with an implicitly activated associate (FTi; FROG-HOP) and unstudied control pairs (e.g., MAN-BOY). The recognition test consisted of a 6-point confidence scale with 6 indicating high confidence that the presented word pairs were studied and 1 indicating high confidence that they were new. A 6-judgment theoretically indicates recollection, while a 5-2 rating indicates the influence of familiarity. Younger adults were more likely to give 6-judgments for studied than new pairs. This finding showed significant false recognition for false-target word pairs. That people predominantly gave 6-judgments to these false alarms indicates that people had false recollections of studying the pairs; FTi and control pairs received equal 4- and 5-judgments.

The purpose of the present study was to apply the Payne-Eakin paradigm to older adults. We hypothesized that older adults would show a great false recognition effect than the younger adults and also would rely more on familiarity than recollection. These findings were obtained; older adults had higher false alarm rates to the FTx than the control word pairs and greater false recognition effects than the younger adults. In addition, their false alarm rate was distributed along the 6, 5, 4 range of the scale, rather than restricted to the 6-judgments, showing familiarity was influencing their recognition. The findings are important to theories of recognition, cognitive aging, and memory.

#### BSE-09

#### Name: Madeline Burton

Major: Natural Resource and Environmental Conservation Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Courtney M. Siegert, Forestry Co-Authors: Heather Alexander, Marcus Lashley

#### Changes to soil properties following fire in upland oak forests

Fire plays an important role in maintaining community structure in upland hardwood ecosystems, and after long-term fire suppression in the eastern United States, shade-tolerant, fire-sensitive species have begun to proliferate in forest understories, creating moister and less-flammable conditions (i.e., mesophication). Changes to ecosystem structure and function begin with individual trees; thus, this study focuses on the effects of fire on soil biogeochemical properties including soil respiration ( $R_h$ ) and associated carbon and nitrogen concentrations. An experimental site was established on Spirit Hill Farm in Holly Springs, Mississippi. The site was divided into two treatment areas: unburned and burn. In each treatment area, we measured  $R_h$ , soil moisture, and soil biogeochemical properties at the base of three each of post oak, southern red oak, and sweetgum trees and at a control point away from influencing trees. In pre-burn conditions, average Rh was relatively similar regardless of tree species. The largest  $R_h$  observed was under sweetgum (2.18 ± 1.20 g C m<sup>-2</sup> d<sup>-1</sup>) followed by the control (1.73 ± 0.69 g C m<sup>-2</sup> d<sup>-1</sup>), post oak (1.65 ± 0.67 g C m<sup>-2</sup> d<sup>-1</sup>), and southern red oak (1.28 ± 0.49 g C m<sup>-2</sup> d<sup>-1</sup>). VWC was largest near post oak (0.222 ± 0.046) followed by sweetgum (0.199 ± 0.071), southern red oak (0.179 ± 0.038), and the control (0.170 ± 0.016). Differences in pre-burn  $R_h$  and moisture were not significantly different across treatments ( $R_h$ : p = 0.395; Moisture: p = 0.896) or species ( $R_h$ : p = 0.440; Moisture: p = 0.556). Soil carbon and nitrogen data are still pending, as are post-burn data. Differences in soil conditions in upland oak ecosystems may be important mechanisms influencing species composition following prescribed fire and will be determined in this study.

#### PSE-05

Name: Brandon Butler Major: Chemical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dong Meng, Chemical Engineering Co-Author: Dr. Jing Zong

#### Analysis of the Molecular Weight Distribution of Supramolecular Linear Telechelic Polymers

Supramolecular structures pose interesting physics in that their size, shape, and secondary interaction can be modified to allow for tunable structures. In particular, supramolecular polymers can be used to form networks that can assembly without a reaction and reassemble after being broken. Telechelic polymers reduce the degrees of freedom by leaving the body of the polymer unencumbered by secondary associations. If the end group functionality is restricted to one partner, a further reduction in complexity is achieved. The structure can only resolve to rings or linear chains of individual polymer units. An analysis of a coarse grained model of a telechelic polymer system, where the ends were limited to one secondary interaction, was attempted using reactive Monte Carlo simulations. The polymer was modeled using dissipative particle dynamics, DPD, pairwise interactions and a simple spring model for bonded interactions. An association energy h was used to control the strength of secondary bonding in the simulation. A molecular weight distribution of the supramolecular structures was obtained from the simulations.

#### BSE-10 Name: Rosevone Byrd, III Major: Biological Engineering Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Renita Horton, Agricultural and Biological Engineering

#### A Low-Cost Top-stage Incubator for Live Cell Imaging

The Cardiovascular Tissue Engineering Laboratory seeks to design physiologically relevant cellularized biomimetic systems. These systems are often validated through a number of assays and imaging techniques. Microscope imaging studies can range from a few minutes to hours long. However, cells require certain conditions for extended studies. The extended studies on the microscope means that cells need to be in a temperature-controlled environment to maintain viability. The cellular platforms would need to be observed at 37°C, with gas and humidity control. In order to meet these environmental requirements for cells, we sought to design, build, and test an onstage incubation system. Typically, incubation systems can cost upwards of \$10K, our design is a fraction of the cost of a current commercially-available incubator system. The goal of this project is to build an affordable, top-stage incubation system that will aid in live cell imaging. This cost-effective stage top incubation system will be especially instrumental for experiments involving organ-on-a-chip microfluidics and may one day be useful for teaching laboratories as well.

AH-01 Name: Joy Cariño Major: English Project Category: Arts and Humanities (Oral Presentation) Faculty Mentor, Department: Dr. Ginger Pizer, English

#### Language Ideologies: Gender Inclusivity in Language Policy

Recent calls for acceptance of the LGBTQ community—specifically trans and non-binary people—through using "preferred" or "alternative" pronouns have been met with resistance. Some claim that people should not ask to be called a pronoun that does not align with their biological sex because this "incorrect" pronoun use undermines language or causes confusion. LGBTQ activists call for widespread gender-neutral language and acceptance of unconventional pronouns such as "zie" or "xe" to promote inclusivity and acknowledge the trans and non-binary community. While there has been previous research on language ideologies behind feminists' discouragement of the generic masculine "he" or "mankind," there is little research on the recent topic of gendered language use in government and universities in relation to trans or non-binary people. For example, language ideologies are evident in recent news coverage and commentary on Danica Roem's election to the Virginia House of Delegates. When Danica Roem, a trans woman, became the first openly trans person elected to a U.S. state legislature, Republican leaders of the Virginia House of Delegates." My research identifies language ideologies concerning pronouns and gender identity in the context of Danica Roem's election and language ideologies concerning pronouns and gender identity in the context of Danica Roem's election and language ideologies concerning pronouns and gender identity in the context of Danica Roem's election and language ideologies concerning pronouns and gender identity in the context of Danica Roem's election and language ideologies concerning pronouns and gender identity in the context of Danica Roem's election and language policy.

#### SS-05

Name: Areal Carter Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Dr. Collo

**Faculty Mentor, Department:** Dr. Colleen Sinclair, Psychology; Dr. Rebecca Goldberg, Psychology; Chelsea Ellithorpe, Psychology; Jessica Utely, Psychology

#### **Examining Sexual Racism In Online Dating**

In the past 10 years, online dating has become increasingly common, largely because of the advancement of apps (Tinder, Grinder, etc.) and smartphones. Technology is now at our fingertips, it is easier to meet someone online than in regular social settings and individuals are both finding potential romantic partners online (Cacioppo et al., 2013; Hall,2014). The purpose of this study is to expand Callander et al. (2015) to examine whether racial biases influence partner selection by

testing whether implicit associations correspond to a tolerance of "sexual racism" and preferences for same-race dating. Sexual racism refers to the process of eliminating potential dating partner based on the perceived race (Callander et al., 2015). Recent studies only focused on the racial interactions between African American and Caucasians. In this study, we are expanding by adding Asian Americans and Hispanic/Latino Americans. With expanding the research, it will help answer our question, if people are more likely to rate dating Participants were instructed to do a two-part experiment within the first part they were instructed to complete a dating profile, demographic survey, Ideological Consistency scale and the MCIAT. The second part participants are randomly assigned to group A or B and are shown 12 dating profiles. With expanding the research, it will help answer our question, if people are more likely to rate dating profile are more likely to rate dating profiles as attractive if they include same-race daters and whether those with higher levels of implicit bias are more likely to display their external bias.

PSE-06

Name: Geneva Catlett Major: Biological Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: John Ramirez-Avila, Civil and Environmental Engineering Co-Authors: Sandra Ortega-Achury, James Grafe Other Competitions: Thesis Research Competition (TRC)

#### Temporal and Spatial Analysis of Water Quality for Catalpa Creek Watershed

A study of Catalpa Creek in Starkville, Mississippi was conducted with the intention of assessing stream health and identifying trends in water quality parameters. Creek headwaters and main stream are currently influenced by nearby university and agricultural runoff, leading to imposed Total Daily Maximum Load (TMDL) restrictions by the Mississippi Department of Environmental Quality (MDEQ). As an ongoing study with the Mississippi State University Department of Civil and Environmental Engineering, this project intends to provide an assessment of the creek's water quality trends in order to improve university awareness of ongoing water quality issues. For analysis, grab water samples were collected weekly at 14 stations along the main channel of the creek. In addition, several parameters were assessed using an YSI sonde, including temperature, pH, salinity, dissolved oxygen, velocity, and flow depth. Results provide a temporal and spatial analysis of the collected data, an assessment of water quality variability within the Catalpa Creek watershed, and the identification of potential short-term best management practices aimed to improve water quality within the watershed.

BSE-11 Name: Ursula Cavalcanti Major: Biological Sciences Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Richard Baird, Biochemistry, Molecular Biology, Entomology and Plant Pathology Co-Authors: Dr. Richard Baird, Dr. Todd Mlsna, Dylan Tribolet, Chathuri Mohottige

## Gas Chromatography-Mass Spectrometry Analysis of Headspace – Solid Phase Micro-extractions for Volatile Metabolomic Differentiation of Macrophomina phaseolina Phenotypes

Macrophomina phaseolina (M. phaseolina) is considered to be one of the most harmful of the fungal plant pathogens. It has a wide host range, infecting nearly 500 plant species in over 100 different families. A few notable hosts include: sweet potato, corn, and soybeans. M. phaseolina causes a variety of diseases such as damping off, seedling blight, stem rot, root rot, along with others. An emerging method of categorizing different M. phaseolina isolates involves analyzing morphology and identifying variations in Microbial Volatile Organic Compounds (MVOC) that using an "electronic nose". For example, M. phaseolina can appear "flat", "fluffy", or an intermediate of the two.

Pathogenicity and morphology can perhaps be linked by studying MVOC's extracted using Solid Phase Micro Extraction (SPME) fibers followed by Gas Chromatography-Mass Spectroscopy (GCMS) analysis. Early detection of M. phaseolina is significantly important to agriculture (particularly in the state of Mississippi) from an economical, as well as a global ecological standpoint. One of the largest global dilemmas today involves the shortage of food due to agricultural

hindrances. The goal of this research is to develop an "electronic nose" that can detect M. phaseolina prior to storage, thereby reducing contamination and increasing agricultural yields. Different isolates of M. phaseolina are to be grown, and their MVOC's analyzed using GCMS. An analysis of the data through various statistical comparisons will be presented.

PSE-07 Name: Deepak Chapagain Major: Computer Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Lalitha Dabbiru, Geosystem Research Institute

#### Fusion of Synthetic Aperture Radar and Hyperspectral Imagery for Oil Spill Detection

Hyperspectral imaginary (HSI) contains large amount of information that was collected and processed from across the electromagnetic spectrum. The spectrum for each pixel in the image may or may not be significant. To get rid of unwanted spectrums various dimensionality reduction techniques were applied. Similarly, Synthetic Aperture Radar (SAR) images are the finer spatial resolution images obtained from synthetic antenna aperture. Considering the richness of hyperspectral data, a technique has been proposed that employs local Fisher's discriminant analysis (LFDA) to reduce the dimensionality and extract the features. Support vector machine (SVM) algorithm successively classifies the SAR and HSI data fused at the pixel level.

SS-06 Name: Kelly Coble Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Danielle K. Nadorff, Ph.D., Psychology Co-Author: Ethan D. Lantz, M.A.

#### Custodial Grandparents and Marriage: A Marital Satisfaction Comparison

Caring for grandchildren has been shown to be a possible cause of stress on a marriage. Depending on the amount of childcare they provide, it may result in dissatisfaction in the marital relationship or cessation of the relationship all together. Custodial grandmothers reported having less time for their husband, less privacy and more tension and arguing, and grandparents who have poor marriages are more likely to be dysfunctional parents to their grandchildren. However, the research conducted on the effects of custodial status on marital satisfaction has thus far been limited to cross-sectional studies. The current study examines the longitudinal differences in 12 aspects of marital satisfaction in a group of custodial grandparents (CGPs) and their same-aged peers. When examined cross-sectionally, CGPs fared worse than their peers in 8 out of 12 aspects of marital satisfaction. However, when examined longitudinally before and after assuming responsibility for their grandchild, there was only one significant Time x Custodial Status effect, with CGPs reporting higher levels of satisfaction than their peers. Findings, limitations, and implications will be discussed.

#### AH-02

Name: Emily Coggins Major: Educational Psychology Project Category: Arts and Humanities (Poster) Faculty Mentor, Department: Wendy Herd, English Co-Authors: Joy Cariño, Meredith Hilliard

#### Back-Vowel Fronting in Northern Mississippi

Back-vowel fronting has been studied and observed in U.S. dialects across the nation, from California and Nevada to Indiana and the New England states. In their study on acoustic characteristics of regional vowel systems, Clopper and Pisoni (2005) found features of back-vowel fronting mainly present in the speech of female participants, but in the South, those features of back-vowel fronting are found in the speech of both female and male speakers. In her study on speakers in Reno, Nevada, Fridland (2008) emphasizes that back-vowel fronting is associated with a variety of social factors -- region, gender, ethnicity -- but also exhibits a shift toward a global whereby speakers across the nation may shift regardless of social differences. However, despite the prevalence of back vowel fronting throughout the nation, it remains unclear whether the phenomenon is originally a characteristic of Southern American English, and Mississippi itself remains an understudied area within the broader community of Southern speech. The present study uses isolated word-list data collected from 29 speakers from the Hills region of North Mississippi. Using F1 and F2 values extracted from the center of monophthong back vowel sounds /o/ and /u/ in words such as boat and boot, we measure the degree of back-vowel fronting present in Mississippi Hills speech and examine its co-occurrence with sociolinguistic factors such as gender, ethnicity, and rurality.

#### BSE-12

Name: Jackson Coole Major: Biological Engineering Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Renita Horton, Agricultural and Biological Engineering Co-Author: Justin Taylor

#### Development of a In Vitro Co-culture system to mechanistically study cardiomyopathies

Organs-on-chip platforms are widely used to investigate development and disease. These platforms have been used to model the heart, lung, liver, kidney, gut, and brain. Serving as simplified models of complex organ systems, they can be used to perform functional comparisons of healthy and diseased tissues. Heart on chip models have been used to investigate stem cell derived cardiomyocyte maturation, disease pathways, as well as drug assays. The heart is composed of a number of different cell types such as fibroblasts, endothelial cells, cardiomyocytes, and neurons. Yet, a limitation of many chip-based studies is the limited focus on single cell types. We hypothesize that the paracrine signals expressed by endothelial cells can affect cardiomyocyte function. Therefore, we sought to design a physiologically relevant *in vitro* co-culture system that consists of an engineered endothelium and cardiac microtissue to test our hypothesis. To adequately mimic the *in vivo* microenvironment, we will couple multiple cell types which are represented in the cardiowascular system. Specifically, this integrated model will support the co-culture and simultaneous evaluation of cardiomyocytes and endothelial cells. We employ soft lithography, photo lithography, and laser etching to manufacture our microfluidic-based chips. We aim to develop the heart on a chip model to study mechanisms that contribute to cardiac disease and also a testing platform for drug therapies to treat or prevent heart disease.

PSE-08 Name: Germaine Cooley Major: Chemical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: John J. Ramirez-Avila, Ph.D., Civil and Environmental Engineering

#### Impacts of Land Use and Vegetation Corridors in Stream Water Quality

Forested areas around a stream shape the transport of sediment and moderate temperatures, while the lack of riparian vegetation could induce stream water quality impairment. Increase in urban runoff increases channel degradation indistinctly of the riparian zone along a corridor, which could also represent a potential impairment to stream health. Temperature, specific conductivity, TDS, pH, turbidity, dissolved oxygen, stream velocity and stream dimensions are being monitored weekly from eight different stations located throughout a tributary flowing upstream over an urban-forested area and downstream over an agricultural area. Water quality conditions, focused on tributaries of the Catalpa Creek Watershed, are studied to decipher any effects caused by differences in type of vegetation in riparian zones and surrounding stream land use. Study results would be beneficial to identify the type of riparian zone considered appropriate to ensure healthy living conditions for stream ecological systems within the Catalpa Creek.

#### AH-03

Name: John-Taylor Corley Major: Landscape Architecture Project Category: Arts and Humanities (Poster) Faculty Mentor, Department: Peter Summerlin, Landscape Architecture; Dr. Elizabeth Tofte, Landscape Architecture Co-Author: Danielle Griffin

#### **GIS Modeling: Identifying Regional Solutions**

Geospatial Information System (GIS) is a software program designed for capturing, storing and displaying geographical data related to positions on Earth's surface. GIS can show many different types of data layered on one aerial map to more easily analyze and identify patterns and relationships that would otherwise go unobserved at large scales. The power of GIS is its ability to sift through incomprehensible amounts of information concurrently and has consequently had an immense impact on solving regional planning issues. This research examines Memphis, TN as a case study to display the way that the most common dilemmas cities face can be conquered with the aid of this promising technology. Memphis was chosen because of its intrinsic connection with water, an element that many other municipalities regularly battle. As this urban area continues to grow, the availability and quality of water resources will define the character, habits, and economy of not only its immediate vicinity but also the surrounding communities. With the increase of development experienced on the periphery of Memphis, pressure has been added to the already fragile water systems, surpassing the natural limits of the rivers and streams, causing them to become impaired. While water quality is doubtlessly a major topic of interest, the reoccurring flooding experienced by residents following extreme weather events has led the discussion to focus on ways to mitigate water quantity from a regional scale. Using McHarg's Method of overlaying data, this project assesses flood risk, land characteristics, and public accessibility to generate a model that isolates optimal sites that could be leveraged to store and purify excess water during peak flow periods.

#### BSE-13

Name: Marie Cozzarelli
Major: Animal and Dairy Sciences (Pre-Vet)
Project Category: Biological Sciences and Engineering
Faculty Mentor, Department: Dr. Jean M.N. Feugang, Animal and Dairy Sciences
Co-Authors: Jackson A. Maddox, Allison R. Julien, Christy S. Steadman, Carrie K. Vance, Peter L. Ryan, Scott T. Willard

#### Comparative analysis of cadmium and cadmium-free quantum dot interactions with boar spermatozoa

Purpose: Typical quantum dot nanoparticles (QD) contains cadmium/selenide-zinc sulfide (CdSe/ZnS). This semiconductor has a size-dependent fluorescence emission, varying from violet to far-red and providing opportunities for bioimaging applications. However, the reported cytotoxic effects of cadmium has prompted the need for its replacement with nonor less-toxic materials such as copper indium sulfide (CuIS), while maintaining the fluorescence capability of the designed QD. Here we compared the effectiveness of copper (Cu) and cadmium (Cd) core-shell QDs for successful sperm labeling. Methods: Boar spermatozoa (2x10<sup>8</sup>/ml) were suspended in phosphate buffered-solution (PBS; 0.5 ml) and mixed with various concentrations (0, 0.02, 0.05, and 0.1 nM) of QD (CuIS/ZnS or CdSe/ZnS). Immediately after co-incubation (30-45 minutes) at 37°C, aliquots of sperm mixtures were evaluated for motility and abnormality using a computer-assisted sperm analyzer. The excess of QDs in remaining sample mixtures were removed by two successive centrifugations. Resulting sperm pellets were imaged to detect sperm-bound QD fluorescence emission, using the IVIS-Imaging system and EVOS-FLAuto microscope. Three independent replicates were performed and data were analyzed byANOVA-1 with significance at P<0.05.

Results: Irrespective of the core QD materials (Cd or Cu), general and dose-dependent decreases of the proportions of motile and forward progressive spermatozoa were observed P<0.05). In comparison to the control (0 nM), the concentrations of 0.02nM and 0.05nM in either QD-core material significantly reduced the proportions of abnormal spermatozoa, displaying bent tail or distal cytoplasmic droplet (P<0.05). Fluorescence imaging showed higher accumulation of both Cu-QD and Cd-QD in the sperm head region, but the signal intensity of Cu-QD appeared weaker. Conclusion: Both Cu and Cd core QD nanoparticles showed potential toxicity at higher concentrations, and Cu-QD had positive effects on sperm motility characteristics and morphology. Further ultrastructural analyses will provide a better

characterization of QD-spermatozoa interactions. Work supported by USDA-ARS Biophotonics Initiative #58-6402-3-018.

PSE-09 Name: Sarah Darrow Major: Computer Science Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Cindy Bethel, Computer Science

#### Tactile Sensing on a Robotic Dog

TherabotTM is a therapeutic assistive robotic dog that is intended to act as a support companion for people diagnosed with Post-Traumatic Stress and trauma-related disorders. This platform is designed to be used during supervised therapy sessions as well as in more frequent at-home exercises. The focus of this research effort is the development and evaluation of life-like and functional behaviors for this complex platform. In order for it to provide optimal support, it is important to understand how the humans using it will interact with it. To accomplish this, a network of sensors including capacitive touch sensors, gyroscopes, and accelerometers has been developed and used to collect data on when, where, and how users interact with the robot. Machine learning and artificial intelligence techniques have been used to analyze this data and determine how to alter the robot's behavior during different interactions. This allows the robot to act autonomously with realistic movements that resemble a real dog naturally responding to interactions with a human.

PSE-10 Name: Meenakshi Das Major: Computer Science Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Sarah Lee, Computer Science Co-Author: Chase Barr

#### Making STEM accessible for students with disabilities.

With the disparity in the percentage of persons with disabilities who complete an undergraduate education and persist on a STEM career pathway compared to those without a disability, there is much work to be done to create equitable and inclusive academic and work environments. Disability inclusion practices promote innovation and provide an accessible space where all abilities are embraced. This poster will provide an overview of inclusion programs that enable students with disabilities to thrive, with particular emphasis on the STEM pathway. It will provide anecdotal stories of students and early college graduates who have benefited from intervention programs. Recommendations for universities and companies on how they may engage and enable persons with disabilities to persist on STEM pathways will be presented.

PSE-11 Name: Mayukh Datta Major: Chemical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Keith Hollis, Chemistry; Charles Edwin Webster, Chemistry

#### Synthesis, Alkylation, and Metalation of Various N-heterocyclic Carbene (CCC-NHC) Pincer Complexes

Symmetric and unsymmetric N-heterocyclic carbene (NHC) ligand precursors and metal pincer complexes have been synthesized. The syntheses of unsymmetric starting ligand cores 3benzimidazole-1-imidazolebenzene and 1-imidazole-3-(1'-1',2',4'-triazole)benzene have been conducted. The aforementioned molecules have been alkylated with 1-iodobutane or 1chlorobutane, forming diiodide and dichloride proligand salts. Furthermore, the symmetric 1,3diimidazolebenzene was alkylated with 1-chlorobutane, and the resulting pro-ligand was used to perform initial metal complex formations. This proligand was metalated with  $Zr(NMe_2)_4$  and was transmetalated using  $Pt[COD]Cl_2$ , forming a platinum CCC-NHC pincer complex, which is a highly stable blue-light emitter under UV and could be used as an organic light emitting diode. The 1,3-bis(3'-butylimidazole)benzene dichloride salt was also metalated and transmetalated with  $Zr(NMe_2)_4$  and Ni(DME)Cl\_2, respectively, to form a nickel complex that has been shown to reduce carbon dioxide. The synthetic methodologies of the Ni-complexes will be extended to 1,3-bis(3'-butylbenzimidazole)benzene salts and to the two aforementioned unsymmetrical salts to form nickel complexes from these proligands.

#### SS-07

Name: Lloyd Dedeaux Major: Human Sciences/Human Dev & Family Studies Project Category: Social Sciences Faculty Mentor, Department: Charles Freeman, Human Sciences; Joe Wilmoth, Human Sciences Co-Authors: Erin McCord, Courtney Sapp, Janeese Parker, Jessica Williams

#### Identifying the relationship between dominant communication styles and relationship status

The purpose of this project is to determine the relationship between individuals' dominant communication styles and their relationship statuses. We know that individuals' dominant communication styles are important in their relationships. However, we do not know whether individuals' relationship statuses tell us what their dominant communication styles are. The survey that we used belongs to Dr. Rebecca Goldberg. Dr. Goldberg is an assistant professor in the Department of Counseling, Educational Psychology and Foundations at Mississippi State University. The survey consists of four personal questions and twenty multiple choice questions. The four personal questions represent age, gender, relationship status, and sexual orientation. Each multiple choice question consists of four answer choices. Each answer choice represents one of the four dominant communication styles. The four dominant communication styles are Assertors (A), Contemplators (C), Demonstrators (D), and Narrators (N). Assertors are fast-paced and direct, but more task-oriented. Contemplators are task-oriented, but more indirect and slow-paced. Demonstrators are people-oriented and fast-paced. Narrators are slowpaced and indirect, but more people-oriented. The individuals we selected are co-workers, family members, and friends who are either single, in a relationship, or married. When they completed the survey, we highlighted the answers that they chose and counted the number of A's, C's, D's, and N's that they had. The letters that had the highest number represented their dominant communication styles. For example, one individual we selected had 7 A's, 5 C's, 3 D's, and 5 N's. Because A had the highest number, their dominant communication style was Assertors. People should study our poster in order to better understand the relationship between individuals' dominant communication styles and their relationship statuses. The reason why this study matters is that if people know what their significant others' dominant communication styles are, then they will be able to better communicate with them.

PSE-12

Name: Christopher Denney Major: Aerospace Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Heejin Cho, Mechanical Engineering Co-Author: Coralie Rose

#### Pleat Geometry Distortion and Aging Effects of Nuclear Grade HEPA Filters

The Institute for Clean Energy Technology (ICET) at Mississippi State University has been involved in evaluating the performance of aged AG-1 Nuclear Grade High Efficiency Particulate Air (HEPA) Filters under design basis conditions to better understand aging effects of the filter media and components. HEPA filter media is coated in multiple protective polymer layers that increase tensile strength, provide protection against water, and sustain resistance to fungal growth. These functional polymer coatings are subject to degradation due to aging. To better understand the aging effects on axial flow filter media ICET performed an aged filter study using three-dimensional laser imaging metrology to determine the extent of pleat geometry distortion in aged filters after testing to design basis conditions. To determine how much damage time will cause to a filter, the pleat edge geometry of aged filters was analyzed. Three-dimensional image scans of several filters of various ages were created before and after exposure to testing at elevated conditions of 90% relative humidity and 140 degrees Fahrenheit. The initial and final scans of filters, which range from four to thirty-five years old, were then compared using VXelements 6.0 3D imaging metrology software to quantify the extent of pleat geometry change caused by age.

#### BSE-14 Name: Clara Diekman Major: Food Science and Technology Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Jiaxu Li, Biochemistry, Molecular Biology, Entomology and Plant Pathology

#### Genomic analysis of genes important for crassulacean acid metabolism in Kalanchoe laxiflora

Crassulacean acid metabolism (CAM) is a carbon assimilation pathway that evolved in some plants like cacti as an adaptation to hot and dry conditions. By only requiring the stomata to be open during the night for carbon dioxide uptake and keeping the stomata closed during the day, the CAM plants lose much less water. Their specialized leaves chemically store the carbon from the  $CO_2$  acquired during the night and use it for photosynthesis during the day. The inherently high water-use efficiency of plants with CAM highlights their potential as a model for improving the production of crops in warmer and drier environments. The recently sequenced genome of the model CAM plant Kalanchoe laxiflora provides an excellent opportunity for systematic analyzing of genes key to crassulacean acid metabolism. We examined seven gene families that are critical for CAM: beta carbonic anhydrase, phosphoenolpyruvate carboxylase, phosphoenolpyruvate carboxylase NAD(P)-dependent malate dehydrogenases, NAD(P)-dependent malate kinase, enzymes, phosphoenolpyruvate carboxykinase, and pyruvate orthophosphate dikinase. The CAM plant Kalanchoe laxiflora has increased copy numbers of genes in the gene families, except the pyruvate orthophosphate dikinase family, when compared with C3 (Arabidopsis and rice) and C4 (sorghum and maize) plants. These results suggest that CAM in Kalanchoe laxiflora is regulated by gene dosage or gene duplication. Furthermore, we found that the upstream regulatory regions of certain CAM genes in Kalanchoe laxiflora are enriched in circadian clock cis-regulatory elements, which is consistent with diurnal changes in gene expression. Comparative genomic analysis of CAM genes in CAM plants is an important step for introducing crassulacean acid metabolism into C3 crop plants for improved water-use efficiency and drought tolerance via genetic engineering.

#### BSE-15

Name: John Dodd Major: Physical Education/Kinesiology Project Category: Biological Sciences and Engineering Faculty Mentor, Department: JohnEric W. Smith, Kinesiology

#### Effects of carbohydrate timing and concurrent training while low carbohydrate dieting on power output

The purpose of this investigation was to examine the effects of carbohydrate (CHO) timing during a four-week concurrent exercise training program on power output while consuming a low CHO, high fat diet. Resistance trained males were randomized into two experimental groups: consumed 30 g of CHO during exercise and 40 g immediately after exercise (SUPP; n = 9) and consumed a non-caloric placebo during exercise and no CHO after exercise (NONSUPP; n = 9). Each group completed a four week training program consisting of 3 days per week resistance training and 2 days per week high intensity interval training (HIIT). The participants also consumed a low CHO, high fat diet (~50% fat, ~25% protein, and  $\sim$ 25% carbohydrate) over the course of the four weeks with the only difference between experimental groupings being the timing of 70 g of CHO. Participants completed a pre- and post-Wingate anaerobic test (WAnT), a 30-s "all-out sprint" on a cycle ergometer. Peak power output, mean power output, relative peak power output, relative mean power output, total work, and fatigue index were measured during the WAnT. Data was analyzed using a mixed effects two-way repeated measures analysis of variance [(pre-intervention x post-intervention) x (SUPP group x NONSUPP group)]. There were no group x time interaction effects or group effects for any WAnT variable (p > 0.05). However, mean power output, relative peak power, relative mean power, fatigue index, and total work completed all significantly increased pre- to postintervention (p < 0.05). Peak power output did not change as a result of concurrent training. Four weeks of both resistance training and HIIT increases anaerobic power output. However, reducing dietary CHO intake does not prevent performance improvements and timing of CHO intake does not affect power adaptations.

#### SS-08 Name: Caroline Douglass Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Andrew F. Jarosz, Psychology Other Competitions: Thesis Research Competition (TRC)

#### De-Mystifying the Word Problem: Is Reading Comprehension the Key?

Word problems are a very common, and very difficult, part of many math curricula. Interestingly, research suggests that in some cases, reading ability may supersede mathematical ability in determining word-problem performance (Bassok, Chase, & Martin, 1998; Kintsch, Reusser, & Weimer, 1988). For example, strong skills in reading comprehension assist in the creation of an accurate situation model, which may translate to more accurate problem-solving by allowing individuals to rule out irrelevant information in the problem (Kintsch et al., 1988). Relatedly, prior work has demonstrated that irrelevant semantic information is more likely than irrelevant numerical information to harm problem solving (Jarosz et al., in prep). The present study explores the connections between proficiency in reading comprehension and the ability to solve complex word problems with numerical interfering operations. Twenty-six participants were presented with multiplication and division math problems incorporating salient, but irrelevant, information. After solving the problems, students self-reported their Composite, Math, and Reading ACT scores. Results demonstrated a correlation between ACT Reading Scores and math word problem performance, r(24) = .40, p = .046. In contrast, the correlation between ACT math scores and word problem performance did not reach significance, r(24) = .33, p = .11. This indicates that while Reading ACT scores were a significant predictor, ACT math scores were not. Results of this study suggest that this is due to participants' ability to create an accurate situation model, which in turn may translate to one's ability to solve word problems which incorporate interfering operations. Future studies should include a larger sample size to increase power, as well as the inclusion of a non-self-reported reading comprehension and mathematical evaluation.

#### BSE-16

Name: Brady Dunaway Major: Environmental Sciences in Agricultural Systems Project Category: Biological Sciences and Engineering Faculty Mentor, Department: JoVonn Hill, Biochemistry, Molecular Biology, Entomology and Plant Pathology

# Comparative Analysis of Vigor and Pollinator Appeal in Black Belt Prairie Forb Seeds Versus Seeds from a Non-Local Supplier

Those who work in grasslands restoration or wildlife planting programs may find that plant materials and genotypes sourced from outside of their local ecoregion can result in plants that do not perform well in local soils and climates, do not exist on site long-term, or do not bloom at times that match the needs of local, specialist pollinators. Replacing these with even the same species but sourced from within the local ecoregion can create a healthier, more ecologically stable plant community that becomes more biodiverse with time and proper management. In cooperation with Prairie Wildlife of Clay County, Mississippi, we will run a set of field trials to compare the germination, growth, and bloom times of species from local, hand-collected seeds versus the same or similar species purchased from Roundstone Native Seed Company. Local seeds will be sown in situ, on several prepared plots of set dimensions next to their out-of-region counterparts grown on similar plots. Hypothesized results should show that while germination is less uniform or consistent in local seed sources, establishment and long-term vigor of seedlings and plant colonies may be superior to bought seeds. Locally acquired plant materials should also bloom at a time suited to the seasonal patterns of local pollinator species, whereas bought seeds may bloom and expire out of sync with what more specialized pollinators require. It may be observed that Roundstone plants bloom at an earlier age than those plants from local populations. Slight advantages, such as earlier maturation and higher germination rate, may initially reveal themselves when growing Roundstone seeds, however in a long-term trial the overall vigor and pollinator appeal should be greater in plants from local seed sources. Those working to restore native ecologies or to build habitat for local fauna should consider these qualities when sourcing their plant materials.

#### BSE-17

#### Name: Isabella Durham

Major: Wildlife and Fisheries Science/Aquaculture and Fisheries Science Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Dr. Garrett Street, College of Forest Resources Co-Authors: Dr. Natraj Krishnan, Dr. Marcus Lashley

#### Adaptation to "dishonest" environmental signals: insights from an experimental microcosm

Global change may alter the fitness of individuals and populations via changes in habitat quality cues. An animal's perception of these quality cues and their ability to adapt to changing cues are critical to population persistence. We examined the influence of perception of resource quality on fitness of fruit flies (Drosophila melanogaster) in an experimental system consisting of dishonest resource signals. Flies were placed on 24 diets varying in nutritional quality, and with non-nutritional quality-modifying additives, in a fully crossed design (high or low concentrations of carbohydrates, yeast, and sugar, and an attractant, repellent, or no additive [the control]). Eight generations were grown on every diet in isolation across 4 experimental trials, and fecundity counts were taken at generations 2 and 8 to assess potential adaptation. Fitness generally declined at low nutritional values as expected, though this effect diminished significantly by generation 8. In generation 2, diets with added attractant exhibited higher fecundity counts, and repellants exhibited lower counts; however, the direction of both effects switched by generation 8. Our results indicate rapid adaptation to adverse true environmental conditions, with populations increasing their fecundity by generation 8 on poor quality resources. Populations also adapted to the presence of a perceptual modifier over the same period—that is, incorrect signals of resource quality ceased to modify behavior within 8 generations of exposure. These results suggest that the rate of generational turnover is critical to population persistence in changing environments. Quickly reproducing ("r-selected") species should more quickly adapt to incorrect signals than those that reproduce slowly ("K-selected") due to decreased time necessary for adaptation to occur across generations. Animal perception and cognition are ecological mechanisms critical to population persistence in changing environments, and to establishment in novel environments (e.g., reintroduction or range expansion), with profound implications for biological invasions, conservation, and management.

BSE-18 Name: Morgan Duvic Major: Animal and Dairy Sciences Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Trent Smith, Animal and Dairy Sciences

#### Evaluation of udder and teat scores in beef cattle and the relationship to calf performance

The objectives of this study were to evaluate udder and teat scores in Angus (n=173 cows with 379 records), Charolais (n=54 cows with 100 records) and Hereford (n=24 cows and 73 records) fall calving cows and determine the relationship with calf performance. Data were collected from 2011 to 2016 with dam age ranging from 2 to 14 yr. Udder and teat scores were taken at calving using Beef Improvement Federation guidelines. Udder scores ranged from 1 (very pendulous) to 9 (very tight). Teat scores ranged from 1 (very large, balloon-shaped teats) to 9 (very small teats). Calf performance data included BW and WW. Udder data were analyzed using the MIXED procedure of SAS with udder or teat scores as response variables with year, breed, and dam age as fixed effects with dam as a random effect. Calf performance data were analyzed within breed with WW as the response variable with fixed effects of sex and udder score with dam age and age at weaning as covariates and sire as the random variable. Birth weight was negatively correlated with udder (-0.23) and teat (-0.21) scores (P<0.001). Breed significantly affected udder scores with Angus dams having the higher scores (6.80  $\pm$  0.11) when compared to Charolais (6.20  $\pm$  0.19) and Hereford (6.13  $\pm$  0.24) which were similar (P<0.05). Teat scores followed the same pattern as Angus dams had significantly higher scores than Charolais and Hereford which were not different

(P<0.05). There were no differences in WW due to udder scores for the three breeds. For teat scores, WW was significantly different in Angus with calves weaning the lightest from dams with a score of 1 (P<0.05). These results are similar to other findings on udder conformation in beef cattle.

Key Words: Udder conformation, beef cattle, calf performance

#### PSE-13 Name: Abdelmoula El Yazizi Major: Electrical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Mehmet Kurum, Electrical and Computer Engineering

#### **Evaluation and Development of Soil Moisture Retrievals Using CYGNSS Observations**

NASA's Cyclone Global Navigation Satellite System (CYGNSS) is primarily an ocean surface wind mission to improve weather prediction, but it also operates continuously over both land and ocean. The purpose of this research is to study and test CYGNSS land observations to assess the system's capability to measure land's surface soil moisture. The approach used here, was comparing CYGNSS reflected power over an area, to soil moisture data collected by other systems over a period of time. CYGNSS data was compared to both NASA's Soil Moisture Active Passive (SMAP) observations, and to Natural Resources Conservation Service (NRCS) measurement sites' soil moisture.

PSE-14
Name: Nicholas Ezzell
Major: Physics
Project Category: Physical Sciences and Engineering
Faculty Mentor, Department: Miguel Fuentes-Cabrera, Center for Nanophase Materials Science, Oak Ridge National Laboratory
Co-Authors: Peter Doak, Artem Maksov, Maxim Ziatdinov
Other Competitions: Community Engagement Research Track

# 2D self-assembly of hexagonal bacterial micro-compartment membrane proteins is sensitive to orientation flips and height-offset

Bacterial micro-compartments, BMCs, are organelles that exist in many types of bacteria. BMCs are composed of enzymes that perform a variety of reactions housed inside an outer-shell of hexagonal and pentagonal proteinaceous tiles. This outer-shell acts as a porous membrane that controls the passage of substrates and products into and out of the BMC, respectively. Because of the variety of tiles that exist and the possibility of combining them into molecular scaffolds with tailored permeability and enzymatic properties, understanding the self-assembly of BMCs is gaining traction. We recently investigated the 2D self-assembly of hexagonal tiles using an approach that combines atomistic and coarse-grained force-fields. With it, we determined that the initial stages of self-assembly are driven by nucleation growth. In this work we present a new approach, where the coarse-grained force-field is mapped to a look-up table that allows us to investigate the boundary interactions between large clusters (islands) in addition to the initial stages of self-assembly. We find that self-assembly of the islands depends not only on the sidedness of the tiles (they are not symmetric when looking from above and below), but also on the difference in height between two tiles. These findings not only indicate the importance of carefully considering the underlying substrate used during experimental studies, but also present a means to explore the creation of new morphologies by adjusting sidedness and height difference. In particular, the computational framework we have created along the way provides a means for experimentalists to predict large-scale structure and behavior of clusters without having to run time-consuming and expensive experiments.

BSE-19 Name: Jasmine Ferrell Major: Biochemistry Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Dr. Lakiesha Williams, Agricultural and Biological Engineering Co-Author: Cameron Boswell

#### **Torque Properties of Porcine Patellar Tendon**

As a result of athletic injuries, the anterior cruciate ligament (ACL) is commonly replaced by the central third of the patella tendon (PT). The ACL failure mechanism is complex; however, research has shown that failure is commonly associated

with a torsional stress state. Studies suggest that the PT, when compared to the hamstring replacement of ACL and allografts, is a more effective ACL replacement. Our goal is to quantify the PT's response to torque and determine if its properties are close to that of the ACL. For this study, porcine PTs were subjected to a torque stress state with a customized device developed in-house. The PT was attached to the patella bone at its proximal end and tibia and fibula at the distal end. Both the patellar bone and tibia/fibula were cemented into separate blocks and then loaded onto the torque device. One end of the device was connected to the gear, which turned the potted bone while the other potted bone remained stationary. When the program commenced, the tendon was twisted. Data showed an increasing linear trend as is also shown in the typical stress-strain response of tendon in tension. The current results suggest that the novel test setup works properly, the recorded data was from the tendon only, and confirmed that the tendon can withstand torque. Future testing, including testing to failure, will allow for comparisons to the ACL torque failure rates that have already been observed through prior research studies.

SS-09

Name: Zoe Fokakis Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Danielle K. Nadorff, Ph.D., Psychology Co-Author: Ian T. McKay, B.A.

#### The impact of custodial status on grandparents' health in a Taiwanese sample

As life expectancy continues to increase, the population of co-resident and custodial grandparents (grandparents responsible for raising their grandchildren) has rapidly increased as well. Previous research has found that custodial grandparents are more likely to report lower satisfaction with their health and more limited activities of daily living. However, little research has examined the relation between custodial status and specific aspects of physical health, such as the presence of heart disease or diabetes. This study aims to provide an answer to these disparate outcomes by looking not just at activities of daily living and self-assessment, but by approaching physical health as a biological factor. Data from the Social Environment and Biomarkers of Aging Study (SEBAS) was used to examine whether grandparents whose grandchildren live with them (absent from any married adult children; CGPs) significantly differ from grandparents whose grandchildren are not co-resident (NCGPs) in the areas of current overall health, health compared to the previous year, health compared to same-aged peers, and the current presence of 12 diseases and disorders (high blood pressure, heart disease, cancer, respiratory disease, arthritis, ulcers, liver/gall bladder disease, gout, spinal spurs, and osteoporosis) as well as biomarkers of health such as cholesterol, triglycerides, and cortisol levels, and leukocyte telomere length. Custodial grandparents self-assessed their current health as significantly worse than non-custodial grandparents. However, there was only one disorder with significant group differences (ever having been diagnosed with lower respiratory disease), and none of the biomarkers yielded significant group differences. Findings, limitations, and clinical implications will be discussed.

BSE-20
Name: Emerald Ford
Major: Animal & Dairy Sciences
Project Category: Biological Sciences and Engineering
Faculty Mentor, Department: Shi-en Lu, Biochemistry, Molecular Biology, Entomology and Plant Pathology
Co-Author: Sonya Baird
Other Competitions: Community Engagement Research Track, Thesis Research Competition (TRC)

#### Characterization of Antifungal Activity of Endophytic Bacteria Associated with Soybean

Charcoal rot in soybeans is a destructive and economically important soil-borne disease in the Southern United States caused by the pathogen *Macrophomina phaseolina*. Currently there are no fungicide controls for the disease and varietal resistance to this disease is not forthcoming; it is imperative to determine if biological control is possible. Endophytic bacteria have not been previously studied for use in control of charcoal rot disease. The objective of this research was to characterize endophytic bacteria of soybean plants and to identify genes associated with antifungal activity. A few

bacterial strains isolated from charcoal rot-associated soybean plants showed strong antifungal activities against the pathogen. The 16S rRNA gene sequence analyses showed that three of the endophytic bacteria belong to the genus *Burkholderia*. Mutants with reduced or eliminated antifungal activity were obtained using a Tn-EZ transposome system. The transposon insertions were confirmed by PCR analysis. Plasmid rescue followed by sequencing was used to characterize the genes targeted by the transposon. Sequence analysis of the targeted genes in one strain showed that one gene encoding nonribosomal peptide synthetase (NRPS) is required for full production of antifungal activity against the pathogen. Whole genome sequencing shows that the genome of the strain is composed of three chromosomes and one plasmid with its closest identity to *Burkholderia pyrrocinia*. The gene targeted in the mutant was localized in approximately 50Kb gene cluster that contains the genes for biosynthesis, regulation, secretion, and modification of an oligopeptide. Determination of the compound structure is underway as well as testing to see the spectrum of action against pathogenic fungi and bacteria. Findings from this research will provide insights to understanding the molecular mechanism associated with antifungal activity as well as provide a bacterial package for enhancement of soybean production.

BSE-21

Name: Katy Franks Major: Biochemistry Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Din-Pow Ma, Biochemistry, Molecular Biology, Entomology and Plant Pathology Co-Author: Amanda Harper

# Identification of Aspergillus flavus MicroRNA-like RNAs Differentially Expressed in Maize Lines with Different Levels of Resistance and Susceptibility to Aflatoxin Accumulation

*Aspergillus flavus* is a common pathogen that infects corn (Zea mays) during pre-harvest and postharvest stages. The infected corn produces aflatoxins B1 and B2, which can result in immunosuppression via aflatoxicosis in mammals if ingested. One of the strategies in reducing aflatoxin contamination is to breed maize lines with resistance to *A. flavus*. Several resistant maize inbred lines have been developed by Dr. Williams's group at USDA/ARS at Mississippi State. MicroRNAs (miRNAs) are a class of small non-protein coding RNA molecules found in many eukaryotic organisms and they are involved in many developmental processes and play key roles in gene regulatory networks and varied biological processes. One hundred and thirty-five miRNA-like RNAs (milRNAs) had been identified in *A. flavus* via Illumina deep sequencing, and the expression of some of them were found to be correlated with aflatoxin production. In this research, the differentially expressed A. flavus milRNAs between the resistant (Mp719) and susceptible (Va35) maize lines were identified by quantitative real-time PCR (qRT-PCR). Small RNAs had been isolated from both maize lines inoculated with *A. flavus* NRRL 3357 which produces high levels of aflatoxin and were subject to qRT-PCR analysis. This study will further our understanding of the molecular mechanisms governing maize resistance to *A. flavus* and aflatoxin accumulation. The identified differentially expressed milRNAs can be used as markers in the development of maize lines with enhanced resistance to aflatoxin accumulation.

BSE-22 Name: Leah Gann Major: Horticulture Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Tongyin Li, Biological Sciences and Engineering Other Competitions: Community Engagement Research Track

#### Use of the MSU Community Garden as a Living Base for Teaching, Research, and Outreach Programs

A case study was conducted to investigate the use of the MSU Community Garden as a living classroom for teaching, research, and outreach programs. The Mississippi State University Community Garden initiated its first planting in April, 2017. Designed by associate professor Cory Gallo's landscape architecture design/build studio, twelve raised beds were designed and built in the garden. Construction of the MSU community Garden is planned to be complete in 2018 with a total number of 30 beds and an orchard. From a teaching standpoint, three courses including the Gardening Experience (PSS 1113), Grow Your Own Salads and Soups: Vegetable Gardening (LA 1001), and Community Food Systems (LA/PSS/FNH
4990/6990) are using the community garden as experiment site, where students gain hands-on experience of growing vegetables. At the MSU Community Garden, students can volunteer to work in the garden and serve as creative outlets for them. The Community Garden also serves as a base for graduate and undergraduate student research. The garden is available to student, staff, and faculty members in MSU and to Starkville citizens and serve for demonstration purposes of new and sustainable gardening practices. The community garden provides opportunity to involve people of all ages in promoting inspiration for gardening and a sense of pride in the work that is accomplished there. Therefore, the community garden is making an impact for people in and outside MSU by increasing health consciousness of the community and promoting a healthy local food system.

#### BSE-23

Name: Anna Gaudin Major: Agronomy Project Category: Biological Sciences and Engineering Faculty Mentor, Department: K. Raja Reddy, Plant and Soil Sciences Co-Author: Hunt Walne

#### Seed Germination Response to Osmotic Stress in Corn Cultivars

Seed germination, controlled by both genetics and the environment, is an important process in the life cycle of corn (Zea mays L.). Drought is one major environmental factor influencing both germination rate, and maximum germination. An in vitro experiment was conducted using polyethelene glycol (PEG 8000) to examine the impact of osmotic stress on the germination properties of six commercially available corn hybrids. Three hybrids contained a known drought tolerant gene package, advertised to perform better under rain fed conditions (P1498, DKC 65-81, and N59B-3111A), while the other three hybrids contained no reported drought tolerance mechanisms (P1319, DKC 66-97), and N61X-3110). Time series data for seed germination was generated at various osmotic potentials from 0 to -0.9MPa, at -0.2 MPa intervals while the seeds incubated at 25°C. Maximum seed germination, time to 50% germination, and seed germination rate were derived by using appropriate regression analysis. A cumulative drought response index (CDRI), developed by summing individual response index of parameters, was used to classify corn hybrids into three drought-tolerant groups. The identified tolerance among hybrids could help producers select the best hybrids suited for suboptimal water conditions.

SS-10 Name: Leslie Gould Major: Agricultural Economics Project Category: Social Sciences Faculty Mentor, Department: Keith Coble, Agricultural Economics Co-Authors: Dr. Keith Coble, Dr. Alba J Collart

# Preference of USDA Spending

Every year, the United States Department of Agriculture (USDA) spends roughly US\$140 billion across farm commodity, nutrition assistance, conservation, and other various programs, yet the average American may prefer to spend public funding differently than USDA's current allocation. In this study, we survey a representative sample of 465 U.S. adults to investigate how they would distribute USDA's funding amongst these four program categories. In addition, we examine whether and how information on the different support programs and on USDA's current budget affects individuals' preferred distribution. We find that, on average, respondents would spend significantly less in nutrition assistance and more on conservation and other programs relative to USDA's current allocation. However, when respondents receive additional information on USDA's current distribution of funding, their allocation towards nutrition assistance programs increases while that for the other three program categories decreases. Our results provide further insights on U.S. public spending preferences, which may serve to inform policymakers as they draft legislation such as the 2018 Farm Bill.

SS-11
Name: Haley Grant
Major: Educational Psychology
Project Category: Social Sciences
Faculty Mentor, Department: Kasia Gallo, Counseling, Educational Psychology, and Foundations

#### Effectiveness of Suicide Prevention/Intervention for Adolescents and Young Adults

According to the U.S. Department of Health & Human Services (CDC, 2015) and the U.S. Surgeon General (2012), suicide is a major public health problem, consistently ranking in the top 10 causes of death in the United States (Bal, Weidner, Leed, & Raaka 2016). While there are many prevention and intervention programs in the world today, suicide is continuing to prevail among causes of death, especially among adolescents and adults. The purpose of this literature review is to explore the effectiveness of suicide prevention/intervention programs from the ages of adolescents to young adults. Today, family involvement and technology are the most prevalent measures within suicide prevention and intervention programs. The demographics of the programs also play an important role in the suicide prevention and intervention efforts, leading to better results if the program was related to a specific demographic rather than being universally distributed. The results appear to show that suicide prevention and intervention efforts are successful initially, but none of the program examine the results long-term. Further research is essential to find out the long-term effects of suicide prevention/intervention programs.

BSE-24 Name: Jillian Greenwood Major: Animal and Dairy Sciences Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Dr. Molly Nicodemus, Animal and Dairy Sciences

#### Relationship between stepping mechanics and leash leading in large dog breeds at a walk

The walk in dogs is often the easiest gait to examine locomotive abnormalities due to its slow pace. Assessment of the walk can reveal prominent orthopedic issues that are common in large dogs such as hip dysplasia. However, this assessment is often done while the dog is walking on a leash, any yet, research concerning the influence of leash leading on gait mechanics is lacking. Study objective was to determine the influence of the leash on walking gait mechanics in large dog breeds. Twelve healthy large dogs (weight: 19-32 kgs) were filmed being led at a walk in both conditions, leashed (L) and unleashed (U). Five consistent strides (velocity: 0.8-1.3 m/sec) were analyzed for each dog at each condition. A computer was used to perform frame-by-frame analysis of gait. Means (SD) were determined for stride variables and ttests were performed between condition types (P=0.05). Stride duration was consistent between condition types (L=0.56+0.08 sec, U=0.48+0.03 sec, P>0.05). While both conditions alternated between tripedal (L=15+1%, U=12+1%, P>0.05) and bipedal support, significant differences were found between condition types within the type of bipedal support (Lateral: L=45+5%, U=36+4%, P<0.05; Diagonal: L=40+3%, U=52+6%, P<0.05). The diagonal nature of the walk was further achieved by coupling of the diagonal limbs as the dog was taken off the leash (Diagonal Advanced: Placements- L= 28+3%, U=17+2%, P<0.05; Lift-Offs- L=30+4%, U=14+1%, P<0.05). This changing of limb timing was accomplished by the dog spending significantly more time with the fore paw on the ground compared to the hind when off the leash (Stance Duration: Fore- 41+4%, Hind- 33+2%, P<0.05), which was not seen while on the leash (Stance Duration: Fore-50+5%, Hind-53+4%, P>0.05). In conclusion, stepping mechanics in large dogs that are walking is influenced by the leash and should be a consideration when doing clinical examinations of the gait.

#### SS-12

Name: Hannah Hardwick Major: Physical Education/Kinesiology Project Category: Social Sciences Faculty Mentor, Department: Chih-Chia (JJ) Chen, Kinesiology Co-Author: Yonjoong Ryuh Other Competitions: Public Health Research Competition

# Characteristics of Exercise Behavior among College Students: A Comparison Study between Kinesiology Exercise Science and Non-Kinesiology Majors

Background: The physical activity levels decline throughout the life span is evident in young adulthood. To date, Kinesiology has become one of the most popular majors in college students. Theoretically, exercise science majors who have professional information and knowledge may lead to increased exercise self-efficacy, exercise motivation and participation compared to other majors. Thus, the purpose of this study was to examine the influence of Kinesiology curriculum on college students' physical activity behavior by merging the perspective of the transtheoretical model. First, physical activity levels, exercise motives, decisional balance and self-efficacy would be different. In addition, Kinesiology curriculum would positively influence college students' stage of change behavior. Methods: The total of 115 Mississippi State students (73 females, 42 males) aged from 18 to 30 years (M=20.6, SD=2.67). The sample was 72.2% Caucasian, 20.9% African American, 1.7% Hispanic, 2.6 % Asian/Pacific Island, and 2.6% other, which paralleled those of the University (71% Caucasian, 21% African American and 2% Hispanic). Five instruments used in this study assessed self-reported exercise motivates, stage of change, self-efficacy, decisional balance, and leisure-time exercise levels.

Results: Independent t-test was used and revealed there was no difference between Kinesiology and Non-Kinesiology majors in weekly vigorous, moderate and light physical activity levels, exercise motives, self-efficacy and decisional balance. In addition, chi-square test indicated the stage of change did not vary as a function of academic major. Discussion: The results of this study showed no difference in physical activity behavior between Kinesiology exercise science and non-Kinesiology majors. The possible reason is that current exercise science curriculum is focused on treating all kinds of populations as exercise professionals. Future curriculum may incorporate physical activity which may give exercise science students more knowledge of various ways to apply that knowledge to their exercise program in order to promote public health and wellness.

SS-13 Name: Hannah Hawkins Major: Educational Psychology Project Category: Social Sciences Faculty Mentor, Department: Kasia Gallo, Educational Psychology

#### Counseling and the neurological components for suicidal individuals

The purpose of the present research is to determine if certain counseling techniques could play a role in helping suicidal individuals overcome their suicidal thoughts, to show counselors what to look for in potential suicidal clients, and to discover neurological dispositions of individuals who have contemplated or attempted suicide. Much research exists on this topic, but a gap in literature was discovered. Research results suggest that many suicidal individuals do not seek counseling, so it is difficult to know the most beneficial techniques to help them overcome suicidal ideations. Some literature did include several counseling techniques and strategies to help suicidal individuals. For example, directly talking about suicide and confronting the issue with a client, and cognitive behavioral therapy where reachable goals are set, are two important techniques. Literature also highlighted certain themes in the way clients act and talk in counseling sessions that suggest they may be suicidal. These include loneliness, sickness, drug use, relationship issues, death of a loved one, poverty, etc. Lastly, the results of neurological studies suggest that individuals who are suicidal or have completed suicide exhibit different neurological functioning patterns than those who have never contemplated or attempted suicide. Examples of these neurological differences in the suicidal brain are rCMRglu differences which are differences in the regional cerebral metabolic rates of glucose in the brain, presence

of genes MAPKI and CREB1, which have shown to correlate with suicidal ideations, hypometabolism and hypermetabolism in the dorsolateral prefrontal cortex region, and the presence of chromosome LOY.

PSE-15
Name: Jeffrey Headley
Major: Physics
Project Category: Physical Sciences and Engineering
Faculty Mentor, Department: Dr. Chuji Wang, Physics and Astronomy
Co-Author: Che A. Fuh
Other Competitions: Thesis Research Competition (TRC), Public Health Research Competition

#### A Novel Combustion Platform for the Study of Microwave Plasma-Assisted Combustion

Plasma-assisted combustion (PAC) refers to the coupling of a plasma to a fuel/air mixture with the aim of enhancing the combustion process. Reported PAC enhancement effects include a reduction of emissions, improved flame stability, improved fuel efficiency, etc. Due to many complex processes occurring simultaneously, the exact mechanisms responsible for PAC are poorly understood. In order to better study these constituent mechanisms, a novel combustion platform is designed, capable of discriminating between the various reaction mechanisms. The novel platform also allows for an in-depth spatial examination of multiple reaction zones using optical emission spectroscopy. Three coupling schemes were examined using an optical diagnostics system which consisted of a digital camera to document the flame structure and an optical emission subsystem to characterize the reaction species. In each of the schemes, the argon microwave plasma stream is generated prior to the subsequent coupling. In scheme I, the plasma stream is coupled to a fuel-oxidizer mixture while in scheme II and III the plasma stream is coupled to the oxidizer stream or the fuel stream, with the resulting mixture subsequently joining the fuel or oxidizer stream, respectively. Digital imaging yielded distinct differences in the flame structure and shape for each coupling scheme. Similarly, for each reaction zone, aside from the plasma ignition zone, the optical emission spectra varied for each coupling scheme. This distinction between coupling schemes, despite maintaining the same experimental parameters, alludes to the differences in the underlying enhancement mechanisms in PAC. These results highlight the novel combustion platform's ability to highlight and differentiate between the underlying enhancements mechanisms.

SS-14 Name: Lily Hebert Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Deborah Eakin, Psychology

#### Word Associations Contribute to the DRM False Memory Effect

Roediger and McDermott (1995) demonstrated that hearing a list of interrelated words increased false memories for an unread, related word. For example, participants could hear words such as dream, slumber, and bed and remember hearing the word sleep because of the relationship of the cue words to sleep. This procedure is known as the Deese-Roediger-McDermott (DRM; 1995) paradigm; participants typically report the false target (i.e. sleep) as "old" as often as they do for a list word (i.e. dream). Although Roediger and McDermott (1995) attributed the false memory effect to a theory of association, not all word lists produced the same effect (Stadler, Roediger, and McDermott 1999). To find a more specific cause of the DRM paradigm, we constructed new word lists using values from the USF Free Association Norms (Nelson et. al 1998), maximizing forward strength between the cues and the false target. Forward strength is the likelihood of responding with sleep when given the word dream, for example. During the study, researchers read each word of the new USF lists and original DRM lists aloud to participants, who then took an old/new recognition test. A false memory effect was obtained for both the USF and DRM lists; however, the effect was larger for the USF lists, indicating that strong FAS between the list cues and false target contributed to false recognition. These findings indicate that the false memory effect can be explained by the implicit activation of the false target during the explicit presentation of associates during reading of the lists. When a list was created that optimized the implicit activation of the false targets, the false memory effect was increased over lists that did not manipulate this factor.

#### PSE-16

Name: Tyler Henderson Major: Physical Education/Kinesiology Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Matthew McAllister, Kinesiology Co-Authors: Margy Westbrook, Hunter Waldman, Dr. JohnEric W. Smith

# Effect of exogenous ketone salts on oxidative stress and cardiovascular responses in firefighters exercising in personal protective equipment

Effect of exogenous ketone salts on oxidative stress and cardiovascular responses in firefighters exercising in personal protective equipment. Margy Westbrook, Tyler Henderson, Hunter Waldman, JohnEric Smith & Matt McAllister Introduction Approximately 45% of all deaths in firefighters (FFs) are attributed to CVD. Exposure to heat, psychological stress, intense physical exertion, smoke exposure, and irregular sleep patterns are known to cause oxidative stress (OS), which facilitates the progression of CVD.  $\beta$ -hydroxybutyrate ( $\beta$ -OHB) has been shown to increase antioxidant status and decrease OS. The purpose of this study was to investigate the effect of  $\beta$ -OHB ingestion on blood markers of OS in professional FFs exercising in personal protective equipment (PPE). Methods: FFs were randomly assigned and ingested either  $\beta$ -OHB or a flavor matched placebo twice/day for seven days in a cross-over manner. Nine FFs completed the supplement protocol and all testing sessions. On the eighth day of supplementation, FFs exercised for 35 min at 60% VO2max 30 min after ingesting the supplement once more. Blood was sampled pre- and post-exercise (post periods: immediately, 30 minutes and 24 hours) and analyzed for markers of OS including red blood cell (RBC) levels of glutathione (GSH), and superoxide dismutase (SOD). Heart rate (HR) was recorded at 5, 10, 20, 30, and 35 min after the start of exercise. Data were analyzed with two-way repeated measures ANOVA. Fisher's LSD was used in the instance of a significant main effect (p < 0.05). Results: There was no treatment effect or treatment × time interaction (p > 0.05) for GSH or SOD. However, the exercise protocol resulted in significant increases in RBC SOD from pre- to immediately postexercise (p < 0.05) (Figure 1) and decreased RBC GSH from pre- to immediately and 30 minutes post-exercise (p < 0.05) (Figure 2). In addition,  $\beta$ -OHB resulted in a significant increase in ketone levels (p < 0.0001) and reduction in HR (p < 0.05) (Figure 3) during the exercise test. Discussion: These data show that physical exercise in professional FFs wearing PPE results in significant OS and seven days of ingestion of  $\beta$ -OHB is not sufficient to effect biomarkers of OS. However,  $\beta$ -OHB was associated with significant reductions in HR during exercise. Future research should investigate the effect of other antioxidants on biomarkers of OS in FFs.

#### BSE-25

Name: Lucie Henein Major: Animal and Dairy Sciences (Pre-Vet) Project Category: Biological Sciences and Engineering Faculty Mentor, Department: George (Trey) Howell III, Center for Environmental Health Sciences, Basic Sciences Co-Authors: Erin McDevitt, Sandeep Kondakala Other Competitions: Public Health Research Competition

# Increased hepatocyte lipid accumulation following exposure to trans-nonachlor is associated with decreased fatty acid oxidation

Type 2 diabetes often leads to a condition known as non-alcoholic fatty liver disease (NAFLD), or hepatic steatosis. Exposure to several organochlorine pesticides and their bioaccumulative metabolites has been associated with the development of type 2 diabetes. This study investigated whether exposure to the organochlorine (OC) pesticide metabolites p,p'-dichlorodiphenyldichloroethylene (DDE), trans-nonachlor, and oxychlordane alters lipid metabolism in hepatocytes to cause neutral lipid accumulation, triglyceride secretion, and fatty acid oxidation. Both McArdle-RH7777 (McA) rat hepatoma cells and rat primary hepatocytes were exposed to increasing concentrations of DDE, trans-nonachlor, and oxychlordane for 48 hours. Neutral lipid accumulation in rat primary hepatocytes increased for trans-nonachlor, whereas in McA hepatoma cells it increased for trans-nonachlor and oxychlordane. Both cell models were then exposed for 24 hours to increasing OC concentrations of trans-nonachlor in both fatty acid (FA)-free BSA, 400 M oleic acid (OA), and 800 M OA for the last 8 hours. With increased trans-nonachlor concentrations, triglyceride secretion in rat primary hepatocytes increased in FA-free BSA, 400 M OA and 800 M OA, while McA hepatoma cells showed increases in triglyceride

secretion following exposure to trans-nonachlor ( $20 \mu M$ ) with OA ( $800 \mu M$ ). Both cell models were finally exposed for 24 hours to increasing concentrations of trans-nonachlor in both FA-free BSA and 400 M OA for the last 8 hours. Rat primary hepatocytes showed an increase in fatty acid oxidation, whereas McA hepatoma cells showed a decrease. Therefore, in rat primary hepatocytes, it appears that the trans-nonachlor-induced neutral lipid accumulation may be due at least in part to decreased fatty acid oxidation and a potential lack of compensatory triglyceride secretion.

#### PSE-17

Name: Taylor Henry Major: Chemical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Santanu Kundu, Chemical Engineering Co-Authors: Satish Mishra, Dr. Santanu Kundu, Mahla Zabet, Dr. Bill Elmore, Jacob Salem

# **Mechanical Properties of 3D Printed Polymer Samples**

3-D Printing is a rapid-prototyping method to produce components with complex geometries. This technique has attracted a lot of interest in various areas ranging from biomedical to electronics and aerospace engineering. Solid-3D objects can be created by this method using a layer-by-layer procedure or fused-deposition method with precise control. Here, acrylonitrile butadiene styrene (ABS), T-glase, and PLA are used to 3-D print objects of different dimensions. These polymers are printed at different temperatures considering their melting points, and they are recycled for printing to maintain cost and environmental efficiency. In addition, the mechanical properties of these polymers are being investigated using tensile tests.

#### SS-15

Name: Laura Herring Major: International Business Project Category: Social Sciences Faculty Mentor, Department: Kathleen Ragsdale, Social Science Research Center Co-Authors: Kathleen Ragsdale, MA PhD, Mary Read-Wahidi, PhD Other Competitions: Community Engagement Research Track, Public Health Research Competition

# Exploring Food Insecurity Congruence among Husband-Wife Dyads Using the Household Hunger Scale: Occasional, Moderate, and Severe Hunger among Small-scale Men and Women Farmers in Rural Ghana

Background: Ghana's Northern Region—where approximately 73.5% of adults are smallholder farmers—experiences high rates of poverty, food insecurity, and childhood malnutrition (Ghana Statistical Service, 2013; Malapit & Quisumbing, 2014; Quaye, 2008). The USAID-funded Feed the Future Soybean Innovation Lab's research in Ghana's Northern Region is focused on assisting smallholder men and women farmers towards improved food security and sustainable agricultural production.

Methods: As part of a larger survey, we administered the six-item Household Hunger Scale (Ballard et al., 2011) to men and women farmers in the Northern Region—of whom the majority were husband-wife dyads—to assess dyad congruence for reported household-level hunger (HLH). The scale categorizes HLH in the past 4 weeks as occasional (1-2 times), moderate (3-10 times), or severe ( $\geq$ 11 times) for three Hunger Events: 1) No food to eat of any kind in the household due to lack of resources to get food, 2) Household member(s) went to sleep at night hungry because there was not enough food, and 3) Household member(s) went a whole day and night without eating anything because there was not enough food.

Results: Husband-wife dyads comprised 93.7% of the sample (N=675). Over 30% reported Hunger Event 1 in the past 4 weeks 1-2 times (19.1%), 3-10 times (11.6%), or >10 times (2.1%). Nearly 29% reported Hunger Event 2 in the past 4 weeks 1-2 times (16.8%), 3-10 times (11.4%), or >10 times (2.8%). Nearly 23% reported Hunger Event 3 in the past 4 weeks 1-2 times (11.6%), 3-10 times (10.3%), or >10 times (2.9%). For all three Hunger Events, females were more likely to report occasional HLH. Males and females were equally likely to report moderate and severe HLH.

Discussion: Results suggest the Household Hunger Scale is an appropriate measure for cross-cultural use to assess HLH in food-insecure regions.

Name: Anna Holliman Major: Animal and Dairy Sciences (Pre-Vet) Project Category: Biological Sciences and Engineering Faculty Mentor, Department: B. J. Rude, Animal and Dairy Sciences Co-Author: J.D. Rivera

#### Evaluation of ensiling as a method to preserve culled sweet potatoes.

Sweet potatoes raised for human consumption have a large cull rate due to cosmetic standards, leading to losses for farmers and wastage of product. Sweet potatoes have elevated concentrations of beta-carotene and neutral detergent fiber, and were tested as a possible ingredient in silage as a method of preserving culled potatoes. At the start of the project, 5.8 kilograms of sweet potato were mixed with 8.2 kilograms of soybean hull pellets in varying ratios. The sweet potatoes were ensiled at 20%, 40%, 60%, and 80% of the overall mixture and allowed to ferment. The pH measured after the three weeks had increased in the 20% and 40% sweet potato mixtures and decreased in the 60% and 80% mixtures. None of these changes were greater than 0.25% so the mixtures did not have a significant decline of pH to begin anaerobic production of lactic acid. Once the pH of the mixtures had been determined, the nutrient balance of the material was assessed by proximate analysis for crude protein, ether extract, and dry matter/ash with a Van Soest et al. (1991) analysis for soluble carbohydrates. In all the mixtures, crude protein remained elevated despite the small crude protein concentration of sweet potato, as the soybean hulls had double the amount of crude protein. Ether extract in the silage remained relatively stable, not changing more than 0.68% from the 80% sweet potato mixture to the 80% soybean mixture. During the Van Soest et al. (1991) analysis the acid detergent fiber and neutral detergent fiber varied by 14.51% and 17.6% respectively, decreasing in concentration system and alternate methods should be investigated.

#### BSE-27

Name: Kristen Hubbard Project Category: Biological Sciences and Engineering Major: Chemical Engineering Faculty Mentor, Department: Renita Horton, Agricultural and Biological Engineering Co-Authors: Allison Healey, Ian Blakely, Nicole Seibold

#### Mechanically Tunable Materials for Biomimetic Microsystems

Microfluidic-based platforms can serve as simplified, yet relevant models for studying biological processes. These biomimetic platforms are an attractive option in that can capture features of an in vivo microenvironment in an in vitro setting, and they can be used to study development and disease. Organs-on-chip efforts seek to design humanized organ models to investigate various diseases. Further, these systems can be used to test drug candidates. Mechanotransductive cues can potentially influence cellular responses. PDMS is widely used in microfluidic applications and has been found to be amenable to supporting cell culture. In this study, we seek to tune the mechanical properties of polydimethylsiloxane (PDMS) to match properties found within the cardiovascular system. Various types of PDMS are available commercially; based on the literature, we selected Sylgard 184 and 527 to begin initial tests. We found that pure 184 yielded a modulus of 2.46 MPa whereas pure 527 resulted in a modulus of approximately 5 kPa. The elastic modulus of a healthy heart has been characterized between 10-15 kPa. Therefore, we created PDMS blends to achieve similar ranges. Our target range is closer to the Sylgard 527, thus we sought to increase the stiffness by doping with Sylgard 184. We tested PDMS blends ranging from 1:15 and 1:20 (184:527). Findings will be compared with previously published polymer studies and reported moduli for healthy and diseased organs within the cardiovascular system. In addition to measuring moduli, we are also performing drug uptake studies to quantify potential drug loss to our system. These studies are critical steps in designing a physiologically relevant device to study biological systems. Our next steps include designing biohybrid systems to culture cells for disease and drug studies. Future work includes using these models to investigate cardiovascular diseases.

#### Name: Rebecca Humphrey

Major: Animal and Dairy Sciences (Pre-Vet) Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Shengfa Liao, Animal and Dairy Sciences Co-Authors: Zhongyue Yang, M. Shamimul Hasan, Mark A. Crenshaw, James Brett, Brian J. Rude, Bubba Burch

# Amino acid profile of GuarPro F-71, a potential protein source for swine and other livestock in the United States

High feed cost always limits the profitability of swine production in the US. Guar meal is the main by-product from the production of guar (Cyamopsis tetragonoba L.) gum. Although said to be unpalatable and maybe toxic, the improved new guar meal products possess promise to be alternative protein-providing feedstuffs for animal industries, mainly because they contain great amounts of protein and carbohydrates and, especially, are inexpensive. This study was conducted to evaluate the amino acid (AA) profile of GuarPro F-71, a newly developed guar gum by-product in India. Samples of GuarPro F-71 were randomly collected from India and aliquoted to multiple sub-samples (20 to 200 g/sub-sample) for nutrient evaluation in 2~7 laboratories. Analytical results showed that GuarPro F-71 contained (as-fed basis; ± SD) 95.3±1.20% dry matter (n=7), 58.6±1.76% crude protein (n=7), 6.47±1.54% crude fat (n=5), 4.21±1.91% crude fiber (n=4), and 5.26±0.40% ash (n=5). The gross energy content (as-fed basis; ± SD) was 4,301±45.1 kcal/kg (n=2). The AA contents (as-fed basis; ± SD; n=3) were 2.42±0.048% lysine, 0.64±0.022% methionine, 0.71±0.032% cysteine, 1.60±0.028% threonine, 0.86±0.032% tryptophan, 7.88±0.093% arginine, 3.24±0.054% leucine, 1.77±0.081% isoleucine, 2.08±0.057% valine, 1.51±0.062% histidine, 2.24±0.024% phenylalanine, 1.51±0.326% tyrosine, 2.82±0.013% glycine, 2.49±0.212% serine, 1.93±0.146% proline, 2.04±0.020% alanine, 11.65±0.288% glutamate, and 5.72±0.095% aspartate. While the contents of leucine, threonine, isoleucine, lysine, and proline were approximately 10~24% less than that in soybean meal (a common dehulled, solvent extracted product), the contents of histidine, tryptophan, glutamic acid, glycine, and arginine were approximately 18~128% higher than those in soybean meal, and so was the crude protein content which was approximately 23% higher. The contents of other AAs were similar (< ±7%) between GuarPro F-71 and soybean meal. Since these AA contents are not proportionally higher than those in soybean meal, more nutritional evaluation is needed before using it in commercial swine production.

PSE-18 Name: Jacob Istre Major: Chemistry Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Xin Cui, Chemistry

# Direct Synthesis of 1,2-Disulfonyl Diazetidine Derivatives and their Synthetic Applications

This work introduces a [2+2]-type double nucleophilic substitution reaction between 1,2-dibromoethane and hydrozones for direct construction of 1,2-diazetidin derivatives. The reaction employs disulfonylhydrazones as reactant, which was deprotonated by n-butyllithium to afford a dianionic nucleophile at low temperature. DMF was proven to be a suitable solvent for a sequential intermolecular and intramolecular nucleophilic substitution. Precise temperature control appeared to be a key to ensure high yields as the vicinal dianionic intermediates need to be stabilized as well as kept homogenous. As a synthetic application of the resulting 1,2-diazetidines, a practical ring-opening process has been developed for a facile synthesis of N-thioiminoethanamine derivatives.

# PSE-19 Name: Shameria Jones Major: Chemical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Neeraj Rai, Chemical Engineering Co-Author: Md Abdus Sabuj

#### Modeling non-covalent interactions in Dye Sensitized Solar Cells using Density Functional Theory

The knowledge of interaction of different components in dye-sensitized solar cells (DSSCs) can help design better systems. Density functional theory (DFT) can be used to probe non-covalent interaction between redox element and the dye, thus, eliminating the need to synthesize complex macromolecules in the first place. In this project, electron transfer between a metal-complex used as a redox shuttle in DSSCs and two dye segments consisting five different substituents having neutral and positive charges were used to determine binding energy, a key factor in molecular attraction. Analysis of neutral substituents shows favorable interactions with cobalt-complex, however, optimization of charged substituents along with full dyes are in progress.

AH-04
Name: William Jordan
Major: Architecture
Project Category: Arts and Humanities (Oral Presentation)
Faculty Mentor, Department: Alexis Gregory, School of Architecture
Co-Authors: Baron Necaise, Olivia Baker, Felipe Olivera

#### Working Hand in Hand

Designing and constructing a building is no simple task; the communication and cooperation of each person involved is essential. While technology has made it is easier for professionals to communicate, collaboration and teamwork between professionals in the construction industry is always a critical issue. Poor cooperation between architects and builders leads to poor craftsmanship, unfulfilled design, and a great deal of ill-feelings between design and construction professionals. Mississippi State University's College of Architecture, Art, and Design is working with students to understand these issues of collaboration. The School of Architecture and Building Construction Science Program has students collaborate on a design/build project each fall semester to achieve this understanding. This collaborative studio gives students experience in problem solving, communicate and collaborate between disciples in the workplace. The Collaborative Studio uses Integrated Project Delivery as the model for design construction. Integrated Project Delivery brings design and construction professionals to gether throughout a project to yield the highest quality research.

During Fall 2017 Collaborative Studio students were instructed to design and build a wooden bench. This process challenged students to overcome their differing points of view. The architecture students were more concerned with the aesthetic connotations of the project while the construction students were focused on creating an efficient and economical bench. Each group had to overcome their prejudices in order to create a final project that takes the best parts of each perspective and combines them. These experiences of understanding one another's viewpoints will serve as the foundation and 'blueprint' for education and practice in the future.

Name: Rebecca Keefer Major: Agribusiness Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Amanda Stone, Animal and Dairy Sciences Co-Authors: Kenneth B. Graves, Scott Hardin Other Competitions: Community Engagement Research Track, Thesis Research Competition (TRC)

#### Evaluating the effects of Vista Pre-T on feed efficiency in heat-stressed dairy cattle

The objective of this study, conducted between April 12 and September 1, 2017 at the Mississippi State University Bearden Dairy Research Center, was to evaluate the effect of Vista Pre-T (AB Vista, Marlborough, UK) on feed efficiency (FE) and milk components during heat stress. Cows (n = 92 Holsteins) were assigned to control (CON) and treatment (TRT) groups based on parity (1 or  $\ge$  2), days in milk (DIM), and milk yield. Cows were weighed and milk fat, protein, and lactose were tested weekly. Orts were weighed daily and FE was calculated by dividing energy corrected milk by dry matter intake. Reticulorumen temperature (RT) was obtained every five minutes via bolus (Smaxtec, GmBH, Austria). Temperature humidity index (THI; Tycon Systems Inc., Bluffdale, UT) was obtained hourly. Milk yield was recorded at each milking. The MIXED procedure of SAS was used to determine the relationship between FE, milk components, milk yield, RT, SCC, and THI between groups. The TRT group was more FE than CON ( $1.54 \pm 0.02$  and  $1.34 \pm 0.05$ ; P < 0.01). The TRT group had higher milk fat than CON ( $4.41 \pm 0.06$  and  $4.02 \pm 0.14\%$ ; P = 0.04). Milk protein was greater in the TRT group compared to CON ( $2.80 \pm 0.01$  and  $2.68 \pm 0.03$ ; P < 0.01). The CON group had lower lactose than TRT ( $4.70 \pm 0.03$  and  $4.85 \pm 0.01$ ; P < 0.01). The TRT group had lower SCC than CON ( $154,170 \pm 15,994$  and  $326,670 \pm 33,326$  cells/mL). Treatment and CON groups did not differ in RT ( $39.27^{\circ}$ C and  $39.11^{\circ}$ C, P = 0.27). Treatment did not have a significant effect on milk yield (P = 0.55), but THI did (P = 0.02). Vista Pre-T significantly improved FE, milk lactose, protein, fat, and SCC with no measured negative implications.

#### PSE-20

Name: Aaron Kimbrell Major: Computer Science Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Cindy Bethel, Computer Science and Engineering Other Competitions: Community Engagement Research Track

# The Use of Ollie as a Low-Cost Alternative for SWAT Robotic Systems

This project expands the commercially available robotic system, Ollie, into a platform capable of providing support to SWAT teams through the addition of an onboard RGB camera and high intensity LED lighting.

The Ollie platform is a low-cost and highly durable cylindrical robot which consists of an internal drive unit encased in a polycarbonate shell with two drive wheels on the outside of the shell. Though the robot is equipped for line-of-sight operation, remote operation is limited due to its lack of onboard imaging sensors. This project seeks to overcome these limitations by modifying the Ollie's hardware to incorporate an RGB camera and high intensity LED lighting.

These modifications will be tested to evaluate their efficiency and usability. This includes testing the control range and camera transmission range, as well as the effective battery life of the unit.

# SS-16

Name: Juliette King
Major: Human Sciences/Human Dev & Family Studies
Project Category: Social Sciences
Faculty Mentor, Department: Charles Freeman, Human Sciences; Joe Wilmoth, Human Sciences
Co-Authors: Meredith Welch, Anne-Marie Smith, Amber Coleman, Zoe Barfoot

#### Perceptions of Traditional Gender Roles in Early Childhood

Gender roles are consistently changing with the world today, and it is important to know if those changes are being interpreted in early childhood. Through marketing schemes and various forms of labeling, children are being exposed to gender-stereotyped clothing, toys, activities, and sports, to name a few. The purpose of this study is to research whether preschool students' preferences follow traditional gender roles when it comes to clothing and toy preferences. Previous research gives insight into the world of pink vs. blue and masculine vs. feminine toys, and this research takes that information a step further. In this study, thirty-one preschool students ages two to four were observed at the Mississippi State University Child Development and Family Studies Center. Each child that was granted permission to participate was observed one-on-one with the researchers and given choices between traditionally masculine and feminine toys varying in gender-stereotyped colors to see if color impacted their toy preference. The participants were also presented with the same piece of clothing in pink and blue and were asked to pick which one they would prefer to wear themselves. We anticipate to find that the male participants will prefer the clothing/toys that are feminine/pink. This study is relevant because it looks at whether the ever-changing view and function of gender roles in today's society is perceived by young children.

#### SS-17

Name: Anna Kirkpatrick Major: Human Sciences/Apparel Textiles & Merchandising Project Category: Social Sciences Faculty Mentor, Department: Charles Freeman, Human Sciences; Joe Wilmoth, Human Sciences Co-Authors: Michelle Jean, Taylor Fuller, Marietta Langdon, Pamela Folson

#### Vanity Sizing and Self-Esteem Among Women

The purpose of this study was to show the effects of vanity sizing and self-esteem among women. In the United States, apparel manufacturers are not using a standard system to label the sizes of ready-to-wear clothing. It is well known that many companies use different ways of measuring sizes for their garments. This method forces the consume to deal with inaccurate sizing methods, which in turn makes it hard for the consumer to determine the proper category for their size and weight.

For the study, a survey was sent out to women of many ages and ethnicities for a period of 2 months. The survey included the Rosenberg Self-Esteem Scale. The questions are answered using a seven-point Likert scale format with answers ranging from strongly agree to strongly disagree. During the survey, the women are asked 10 questions about their self-esteem. These questions are followed by a video for the women to watch that describes vanity sizing; after the video, the women then complete the Rosenberg Self-Esteem Scale again to see if knowledge gained from the video affect self-esteem.

We had 68 responses to the survey. The results found that most women's answers varied before and after watching the video. The study found that most women are not satisfied with themselves. After watching the video, most women became more satisfied with themselves but were still on the lower self-esteem side. Therefore, watching the video overall seemed to help women become more confident. Since the video highlights what vanity sizing is, it is likely the women's self-esteem grew because they began to understand that the problem is with the retailers not sizing the same.

# AH-05

Name: Benjamin Kromann Major: Electrical Engineering Project Category: Arts and Humanities (Oral Presentation) Faculty Mentor, Department Dr. William Kallfelz, Philosophy and Religion

# The Fundamentality of Causation and Experience

Two hotly-debated issues in philosophy are the Hard Problem of Conscious Experience and the Causal Induction Problem. These problems alone occupy huge swaths of philosophical research, and there is no shortage of different views to be had on them. One issue brought to light by the presented research is that these problems, while they are usually formulated as entirely separate – one in Philosophy of Mind and the other in Epistemology, they are in fact strongly and intractably related. The present research serves to put both problems within an analytic, metaphysical framework, and explores the results of considering them both in close light of each other. The resulting metaphysic is one that takes both causation and experience to be fundamental facets of reality, part of a larger framework that takes Process to be the ontological primitive, rather than substance or form. This has wide-reaching implications for philosophy in general, but especially for Ontology and Philosophy of Mind.

#### **BSE-30**

Name: Hannah Kruse

Major: Animal and Dairy Sciences (Pre-Vet)

Project Category: Biological Sciences and Engineering

Faculty Mentor, Department: Jean M.N. Feugang, Animal and Dairy Science

**Co-Authors:** Seong Bin Park, Shecoya White, Christy S. Steadman, Peter L. Ryan, Scott T. Willard, Henry J. Clemente, Jean M. Feugang

Other Competitions: Community Engagement Research Track, Public Health Research Competition

# Antibacterial effects of silver magnetic nanoparticles against Escherichia coli, Salmonella enterica serovar Typhimurium and S. Anatum

Purpose: The persistent resistance of many foodborne pathogens to existing antibiotics is a growing concern in healthcare and food safety. Silver magnetic nanoparticles have shown promise in killing or slowing growth of different bacteria. Here we analyzed the antibacterial potential of silver-coated magnetic nanoparticles (Ag-MNP) on foodborne pathogenic bacteria.

Methods: *Escherichia coli, Salmonella enterica serovar Typhimurium*, and *Salmonella Anatum* were incubated with various concentrations of Ag-MNP (0 to 200 µg/ml). Triplicate cultures were used for each bacterial/concentration pair. Growth curves were measured by optical density (OD) at 600 nm and bioluminescent imaging (BLI) for 24 hours, and aliquots of each sample were subjected to colony forming units (CFU/mL) determination. Thereafter, all samples were placed under a magnetic field (5-10 minutes) to trap the Ag-MNP and allow the elution of supernatants containing residual bacterial cells. Aliquots of each eluate were prepared for transmission electron microscopy (TEM) to observe Ag-MNP and bacteria interactions. Finally, subsets of control and Ag-MNP exposed *E. coli* were used for gel-based proteome analysis (two-dimensional electrophoresis or 2-DE). Data were analyzed by Student's t-test or One-way ANOVA, with P<0.05 indicating significance.

Results: Measurements of OD and BLI showed significant and dose-dependent increases of the lag phase durations in all bacteria. The CFU counts revealed significant decreases in bacteria concentrations following exposures to 100  $\mu$ g/ml (P<0.05) and 200  $\mu$ g/ml (P<0.01) Ag-MNP. The TEM images showed direct interactions of Ag-MNP with bacterial surface membranes and intracellular localization. The 2-DE analysis yielded 25 protein spots that were significantly differentially expressed between control and Ag-MNP groups.

Conclusion: The present study demonstrates the antibacterial capability of silver-coated magnetic nanoparticles, causing protein changes as observed with *E. coli*. The identification of these proteins will shed the light on the molecular mechanisms induced by the silver-coated magnetic nanoparticles, as potential alternative agents to antibiotics. Work supported by USDA-ARS Biophotonics Initiative #58-6402-3-018.

# AH-06

Name: Lucia Lang Major: Aerospace Engineering Project Category: Arts and Humanities (Oral Presentation) Faculty Mentor, Department: Dr. Kristin Boyce, Philosophy and Religion

# The Ethics of Advancement

Because of the intensive demands of STEM curriculums, little room is left in the education of an engineer for the arts and humanities. I believe that this is a mistake for many reasons, but I am going to focus on one. While STEM curriculums do an effective job of teaching students the objective aspects of science and mathematics, such as the physical qualities of the world and our ability to interact with them, they devote little attention to developing a student's capacity to think constructively about the implications of technological progress. As the modern architects of a future in an information age, it is the responsibility of engineers in particular to consider the difficult ethical questions of such advances. Developing this capacity to think creatively about the ethical implications of this societal and technological progress is a crucial contribution of a liberal arts background in a STEM education. One text in particular that has deepened my thinking about this is Mary Shelley's *Frankenstein*. Within this text, a scientist devotes his life to pursuing a scientific end goal, but he fails to ask himself or fellow scientists whether scientific achievement for the achievement's sake is a goal in line with his duty to society as an expert and, perhaps more importantly, as a human. Engineers in particular must be aware of this question and the discussions it raises.

# SS-18

Name: Marisa Laudadio Major: Communcation/Public Relations Project Category: Social Sciences Faculty Mentor, Department: Dr. Holli Seitz, Communication

# Using Publicly Available Comments on Facebook to Ascertain Public Opinion of International Adoption Background.

This research used online user-generated comments on stories about international adoption to address the following research questions about public opinion regarding international adoption: 1) What is predominant public sentiment toward international adoption? 2) What are common perceptions of international adoption? 3) What language is used to discuss these perceptions? 4) What issues contribute to these perceptions? Method.

The author searched the Facebook pages of 11 leading U.S. news sources using the term "adoption" to find stories pertaining to international adoption posted between June 1, 2016, to June 30, 2017. 11 stories and their comments (approximately 6,500) were collected. For two articles that had over 1,000 comments, 50% of the comments were sampled. Only comments pertaining to international adoption were retained for further analysis. These comments were uploaded to NVivo and analyzed using content analysis and thematic analysis. Results.

Public sentiment was split; approximately half the comments supported international adoption and half opposed international adoption. Perceptions associated with supporting international adoption included the idea that it saves lives or is a calling. Perceptions associated with opposing international adoption included the idea that America has enough children domestically needing help, and international adoption is selfish. Other identified perceptions included, "adoption is hard," "adoption is expensive," "adoption is selfish," and "most parents who adopt are seen in a positive light." Language used to describe adoptive parents included "angels," "good Samaritans," and "courageous." Issues contributing to perceptions were 1) immigration, 2) bureaucratic red tape, 3) the idea that governments "sell children," and 4) the possibility of separating siblings.

# Conclusions.

This research suggests that there are at least two distinct "sides" in online conversations about international adoption, each highlighting distinct issues of importance in the debate. Adoption advocates can use this information to shape communication and advocacy strategies.

#### Name: Emily Lawrence

Major: Agricultural Education, Leadership and Communications

Project Category: Biological Sciences and Engineering

Faculty Mentor, Department: Richard Baird, Biochemistry, Molecular Biology, Entomology and Plant Pathology; Stephen Meyers, North Mississippi Research and Extension Center

Co-Author: Dylan Tribolet

Do Packing Line Sanitizers Affect the Efficacy of Post-Harvest Fungicides to Control Rhizopus Soft Rot in Sweetpotato?

As part of the new Food Safety Modernization Act, it is recommended that sweetpotato packers use sanitizers in their postharvest agricultural water. The purpose of this study was to determine if sanitizers influence the efficacy of commonly used sweetpotato packing line fungicides to control Rhizopus soft rot, a common post-harvest sweetpotato disease. Rhizopus stolonifer discovered on sweetpotato roots in Pontotoc, MS was cultured and isolated. Surface sterilized 'Beauregard' sweetpotato storage roots were subjected to artificial wounding (8 mm wide by 5 mm deep) using an electronic device that applied uniform pressure. After wounding, a R. stolonifer suspension was applied and allowed to air dry before sweetpotatoes were subjected to a factorial of three fungicides treatments [water, Botran (2, 6-dichloro-4nitroaniline), and Scholar (fludioxonil)] by four sanitizers [water, Jet-Ag (peroxyacetic acid), Oxine (chlorine dioxide), and calcium chloride] by two levels of turbidity (clean or dirty). Three additional control treatments were included without fungicide or sanitizer treatments: non-wounded, non-inoculated; wounded, inoculated; wounded, non-inoculated. Following previous study protocols, roots were rated for incidence and severity of infection nine days after the test was established. Reisolation of R. stolonifer from symptomatic tissues was conducted to confirm pathogenicity. Severity was determined by a visual estimate of root area showing symptoms. Among the controls, wounding resulted in greater disease incidence (21%) than not wounding (0%) from natural inoculum and inoculation resulted in greater incidence (40%) than not inoculating (1%). Among all other treatments, infection incidence varied between the fungicides and water treatments ranging between 1 to 21% (average 11%). In addition, infection incidence did not differ by water turbidity (14% for both clean and dirty). By adding a sanitizer to the postharvest agricultural water, producers could prevent potential losses from their harvest, resulting in larger crop yields and a positive economic impact.

SS-19

Name: Erin Lenox Major: Human Sciences/Human Dev & Family Studies Project Category: Social Sciences Faculty Mentor, Department: Charles Freeman, Human Sciences; Joe Wilmoth, Human Sciences Co-Authors: Mary Margaret Mattingly, Searcy Swain, Cori Brunet, Brooke Matthews

# Effects of Technology Use on Relationship Satisfaction

With many students at Mississippi State University involved in a romantic relationship and with the increased use of technology today, our research team chose to investigate how these two elements relate to one another. The purpose of this study is to determine if cell phone use influences relationship satisfaction. We are researching to find the correlation between technology use and couples fulfillment within their relationships. We conducted an online survey to collect both quantitative data and qualitative data to grasp a better understanding of the interconnection between the two components using the Qualtrics Survey Software. The survey questions consisted of questions such as relationship status, use of technology in different social settings such as during meal time and conversations. We are predicting a positive correlation between cell phone usage and relationship dissatisfaction. Our survey results will reveal the association between these two elements.

# BSE-32 Name: Leah Leonard Major: Forestry/Wildlife Management Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Dr. Heather Alexander, College of Forest Resources

# Does sampling more than one increment core in growth-index-ratio-based stand table projection improve forest yield prediction precision?

Predicting the future yield of forest stands is the basis of management as well as policy and economic decisions regarding forests. Obtaining future forest yield is not a straightforward process in comparison to obtaining current yields, which can be measured directly in the field. Stand Table Projection (STP) is one of the approaches of predicting future yields of forest stands. STP is simple to apply because it only requires previous diameter growth measurements from a sample of the trees in the stand, which can be measured from increment cores taken from the sample trees. Usually, one increment core is sampled per tree dbh class. One increment core may not be a good representation of a dbh class due to possibility of various measurement and growth ring formation issues. Thus, taking more than one increment core per tree dbh class may help minimize the effect of increment core measurement errors on yield predictions from STP. Individual tree measurements from 364 longleaf pine research plots in the Southeastern United States were used to investigate whether sampling more than one tree per tree size class, for previous diameter growth measurements, would significantly reduce future yield prediction errors from STP. Findings from the research indicated that sampling more than one tree per dbh class, for STP increment cores, may not result in lower STP prediction errors. In addition, it was observed that STP prediction errors for stands that were less than 50 years old were more than 2 times larger than the errors for stands that were older than 50 years.

#### SS-20

Name: Madisyn Lincoln Major: Human Sciences/Human Dev & Family Studies Project Category: Social Sciences Faculty Mentor, Department: Charles Freeman, Human Sciences; Joe Wilmoth, Human Sciences Co-Authors: Kathleen Hand, Kacie Wilkinson, Jazzmun Holmes, Xavia Reese

#### Is there a relationship between school uniforms and morning routines?

Uniform use in public and private schools are rising, but we know little about how they affect student's morning routines. We wanted to discover the relationship between school uniforms and morning routines. Through our research, we were able to get a clear understanding of the difficulties, benefits, and misunderstandings of the reasoning behind morning routines. In Segal's research in 2004, routines are discussed in terms of the order they give to family life, whereas the lack of a family routine is discussed in terms of lack in order in the family. In West's research in 1999, more than half of parents who participated in the survey strongly favored the use of school uniforms. We are currently doing research on the long-term and short-term effects of how students react to school uniforms and how the uniforms play a role in their morning routines. For example, students who have been wearing school uniforms tend to want to express their own personality and individuality by the time they reach high school. We are gathering data by conducting interviews with parents of students who are or have worn school uniforms. We selected these individuals from private and public schools where uniforms are required. The research that we are gathering will give detailed information from parent's perceptions of morning routines that involve school uniforms. The study matters because it informs others of morning routines that involve school uniforms.

Name: Christina Loftin
Major: Biological Sciences
Project Category: Biological Sciences and Engineering
Faculty Mentor, Department: Dr. Andrea Varela-Stokes, Basic Science, College of Veterinary Medicine
Co-Author: Dr. Uri Donnett
Other Competitions: Thesis Research Competition (TRC), Public Health Research Competition

#### Prevalence of gastrointestinal parasites in northern Mississippi shelter cats

Parasitism of domestic cats (Felis catus) impacts feline health and has public health implications when zoonotic parasites are present. High parasite burden can cause anemia, immune-suppression, and poor vaccine response. Our objective was to evaluate the prevalence and intensity of gastrointestinal parasites in cats from northern Mississippi animal shelters. Feline cadavers (n=56) were collected from August 2017 to January 2018 from seven animal shelters in Northern Mississippi. Data collected included shelter source, gender, reproductive status, intake date and source, and internal/external parasite prevention records. Cadavers were processed to isolate stomach, small intestine, and large intestine. Sieves were used to collect contents which were then examined using stereomicroscopes for helminth identification. Centrifugal flotation with Sheather's sugar solution were performed on feces recovered from the rectum. Urine sediments were examined following centrifugation. We recovered helminths in 45 of 56 cats (80%). Thus far, we have identified Ancylostoma spp. (52%), Toxocara cati (41%), Taenia spp (29%), Dipylidium caninum (21%), and Spirometra spp. (2%). Thirty-six of 56 cats had positive fecal examinations (64%), with parasite eggs including *Toxocara cati* (39%), Ancylostoma spp. (34%), Coccidia spp. (23%), Spirometra spp. (9%), Taenia spp (9%), and Capillaria aerophilia (5%). Additionally 3 of 48 cats (6%) had capillarid-type eggs (Pearsonema spp.) in urine sediment. Ancylostoma spp., D. caninum, Taenia spp., T. cati, and Spirometra spp. are associated with human infection and were identified in this study. This is significant for feline and human health as, without proper healthcare, these cats may be released still shedding zoonotic parasites.

#### AH-07

# Name: Kayley Loggins

Major: Human Sciences/Apparel Textiles & Merchandising Project Category: Arts and Humanities (Poster) Faculty Mentor, Department: JuYoung Lee, Human Sciences

# The Relationship between the Furniture Industry and the Textile Industry

Today's consumers want products personalized to cater to their needs and wants and to receive these products quickly (Schuler, 2003). The United States furniture industry needs to implement new policies like mass customization and lower prices to stay competitive with foreign countries (Schuler, 2003). Most furniture industry models are currently outdated and cannot cater to customers' needs (Schuler, 2003). New consumers also want to feel guilt free after their purchases in regard to sustainability which companies will use to their advantage in marketing (Todeschini, 2017).

The textile industry is an important part of the furniture industry, so for furniture to be eco-friendly then textiles must be as well (Schuler, 2003). To become more green and economical, some companies are trying to transition to circular economy techniques (Todeschini, 2017). If the textile industry is behind then the furniture industry is behind because to be green and efficient every step of the design process must be efficient (Dangelico, 2013).

There is limited research in the relationship between the furniture and textile industry in direct relation with sustainability efforts (Dangelic0, 2013). The purpose of this research is to investigate what connections can be made between the furniture and textile industries in terms of business models and new strategies (Schuler, 2003). This research has a practical implication to find variables that increase the cost of furniture production through the product development phase in in relation to the textile industry since the product development phase is already the costliest part of production (Tyler, 2006).

In this research, I will use the Theory of Reasoned action to establish basis for my hypotheses which include positive attitude leads to positive purchase intention, brand loyalty leads to related purchases, and positive subjective norms will lead to positive purchase intention. I will use a survey to find results.

Name: Edward Hayes Lovelace Major: Poultry Science Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Wei Zhai, Poultry Science Co-Author: Bo Zhang

### Effects of dietary amino acid reduction on the meat yield of six strains of broilers

The effects of limiting the amount of amino acids in diets were determined on 6 strains of broilers. A total of 1,504 dayold hatchlings were randomly placed among 8 blocks in an environment controlled broiler house. Each of the 8 blocks received all the 12 treatments. The layout of the treatments was 6 (strains) × 2 (diets) factorial arrangement. Of the 6 strains of broilers there were 5 modern commercial strains and a control meat-type strain developed in 1955, Athens Canadian Random Bred (ACRB). The 2 diets that were given to the broilers consisted of one diet with normal levels of amino acids (AA) and one diet of 20% reduced amino acids (digestible lysine, total sulfur AA, and methionine). Data were analyzed using two-way ANOVA using PROC GLM of SAS 9.4. On d 42, carcass weights were decreased due to dietary AA reduction in all 5 modern commercial broiler strains (P = 0.007). On d 56, carcass weights were decreased in only 3 modern commercial broiler strains due to AA reduction (P = 0.001). In a similar manner, breast weights were reduced in birds fed AA reduced diets in all commercial broiler strains on both d 42 and 56 (P < 0.0001, P = 0.0002). In opposition, abdominal fat pad weight increased due to dietary AA reduction on both d 42 and 56 (P < 0.0001, P = 0.016), which may due to imbalance of AA and energy composition of the diets. However, the carcass or breast weights of ACRB were not affected. In conclusion, AA reduction affected meat yields of various broiler strains at various ages differently. Breast growth of modern commercial broiler strains was more sensitive to AA reduction than the rest of the body, which may due to genetic selection of high breast yield of broilers.

# AH-08 Name: Samuel Lucas Major: Chemical Engineering Project Category: Arts and Humanities (Oral Presentation) Faculty Mentor, Department: Dr. Tommy Anderson, English

# The Power of the Firstborn: J.R.R. Tolkien's Reimagining of Elves

With the publication of *The Hobbit* and *The Lord of the Rings*, J.R.R. Tolkien revolutionized the then nascent genre of fantasy literature by his portrayal of elves, a portrayal that was reinforced and expanded upon in his later writings. As part of this reimagining, Tolkien drew upon a range of influences, including Celtic mythology, Roman Catholicism, and early English folklore. These sources allowed him to reform Victorian/Edwardian fairies into robust and noble characters that joined with human beings to shape Middle-Earth. In this paper, I will consider Tolkien's sources and trajectory to argue that his intertextual relationship with the originators and propagators of his sources reveals that he was more interested in redefining literary archetypes than in repeating established tropes and figures. In repositioning Tolkien in this way, I make the broader claim that his body of work redraws the boundaries of the genre of fantasy fiction.

# PSE-21 Name: Phong Ly Major: Civil Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Jason Street, Sustainable Bioproducts Co-Authors: Brian Mitchell, Julianna Stratton, Beth Stokes

# Investigation of Modified Kudzu Proteins as an Alternative Adhesive for Wood Composites

Wood adhesives are ubiquitously used for the purpose of wood composite manufacturing. In 2015, over 500 kilotons of wood adhesives were sold in the US market, of which urea-formaldehyde (UF) and melamine urea-formaldehyde (MUF) accounted for nearly 70 percent of this volume. Because of the potentially toxic effects of formaldehyde to human health,

there has been a growing consumer drive for more sustainable adhesive alternatives such as protein based adhesives. Recent research has explored the use of modified soy proteins and the interest in a renewable feedstock. However, very few studies have been conducted on the potential of modified Japanese arrowroot or kudzu proteins as a wood adhesive. Because of its rapid growth of nearly 60 feet in an entire season as well as its 15-18 percent crude protein content, the harvesting of the invasive vine species shows great promise as a renewable, non-toxic alternative to UF and MUF wood adhesives. In this study, kudzu proteins were extracted from the leaves of raw kudzu found in rural Mississippi and modified with 10 percent NaOH solution to create a wood adhesive. The purpose of this work was to examine the shear strength of kudzu samples using a standard lap shear test and to compare its performance with soy proteins also modified with 10 percent NaOH.

#### BSE-35

Name: Jillian Masters
 Major: Microbiology
 Project Category: Biological Sciences and Engineering
 Faculty Mentor, Department: Dr. Jonas King, Biochemistry, Molecular Biology, Entomology and Plant Pathology
 Co-Authors: Catherine Dean, Donald Yee, Lily Brooks, Aline Badial
 Other Competitions: Public Health Research Competition

#### Differential expression of immune genes in Zika infection Aedes aegypti mosquitoes

Arboviruses transmitted by mosquitoes are a significant cause of mortality throughout the world, making them relevant to public health. Transmission of these disease-causing agents is dependent upon the existence of competent arthropod vectors that have the capability to maintain the pathogen, then transmit it to a subsequent host. Multiple studies of vector competence have suggested that the interaction that occurs between pathogens and the mosquito immune system plays a role in determining competence of the mosquito as a vector for disease. The reported capability of viruses to alter the response of the host immune system suggests that host-pathogen interactions could influence the efficiency of a mosquito's immune response. In this study, we analyzed relative expression of a suite of immune genes from ZIKV infected Aedes aegypti. Mosquitoes were reared as part of a larger study investigating the effects of larval diet on vector competence. Standard extraction techniques and cDNA synthesis, followed by gRT-PCR, using previously published primer sets, was used to analyze relative expression at the transcriptomic level. Analyses consisted of one group comprised of mosquitoes infected with Zika virus, as well as a second group of non-infected mosquitoes reared under identical conditions. Differential expression was observed in mosquitoes from the infected group in all immune genes analyzed when compared to the control mosquitoes, the general trend being down-regulation of genes when compared to housekeeping genes following viral infection. These results represent a step towards illuminating the influence of viral infection on the immune response in mosquitoes, which may have subsequent consequences for the transmission of arboviruses. Results from an ongoing study using the same suite of Aedes immune genes to measure gene expression as mosquitoes age under laboratory conditions will also be presented.

#### PSE-22

Name: Alec Mau Major: Geosciences/Broadcast Meteorology/Climatology Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Andrew Mercer, Geosciences Other Competitions: Thesis Research Competition (TRC)

# Obtaining a Climatology of Extratropical Transition Tornado Events Associated with Atlantic Basin US Landfalling Tropical Cyclones

Despite well-known risks associated with tornado incidence during a landfalling tropical cyclone, there is no accurate way to forecast which systems are more or less tornado prone. There also is a lack in continuity in overall forecasting because the transition of the tropical cyclone to an extratropical phase often shifts the forecast focus from one NOAA office to another. The purpose of this research is to develop a climatology of tornado incidence, severity, and frequency associated with all landfalling Atlantic Basin tropical cyclones that have undergone an extratropical transition in the United States

from 1995 (the beginning of the Doppler radar era) to 2016. Utilizing NCEP reanalysis data since 1995, we tracked and logged landfalling tropical cyclones as they underwent extratropical transition, often logging positions and times of closed cyclones that extended beyond NOAA's HURDAT log, to establish a climatology of U.S.-landfalling tropical cyclones. This established climatology is combined with the tornado report database provided by NOAA's Storm Prediction Center to formulate climatological characteristics of the tornadoes associated with extratropical cyclones that originated as landfalling tropical cyclones. Statistical climatologies of tornado EF ranking, path length, path width, and overall tornado counts by individual events are analyzed post-transition to illustrate the specific risks these isolated tornadoes pose. As threats for tornadoes within landfalling tropical cyclones persist past the transition phase, it is important to understand the inherent risks associated with these tornadoes. This research will provide valuable information regarding the risk of isolated tornado formation within a tropical cyclone as it undergoes extratropical transition.

BSE-36

Name: Emily McCabe Major: Biological Engineering Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Dr. Lauren Priddy, Agricultural and Biological Engineering

#### Rapid Prototyping and Development of a Tracheotomy Tube for Calves

If conventional treatments are unsuccessful, infections and diseases of the upper respiratory tract in bovine and equine animals may necessitate a tracheostomy. While some animals live long, full lives with a stoma (hole in the trachea) alone, others, such as calves, frequently develop complications from this procedure. Since little research has been conducted in this area, it is difficult to find solutions catered to the needs of these animals. While tracheostomy tubes have been successful in humans, using them in calves can be hazardous, as the calves quickly outgrow even the largest available human tracheostomy tube. The small, ill-fitting tube can lead to significant discomfort and more severe complications including death. Advancements in rapid prototyping allow researchers to, in an iterative process, tailor 3D printed models to the geometric needs of specific patients. To this end, we used computer aided design (CAD) as well as additive manufacturing (AM) to develop a tracheostomy tube appropriate for bovine animals, with the primary design criteria aimed to accommodate large animal tracheas, as well as growth in these animals. CAD programming allows us to quickly develop models and alter designs with specific feedback from doctors who have day to day contact with the patients. Specifically, we have modified the thickness, size, and mechanical strength of the neck plate and cannula of a commercially available, smaller human tracheostomy tube. CAD and 3D printing technologies can be used to develop tracheostomy tubes for other animals such as horses to improve their quality of life after tracheostomy.

PSE-23 Name: Martin McCandless Major: Aerospace Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Xiao Wang, Aerospace Engineering, Center for Advanced Vehicular Systems Other Competitions: Public Health Research Competition

#### **Computational Fluid Dynamic Simulation of Human Lung Airway Flow**

Accurate knowledge of airflow in the human airway allows for better understanding of breathing patterns and predictions of drug delivery in aerosols. *In-vivo* measurements of airflow within the human lung are problematic considering its extremally large numbers of branches that become smaller and more difficult to analyze; therefore, *in-vitro* analyses using computational fluid dynamics (CFD) may offer an approach to investigate air flow.

Patient-specific computerized tomography scans of the upper airway and a computer generated lower airway geometry that is physiologically statistically validated are used to generate the CFD mesh to 16 generations of the conducting zone. Validation of the CFD simulations are compared with a whole-body physiology simulation tool (HumMod). To reduce computing resources, one daughter bifurcation is truncated and replaced with boundary conditions that correspond to a non-truncated region of the lung. Good agreement is found between the CFD and HumMod during 5 seconds of a complete

breathing cycle. The total inhaled air volume is 0.515 L over an inhalation time of 2.5 s. The average volumetric flow rate is 0.206 L/s with a maximum flow rate of 0.451 L/s and a minimum flow rate of -0.447 L/s.

The results of this study suggest that CFD can provide an alternative to modeling the lung and are comparable to HumMod. With appropriate boundary conditions in place, the simulation results yielded excellent mass conservation over each breath cycle and an error of less than 0.02% of the maximum inhaled volume. It is observed that pressure distributions are heterogeneous through all the generations of the airway tree, and the turbulent regions in the upper airways can help predict the particle and aerosol deposition. The model is ready for lobar motion and incorporation of the alveolar region for more realistic simulations.

#### PSE-24

#### Name: Gage McCarty

Major: Physical Education/Kinesiology Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Matt McAllister, Kinesiology Co-Authors: JohnEric Smith, Hunter Waldman, Brendan Jones Other Competitions: Community Engagement Research Track

# The Impact of Environmental Heat and Anti-Oxidant Supplementation on Markers of Oxidative Stress in Professional Firefighters

#### Introduction

Approximately 45% of all deaths in firefighters are attributed to CVD. Exposure to heat, psychological stress, intense physical exertion, smoke exposure, and irregular sleep patterns due to variations in shift work are known to cause oxidative stress (OS), which is a major factor facilitating the progression of CVD. Curcumin is a powerful antioxidant supplement that has been shown to reduce OS and increase antioxidant capacity. The purpose of this study was to: 1) investigate the effect of environmental heat and 2) investigate the impact of ingesting curcumin on blood markers of OS resulting from a structured fire exercise in professional firefighters.

#### Methods

Blood was collected before, immediately after, and 30 min after a victim search and clear scenario and participants were exposed to three trials: 1- no heat, trials 2 and 3 involved added environmental heat during the procedure as well as ingestion of curcumin or placebo which were randomly assigned and ingested 30 min prior to the exercise. Blood was analyzed for markers of antioxidant status and OS including glutathione (GSH) and superoxide dismutase (SOD). Heart rate (HR) was recorded pre- and during exercise (5, 20, 15, 20 min) as well as immediately after completion of the exercise. Data were analyzed with two-way repeated measures ANOVA. Fisher's LSD was used in the instance of a significant main effect (p < 0.05).

#### Results

There was no significant session x time interaction, or main effect for time for blood GSH (p > 0.05). However, there was a significant main effect for session (p < 0.01) with significant elevations in GSH for both heat trials (curcumin and placebo) compared to no heat (Figure 1). Regarding SOD, there was no significant session x time interaction, or main effect for time or session (p > 0.05). SOD means are shown in Figure 2. Regarding HR, there was no significant session x time interaction, or main effect for session (p > 0.05); however, there was a significant effect for time (p < 0.01), with significant elevations in HR during exercise compared to pre and post (Figure 3).

# Discussion

The main findings are that heat exposure did not cause significant OS and ingestion of curcumin did not result in significant changes in antioxidant status. However, exposure to heat caused increases in antioxidant status (independent of antioxidant ingestion) which can likely be attributed to the training status of the firefighters tested. The firefighters tested this protocol are routinely exposed to heat for training purposes. As a training adaptation, heat exposure may trigger an up-regulation of antioxidant status to prevent OS; however, future research is needed to confirm this hypothesis.

SS-21 Name: Bailey McDaniel Major: Sociology Project Category: Social Sciences Faculty Mentor, Department: Dr. David C. May, Criminology

#### Factors that Predict Processing Sexual Misconduct Cases on University Campuses

There is a growing body of research on the causes and consequences of sexual assault on college campuses. A number of researchers have also examined the factors that lead to sexual assault (e.g., alcohol abuse, permissive rape culture) among college students. Nevertheless, no research exists that examines how universities process sexual misconduct cases and what factors make universities more or less effective in their handling of these cases. In the current study, I created a scale to evaluate 150 universities randomly selected from the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) on their proficiency in processing sexual misconduct cases at the university level. Preliminary findings suggest that the proficiency in handling these cases at the university level is affected by whether the university is public or private, their NCAA Division Ranking, and their percentage of female enrollment, among other factors. Implications for university policy and future research are also discussed.

BSE-37 Name: Erin McDevitt Major: Biochemistry Project Category: Biological Sciences and Engineering Faculty Mentor, Department: George Howell III, College of Veterinary Medicine Co-Authors: Lucie Henein, Sandeep Kondakala

# Exposure to the organochlorine compound trans-nonachlor increases hepatocyte neutral lipid accumulation due in part to increased de novo lipogenesis

One common manifestation of type 2 diabetes is hepatic steatosis, or nonalcoholic fatty liver disease (NAFLD). Many recent studies have shown correlations between pesticide exposures and type 2 diabetes presence. Specifically, the organochlorine pesticides or their metabolites have been highly implicated in this phenomenon. Thus, the current study was designed to determine if the prevalent organochlorine compound trans-nonachlor could directly affect hepatocyte lipid metabolism and produce steatosis. To execute this, both rat primary hepatocytes and McArdle-RH7777 cells were incubated with trans-nonachlor at various concentrations (0, 0.02, 0.2, 2.0, and 20 µM) for 24 to 48 hours then lipid accumulation and a marker of lipogenesis, fatty acid synthase, were examined. At the end of 48 hours, trans-nonachlor significantly increased neutral lipid accumulation in both cell types. After 24 hours, real time PCR was then used to determine fatty acid synthase (FAS) expression at each concentration. FAS gene expression levels in the primary hepatocytes showed a steady increase as trans-nonachlor concentration levels rose. In the McA cells, FAS protein levels showed steady increase with trans-nonachlor concentrations. This current data indicates that exposure to the organochlorine metabolite trans-nonachlor increases FAS gene expression, promoter activity, and protein level which may contribute to the currently observed neutral lipid accumulation. Thus, these data indicate that increased lipogenesis may be a key mechanism governing organochlorine-induced hepatic steatosis.

Name: Liam McDougal Major: Biological Engineering Project Category: Biological Sciences and Engineering Home Institution: Mississippi School for Mathematics and Science Faculty Mentor, Department: Dr. Lauren Priddy, Agricultural and Biological Engineering Co-Author: Weitong Chen

### Anisotropic mechanical properties of additively manufactured poly(lactic acid)

Background: Presently, the 'gold standard' treatment of a large bone defect is autografting, which harvests bone from a non-load-bearing site in the patient. However, due to limited tissue availability and the complication of the secondary operations, an alternative therapeutic is desirable. The purpose of this research is to use additive manufacturing (AM) to print a biodegradable polymer scaffold to be implanted in the defect site of bone. Ideally, this scaffold will have similar mechanical properties to those of the bone tissue. Although poly(lactic acid) (PLA) as a material is isotropic, the AM process inherently involves laying down material in a directional manner. We wanted to examine whether the build direction used in AM would lead to a directional dependence in the mechanical properties of PLA.

Method: The PLA solid samples with dimensions of 4x4x8mm were printed by a Lulzbot TAZ 3D printer. Compression testing in three orthogonal directions (X, Y, and Z, n=8) was performed at 1 mm/min, and force data was measured. Young's modulus and stiffness, which are the slope of the linear portion of the force-displacement and stress-strain curves, respectively, were calculated and compared among the three loading directions.

Results: Comparisons among the three axes showed that there was no difference in stiffness or Young's modulus in the X and Y directions. However, the stiffness and Young's modulus in the Z direction were significantly greater than those in the X and Y directions. These results underscore the importance of taking build direction into account when deciding how to orient samples for printing. Notably, the Young's modulus in the Z direction was 325 MPa, which is within the reported range of Young's modulus for trabecular bone (100-500 MPa). Ongoing work involves the design of porous PLA structures that more closely mimic the architecture of trabecular bone.

SS-22

Name: Amelia McLemore Major: Human Sciences/Human Dev & Family Studies Project Category: Social Sciences Faculty Mentor, Department: Charles Freeman, Human Sciences; Joe Wilmoth, Human Sciences Co-Authors: Mika Williams, Carolina Berryhill, Kristina Hudson, Raven Carpenter

# **Clothing Size and Body Image**

Our purpose for this research project is to discover whether clothing sizes have an effect on self-esteem. Previous research shows that people who find they wear a smaller size have an increase in self-esteem; however, people who found they are a larger clothing size did not show significant differences in self-esteem (Kinley 2018). We are collecting our data from doing quantitative research through pre-and post-questionnaires using Qualtrics; an online survey system. In between the questionnaires, the participants measure their body size using the ASTM (American Society for Testing and Materials) measuring system. For our research, our focus group is women ages (18-24). It is beneficial for people to learn about our research study; so that people can see that their clothing size is just a number, it does not determine their self-worth.

# AH-09 Name: Nate Mitchell Major: Chemical Engineering Project Category: Arts and Humanities (Poster) Faculty Mentor, Department: Dr. Jack Blendinger, Educational Leadership Co-Authors: Kaleigh Neiswander, Haley Petersen, Lexie Thompson, C. J. Weddle, Taylor White, Noah Wright

#### Write Like a Champ

The primary purpose of the innovative Write Like a Champ Research Project was to put into action an experimental innovative *textual criticism* strategy involving an undergraduate student-team whose members take on the dual role of *researcher-subject to* produce a product intended to help other undergraduate students, especially freshmen, become proficient academic writers. The problem our research addressed was that many freshmen and transfer students have trouble earning "C" or higher grades in their university courses because of writing deficiencies.

The research was initiated during the 2017 Fall Semester among students enrolled in LSK 1001 Freshman Seminar: Writing Like a Champ. The seminar was part of the First Year Experience Program at' MSU that features small class sizes and faculty who are dedicated to connecting with students through engaging activities and mentorship. After the seminar concluded, five of the freshman students-Nate Mitchell, Kaleigh Neiswander, Haley Petersen, C. J. Weddle, and Noah Wright-formed a research team to continue the project started in the fall. Two additional undergraduate students Lexie Thompson (junior) and Taylor White (sophomore)-were invited to join the team.

Throughout the fall semester, hundreds of pages in numerous documents, accessible to the public, addressing English composition were read, analyzed, and discussed. Textual criticism methods were utilized to prepare a co-authored manuscript focusing on "how-to" write like a champion. During the process, the researchers switched roles, becoming subjects, to test the materials created.

Research findings led to the preparation of a manuscript intended to help undergraduate students (1) master key English essentials (e.g., grammar); (2) craft "A" level responses for question-answer assignments; and (3) write "gold medal" worthy essays, research reports, and scholarly papers. The Kendall Hunt Publishing Company has expressed interest in publishing the co-authored manuscript. Publication royalties will be designated for undergraduate scholarship assistance.

PSE-25
Name: Buckston Morgan
Major: Chemical Engineering
Project Category: Physical Sciences and Engineering
Faculty Mentor, Department: Dr. Santanu Kundu, Chemical Engineering; Dr. Rangana Wijayapala, Chemical Engineering

#### Photoluminescence Polymer Film with Carbon Nanodots

Carbon nanodots are a class of carbon nanomaterials with particle size in the order of 10 nm. Carbon nanodots have great potential for bioimaging and biosensing which is contributed from their properties of low toxicity, low cost, resistance to photobleaching, and low environmental impact. Hydrothermal carbonization technique was used to synthesize yellow, red, and blue photoluminescent carbon nanodots with amine functional groups from ortho, para, and meta phenylenediamine, respectively. In this study, each set of carbon nanodots are interfacially polymerized with adipoyl chloride in order to make a thin layer of photoluminescent film. The polymer film is characterized using UV-Vis spectroscopy, Fourier-transform infrared spectroscopy, fluorescence spectroscopy, gel permeation chromatography, scanning electron microscope, and transmission electron microscope.

Name: Mustafa Muhammad Major: Biochemistry Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Sorina Popescu, Biochemistry, Molecular Biology, Entomology and Plant Pathology Co-Author: Gizem Dimlioglu

### The Effect of Oryzalin on Secondary Roots of Arabidopsis Mutants ilk1, ilk4, and ilk5

Integrin Linked Kinases have a variety functions and they have target specificity in plants and animals. Ilk genes function to send intracellular signals that control the regulation of signaling cascades. Ilk1 is linked to hyperosmotic sensitivity and the uptake of available nutrients. Ilk1 is located in the root system of plants or sometimes in the plasma membrane. Since integrin linked kinases have such diverse functions in plants, it can become variable what specific effects these ilk genes express due to specific environmental stressors. In this study, ilk genes are analyzed qualitatively to understand their effects on secondary root length of wild type, ilk1, ilk4, and ilk5 genes. Ilk genes of the Arabidoposis plant which includes: ilk 1, ilk 4, and ilk 5 mutant seeds were grown in a growth chamber at 22°C after being grown on Hoagland medium. Oryzalin is used as the stressor in Arabidoposis plants because it destabilizes microtubule growth. With unknown knowledge of the mutant genes: ilk1, ilk4, and ilk 5, the study specializes on the direct effect of oryzalin on the secondary growth of these mutants. Throughout the study it was noticed that the secondary roots of wild type showed a significant decrease in growth when concentrated with 150 and 200 nm of oryzalin. However, by measuring the ilk genes: ilk 1,4, &5, we can conclude that they have inferred resistance to oryzalin and the secondary roots grew normally at 150 nm and 250 nm of oryzalin.

#### PSE-26

Name: Shanika Musser
Major: Civil Engineering
Project Category: Physical Sciences and Engineering
Faculty Mentor, Department: John J. Ramirez-Avila, Civil and Environmental Engineering
Co-Authors: Tulia Delgado, Sandra L. Ortega-Achury
Other Competitions: Community Engagement Research Track

#### Streams Water Quality in the Catalpa Creek: Are Grazing Fields Contributing to Their Impairment?

Runoff from agricultural fields impacts the water quality of receiving waterbodies. Water quality impairment by a variety of contaminants has been declared for the Catalpa Creek, which runs through the Mississippi State University's campus and experimental station. A study is performed to assess the water quality of runoff leaving grazing fields within the Catalpa Creek Watershed under natural rainfall conditions. The assessment is conducted by automatically collecting runoff samples at the edge of the field in two sites on the South Farm. Grab samples are also collected from the runoff path when it is still flowing. A YSI sonde is used to determine pH, temperature, total dissolved solids (TDS), turbidity, and dissolved oxygen (DO) of the samples. Temporal analyses are performed to identify runoff water quality characteristics and how they affect or relate to the impairment of receiving waterbodies. Final results are expected to guide the implementation of management practices that will reduce the amount pollution flowing to streams within the watershed.

SS-23 Name: Hemanth Nannapaneni Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Deborah K. Eakin, Psychology Other Competitions: Public Health Research Competition

#### **Critical Word Characteristics Leading to False Memory Effects**

False memories have been studied in many experiments, most famously by Roediger and McDermott (1995), who used their DRM paradigm to demonstrate the prevalence of false recognition. For this paradigm, lists of words were read to

participants (e.g., *dream, bed, nap, and yawn*). On a recognition test, people incorrectly indicated that the false target word sleep was on the list. This effect has been attributed to the associate properties theory, which states false memories result from strong associations among list word; however, the type of associative relationships were not specified.

The purpose of this study was to compare critical characteristics representing relationships between list words and false targets with the goal of understanding underlying factors contributing to the DRM false recognition effect. We used the USF Word Association Norms to create word lists characterized by high forward associative strength (FAS) for the original DRM false targets. We specifically looked at the degree to which FAS and backward association strength (BAS)—the association strength from the target to each list word—contributed to the false recognition effect. We also examined other word association characteristics included in the USF Norms and compared them to the characteristics of the original DRM word lists.

In short, our USF word lists produced a higher false memory effect than the DRM word lists. Although the FAS differences between the lists were significantly different, the key predictor of the higher false recognition effect for the USF lists than the DRM list was the degree to which the lists items were connected with each other.

BSE-40 Name: Rita Nelson Major: Landscape Architecture Project Category: Biological Sciences and Engineering

#### Faculty Mentor, Department: Cory Gallo, Landscape Architecture

#### **Design Exploration: Vertical Trellis Structures in Community Gardens**

The Mississippi State Community Garden strives to educate and explore different growing techniques for educational and nutritional benefits. A major component of successful garden design is having a variety of growing practices and methods. Vertical and year-round growing can welcome new opportunities to maximize food production and growing space. A multiuse hoop house design was explored for the garden that is both functional and interesting. Design variations were explored that allowed both summer vertical growing and winter greenhouse covering. Through a design process that explored material limitations, cost variables and ergonomic considerations, a modified hoop-house structure was eventually developed that met the various design criteria. The design was further refined through the development of a three dimensional mock-up to test scale and material limitations. The resulting structure will be deployed in the Community Garden and instructions on the construction of the multi-faceted structure will be available on the Garden's web site.

PSE-27 Name: Randall Niffenegger Major: Physics Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Angelle Tanner, Physics and Astronomy Other Competitions: Thesis Research Competition (TRC)

#### Comparing Photometric Flicker and Radial Velocity Jitter of M Dwarf Stars for Earth-mass Planet Detection

With M type stars being ideal targets for Earth-mass planet searches using high precision, high cadence radial velocity (RV) measurements, the issue of characterizing their intrinsic RV noise has become of paramount importance. In this pilot study, using the WIYN 3.5m telescope and the WHIRC instrument to collect high cadence infrared photometry, we compare datasets of five M dwarf targets with both K2 optical light curves and RV measurements. Comparing these properties we attempt to predict the degree of RV jitter normalized by photometric flicker of the M dwarf. This comparison may allow astronomers the capability to achieve high precision, ground based observations through revealing new intrinsic characteristics of M type stars, and therefore, better predict which stars are strong candidates for Earth-mass planets.

# PSE-28 Name: Taylor Noble Major: Civil Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: John Ramirez-Avila, Civil and Environmental Engineering Co-Authors: James Graffe, Sandra Ortega-Achury

#### Enhancing Water Resources in Mississippi: Effects of riparian zones in stream health and water quality

Stream health can be significantly affected by the type and characteristics of existing riparian zones along stream corridors. A study is performed to compare forested and grassed riparian zones on tributaries within the Catalpa Creek Watershed, in order to better understand their effects on stream water quality and health. Parameters such as temperature, dissolved oxygen, pH, turbidity and salinity were measured weekly with the use of a YSI Sonde. Flow velocity, channel geometry and flow discharge were determined via a Sontek flow tracker device and water samples were grabbed and tested in the laboratory for total suspended solids. Temporal and spatial differences in water quality, including changes in temperature, dissolved oxygen levels and suspended solids are assessed to determine how they are affected by seasonal changes and the riparian zone characteristics. As the riparian vegetation transitions to forest, dissolved oxygen increased, while temperature decreased. Overall, results have evidenced a need to properly maintain forested riparian zones to provide benefits in water quality and stream health within the Catalpa Creek and Mississippian streams.

BSE-41 Name: Chris Nutter Major: Biochemistry Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Dr. Donna Gordon, Biology

#### Tropomyosin mutants reveal a role for F-actin in occidiofungin bioactivity

Occidiofungin is a novel cyclic peptide secreted by the microbe Burkholderia contaminans MS14 shown to have broadspectrum antifungal properties. Prior work indicates that occidiofungin induces an apoptotic death through a mechanism that is unique from that of current antifungals; however the molecular target of this compound remains unknown. Recent work suggests that exposure to occidiofungin results in altered organization of the actin cytoskeleton in the bakers yeast, S. cerevisiae. Based on this finding, we were interested in further exploring the link between actin and occidiofunginmediated cell death in this model fungus. As actin is essential for cell viability, we focused our efforts on characterizing the impact of occidiofungin on haploid strains deleted for genes coding for various actin-binding proteins using a minimum inhibitory concentration approach. Of the mutants tested, only Δtpm1 was found to have altered susceptibility to occidiofungin, resulting in a 4-fold resistance profile compared to a wild type strain. TPM1 codes for the major isoform of tropomyosin and deletion mutants have been reported to have a loss in F-actin cables, a phenotype that is very similar to that seen for occidiofungin treated cells. Like tpm1∆ mutants, occidiofungin exposed cells were also found to have a mild nuclear positioning defect with the accumulation of 12-15% binucleate cells within 30 minutes of exposure to the antifungal. To further substantiate a role for F-actin in occidiofungin bioactivity, future experiments will include the pharmacological disruption of actin filaments using latrunculinA, an actin monomer-binding compound. Together, results from this work will be used to further characterize a role for F-actin as the possible biological target of occidiofungin activity.

# PSE-29 Name: Erin O'Quinn Major: Mechanical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Matthew Priddy, Mechanical Engineering

#### A survey of spherical indentation methods to investigate properties of irradiated tungsten

Nuclear power plants are a common source of energy globally, accounting for 20% of the energy usage in the United States in 2017. After decades of radiation exposure, the originally constructed materials have become highly irradiated, which can have a significant impact on their material properties, such as brittleness and hardness. Currently, there are many experimental studies being performed to investigate these properties of irradiated materials. However, these methods do not provide consistent results, causing a lack of comparable data among different studies. This work seeks to investigate the benefits and limitations of these different studies in an effort to establish a more effective and uniform testing methods for future studies. One method that shows promise is nanoindentation because it allows for the investigation of the material properties for a relatively small portion of the sample. This is critical because ion-beam radiation only impacts the material's surface to a depth on the scale of nanometers. Radiation damage of this nature impacts the material non-uniformly, causing a variance in properties at different depths depending on the level of radiation exposure. Nanoindentation allows the use of differing size indenter tips that allow properties at a variety of depths to be investigated. Future plans for this work includes comparing experimental results with simulation findings to learn more about the localized response within the irradiated layers.

#### BSE-42

Name: Katherine Oakley
Major: Animal & Dairy Sciences
Project Category: Biological Sciences and Engineering
Faculty Mentor, Department: Shien Lu, Biochemistry, Molecular Biology, Entomology and Plant Pathology
Co-Author: Sonya Baird

#### Characterization of Antimicrobial Bacteria Isolated from Rhizosphere of Soybean Plants

Characterization of Antimicrobial Bacteria Isolated from Rhizosphere of Soybean Plants Katherine Oakley Antimicrobial bacteria serve as body guards to protect plants from fungal and bacterial pathogens in soil. To isolate antimicrobial bacteria in September, 2017, soil was washed from roots of healthy soybean plants growing in areas where most of the plants were affected with charcoal rot disease caused by the fungal pathogen *Macrophomina phaseolina*. Two bacterial isolates were obtained which possess antimicrobial activities against the indicator fungus *Geotrichum candidum*. Sequence analyses of the 16S rDNA and recA genes showed that the two isolates belong to the bacteria genus *Burkholderia*. Antimicrobial activities of the two isolates were evaluated against seven strains of fungi and eight strains of bacteria using overspray bioassays with the measurement of resulting inhibitory zones. These tests were conducted on two different culture media, NBY (nutrient broth yeast extract agar) and PDA (potato dextrose agar). The two isolates exhibited activity against a variety of fungi and both Gram negative and Gram positive bacteria when tested on the PDA medium, but only against Gram negative bacteria when tested on NBY medium. This indicates the bacteria may produce different antimicrobial compounds on the two culture media. Further identification of the taxonomic positions and antimicrobial activities of the two isolates are under way. Both isolates show promise for use as antimicrobial agents in plant disease management.

#### PSE-30

#### Name: Ashlyn Parkhurst

Major: Biological Sciences/Biological Sciences Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Nicholas Fitzkee, Chemistry Department Co-Author: Randika Perera

# The Role of Electrostatic Interactions in Protein Binding to Gold Nanoparticles

Gold nanoparticles (AuNPs) are of interest in the biomedical industry because of promising opportunities in drug delivery, imaging, and biosensing. Electrostatic interactions are potentially important for controlling nanoparticle binding. Because citrate stabilized gold nanoparticles have a net negative charge, we hypothesize that electrostatics will be a major factor on how proteins and AuNP interact. To test this hypothesis we reductively methylated Lysine residues to have two bulky methyl groups which will hinder the positive charge of Lysine. Binding capacity experiments carried out through NMR spectroscopy concluded that methylated GB3 variants had lower binding capacity compared to WT GB3 indicating the importance of electrostatic interactions. Three lysine residues of GB3 were previously hypothesized as possible sites for protein-AuNP binding, K4, K13, and K50. Lysine residue K13 lies in the  $\beta$ -sheet of GB3 and we believe that manipulating K13 to differently charged residues will have an effect on how binding. We mutated K13 Lysine to Glycine, Arginine, and Glutamic Acid using site-directed mutagenesis. Since Glycine, Arginine, and Glutamic Acid have no charge, positive charge, and negative charge respectively, we can observe how the binding capacity differs for each charge state. Our hypothesis was both Glycine and Glutamic Acid should have a lower binding capacity, and Arginine should have a higher capacity owing to their charge state compared to positively charged WT GB3. An NMR half filter experiment was used to carry out this test where, both GB3 variant and WT GB3 compete for the AuNP surface in the same solution. The results concluded that the charge state of the residues play an important role in protein binding to AuNPs. In light of these findings, we hope to continue to better the understanding of how proteins and AuNPs bind to further advance research in nanoparticle biotechnology.

BSE-43

Name: Whitney Parnell
Major: Animal and Dairy Sciences (Pre-Vet)
Project Category: Biological Sciences and Engineering
Faculty Mentor, Department: Dr. Derris Burnett, Animal and Dairy Sciences
Co-Authors: Robyn Thompson, Racheal Lemire, Shecoya White, Caleb Lemley

# The Effect of Maternal Melatonin Supplementation During Gestation on Gene Expression in Skeletal Muscle and Liver from Small, Medium, and Large Littermate Piglets

Selection for hyperprolific sows has increased litter size over the past two decades by a rate of about 0.2 piglets per sow, annually. An unintended consequence is that intra-litter birthweight variation has increased the proportion of low birth weight (LBW). Melatonin is a powerful antioxidant and vasodilator that has the potential to rescue compromised pregnancies reducing the incidence and severity of intrauterine growth restriction and LBW. The objective was to determine the impact of maternal melatonin during mid-late gestation on litter size, incidence of LBW, and expression of metabolic genes in loin muscle and liver of offspring. A total of 6 sows were purchased at 60 days of gestation and were assigned to one of two treatment groups consisting of a standard gestation diet supplemented with 0 mg/day (control; n = 3) or 20 mg/day melatonin (MEL; n = 3) as a top dress. The treatment diets were fed for 30 days at which point the sows were harvested for collection of the gravid uterus and characterization of the fetuses. Weight of each fetus was determined to assess litter weight. The longissimus dorsi muscle and liver were collected from the smallest, median, and largest male piglets for gene expression analysis using quantitative real time PCR. Data were analyzed as a completely randomized design using the GLIMMIX procedure of SAS Version 9.4. Model included treatment, size, and treatment x size. The animals within the control group had a significantly higher (P < 0.05) body weight and liver weight compared to the melatonin treated sows.

# SS-24 Name: Delaney Peters Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Danielle K. Nadorff, Ph.D., Psychology Co-Author: Ethan D. Lantz, M.A.

# Reasons for parental absence among custodial grandchildren and foster children: A replication and extension of the Nine Ds

Recently there has been an increase in the number of children being raised by their grandparents. The most current estimates from the American Community Survey report that there are approximately 7,378,100 children in the U.S. living with their grandparents, and approximately 298,100 of these live in skipped-generation homes. Comparatively, there were an estimated 196,446 children living in non-relative foster care in 2016. In previous studies, children being raised by their grandparents have been reported to have higher levels of depressive symptoms than children raised by their biological parent(s). Edwards and Ray identified nine reasons why children are raised by their grandparents: divorce, departure, drugs, desertion, death, diseases, delivery, detention, and deployment. However, little is known regarding the relative prevalence of these "Nine Ds," or their generalizability to other samples of children being raised by a non-parent. We examined to what extent these nine categories could fit the reasons given by a sample of 241 grandparents raising grandchildren and 120 foster parents regarding why they assumed care of their child. We found that the Nine Ds were able to categorize only 31.7% of reasons grandparents reported raising their grandchildren, and 7.0% of reasons reported by foster parents on why they had assumed this role. Three additional "Ds" identified as reasons for assuming non-parental childcare by our sample were "Duty," "Dollars," and "Daily Grind." Further explanations, limitations, and clinical implications are discussed.

PSE-31 Name: Matthew Phillips Major: Civil Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Seamus Freyne, Civil Engineering

#### Insulated Concrete Form Housing Market in the Southeast USA

The residential housing market in the southeastern USA is very prone to disasters, and unfortunately, the traditional wood frame houses that inhabit this region are not efficient enough to protect its inhabitants. Insulated concrete form (ICF) homes offer a safer alternative. This research was performed to determine why ICF homes are not more common in this disaster-prone region and possible solutions to boost their market. This research was performed by two methods: a literature review and a survey sent out to major ICF contractors in the region. The survey concluded that ICF homes offer great energy efficiency and are much stronger than their wood counterparts, but they lose a fair amount of business due to the increase in price and general contractor reluctance to change. Overall, the ICF contractors were pleased with the performance of their ICF blocks, and it can be concluded that further research should be implemented into the marketing of ICF rather than the actual performance of ICF homes to make a significant change in the housing market of this region.

#### SS-25

Name: Janiece Pigg Major: Agricultural Information Science Project Category: Social Sciences Faculty Mentor, Department: Dr. Carley Morrison, School of Human Sciences Co-Author: Dr. Laura Greenhaw Other Competitions: Community Engagement Research Track, Thesis Research Competition (TRC)

#### Is it worth it? A case study exploring volunteer leaders' perceptions of leadership training

To meet and sustain their organizational goals, volunteer-based and nonprofit organizations are reliant on volunteers. Many volunteer-based organizations seek to increase positive social change in their community. One way this can be achieved is by identifying and training volunteers as leaders of the organization. However, there is limited literature investigating the outcomes of providing leadership training to volunteers. This case study determined participants' perceptions of a volunteer leadership training experience compared to observations of the actual leadership training. A focus group revealed three themes that were both justified and refuted by observations of the training: 1.) the need for refresher courses and follow-up trainings, 2.) a disconnect between understanding leadership concepts and physically applying them in the volunteer scenario, and 3.) the transfer of for-profit skills and experience to the non-profit setting.

PSE-32 Name: Jordyn Polito Major: Chemical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Neeraj Rai, Chemical Engineering Co-Author: Shanmuga Venkatesan

#### Molecular Dynamics Simulations on Lignin Solubility in Various Solvents

Zeolites are crystalline solids that have wide applications in industrial areas for hydrocarbon conversion and adsorption of molecules. Recent studies report biofuel conversion isomerization reactions using two-dimensional (2D) zeolites show higher efficiency than using three-dimensional (3D) zeolites. Molecular dynamics (MD) simulations studies on these systems will provide insights into the dynamics of diffusing complex bio molecules in 2D and 3D zeolites. The biopolymer lignin is the most abundant non-carbohydrate containing polymer found in nature. Because of its unique aromatic structure and large availability as a renewable resource, lignin has great potential for use as biofuel. However, its size and many different conformations make it difficult to study. As a result, little is known about the intermolecular interactions of lignin molecules in water and methanol solvents. Radial distribution function (RDF) and hydrogen bond analysis of these biopolymers were considered to study molecular interactions. Diffusion analysis was also performed to study the dynamics of the lignin molecules in the solvents. These diffusional process studies will provide valuable insights to aid in modeling biofuel conversion using 2D and 3D zeolites.

BSE-44 Name: Mark Porter Major: Forestry/Forest Management Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Brent Frey, Forestry

# Evaluating stand density relationships in mixed species forests of the Mississippi river flood plain

Bottomland hardwood (BLH) forests are ecologically and economically important resources in floodplains of the southeastern US. Management of these forests can be challenging due to variation in species composition and site characteristics. One of the main tools available to the BLH forester is density management (i.e. "thinning"), with stocking guides being a common quantitative tool used to guide density management decisions. The current BLH stocking guide was developed based on expert opinion rather than empirical data, and is applied to a wide range of BLH forest types.

This could be problematic as different species mixtures likely have different growing space requirements and thus carrying capacity, represented as maximum density, may vary between different forest types. We are using data from the US Forest Service Forest Inventory and Analysis program and peer-reviewed literature to evaluate differences in relative stocking among several common forest types in the Lower Mississippi flood plain. We are assessing the maximum relative density by simple linear regression of plot level data, in addition to evaluating the upper and lowers bounds of desirable stocking based on methods used in hardwood stocking guides developed in other regions. More specifically, for lower bounds we are evaluating the minimum number of trees of a given size required to achieve crown closure, which is where trees start competing for growing space. Preliminary results on lower bound stocking support our hypothesis that different species will achieve crown closure at different stocking levels. These findings should provide guidance to managers about density management in forest types of different species composition to meet desired stand structural characteristics. Also, by improving our knowledge of density relationships related to species composition, this study should help in the design of mixed-species afforestation efforts aimed at restoring floodplain forest cover in the southeastern US.

#### SS-26

Name: Angela Provenzano Major: Educational Psychology Project Category: Social Sciences Faculty Mentor, Department: Danielle K. Nadorff, Ph.D., Psychology Co-Author: Melanie A. Stearns, M.S.

#### Influences of Marital Status on Custodial Grandparents' Psychological Health

Custodial grandparenting, or serving as primary caregivers for one's grandchildren, has been a rising phenomenon in the United States for the past 20+ years (Bryson, 2001; Kreider & Ellis, 2011). There are approximately 7.2 million grandparents whose grandchildren live with them within the United States. Of these, roughly 17.7% report being responsible for raising their grandchildren (Census, 2017). Studies convey married custodial grandmothers generally experience more support and better psychological outcomes than unmarried custodial grandmothers (Bachman, & Chase-Lansdale, 2005; Dowdell, 1995; Neely-Barnes, Graff & Washington, 2010), with little research on custodial grandfathers. The current study hypothesized that marital status would significantly reduce depressive symptoms for custodial grandparents compared to non-custodial grandparents.

The sample (N = 7261) consisted of adults aged 18 to 70 years (M = 43.21, SD = 12) who participated in the 2001-2003 National Survey of Families and Household, a series self-administered interviews and questionnaires. The survey consisted of the Center for Epidemiological Studies—Depression subscale (CES-D; Radloff, 1977), and included demographic questions about marital status and custodial grandparenting status.

Moderation of Custodial Status on the relation between Marital Status (married vs divorced or separated) and Depressive Symptoms, controlling for gender, was tested using Model 1 of SPSS' Process Macro. A significant interaction was found (t= -2.14, p =.03), indicating that custodial status does moderate this relation after controlling for gender. Looking at the conditional effects, marital status was not predictive of depressive symptoms for those who had never reported raising their grandchildren (p = .08), but was significant for custodial grandparents (p = .002). Custodial grandparents who were married were less likely to report depressive symptoms. Thus, marriage serves as more prominent social support for custodial grandparents who face the dual burden for caring for themselves and a grandchild(ren) at a later age.

SS-27 Name: Mukhunth Raghavan Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Jarrod Moss, Psychology

# Is there a Multilingualism Advantage for Interruption-Recovery?

Evidence from prior studies has suggested that fluency in more than one language is beneficial for tasks involving inhibitory control and switching between tasks (Marian & Shook, 2012). Studies have also suggested that interruption-recovery skill can be transferred to novel tasks (Jones & Moss, 2015). Previous studies assumed that multilingual individuals possess the

skill to recover from an interruption; however, the difference in ability between multilinguals and monolinguals to resume from an interruption was not studied. Different cognitive control processes may be involved in interruption-recovery than in task-switching. In the current study, participants were interrupted during primary task performance and the time taken to resume the primary task, resumption lag time, was measured. The primary task was the Tower of Hanoi and participants were interrupted by a two-digit addition task. The results indicated that multilinguals were in fact not better than monolinguals at interruption-recovery, and had a significantly longer resumption lag than the latter. Both groups were equally accurate at performing both tasks. These results highlight the need for a more detailed understanding of the multilingual advantage in some cognitive control tasks. These results would have to be replicated to confirm the multilingual disadvantage in interruption-recovery.

#### BSE-45

Name: Sydney Reed Major: Biological Engineering Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Dr. Renita Horton, Agricultural and Biological Engineering

#### Investigating the Cardiovascular Consequences of Sickle Cell Disease

Sickle cell disease (SCD) is the most common inherited blood disorder, a disorder that results in hemoglobin polymerization. This polymerization causes red blood cells to remodel, losing their ability to easily navigate through blood vessels. Thus, occlusions form within the vasculature and contribute to ischemia and organ damage. Individuals with SCD are plagued by a number of co-morbidities such as sudden cardiac death and cardiomyopathies. Approximately 30% of SCD related deaths are attributed to cardiovascular complications. Unfortunately, the mechanisms that contribute to these co-morbidities remain poorly understood. We utilized the Townes mouse model to investigate sickle cell disease related cardiac dysfunction, assessing the effects of SCD on cardiovascular tissue as the disease progresses within the body. The Townes mouse has been genetically modified to produce human hemoglobin and can also carry the SCD mutation.

In this study, we will characterize the effects of SCD by quantifying morphological changes that occur as sickle cell disease progresses. Structural features of the heart will be characterized in the Townes mouse model. Additionally, we will compare heart weight to body weight, cell size, and sub-cellular structural organization in healthy and diseased animals. The significance of this study lies in identifying the mechanisms that contribute to cardiovascular complications in SCD.

PSE-33 Name: Ian Robinson Major: Electrical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Joni Kluss, Electrical and Computer Engineering

# Design of an Accelerated Aging Chamber for Long-Term Degradation Assessment under Simultaneous Electrical, Thermal, and Environmental Stress

Outdoor power system components are exposed to a variety of stresses, inherently, so are the materials used in the insulation of these components. These materials must not only be electrically adequate, but they must also be able to maintain long-term reliability and stability. In other words, it is the culmination of the various electrical, physical and chemical singularities that ultimately distinguishes the suitability of these insulating materials for service. To "predict" the useful life of electrical insulating materials and system components, tests usually employ the presence of salt-fog, UV radiation or thermal cycling. Typically, the assessment of long term degradation is done on small stamp-sized samples, where each sample must undergo each type of test (electrical, UV, salt fog, etc.) individually and separately. Although this standard of testing is acceptable, often electrical components do not face each of the stresses in periodic stages, nor do they effect small areas of the component. Power system components will endure an array of inclement scenarios at the same time, at multiple points. This project designs a system that will replicate the wide range of representative environmental stresses that power system components must endure in conjunction with daily operational stresses. The constructed design capable of stressing full-scale power system components with all of the referenced methods of

accelerated aging, enables more adequate long-term degradation assessments for critical devices, in turn, giving way to heightened quality, stability and overall reliability in the field.

SS-28 Name: Andrew Robison Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Carolyn Adams-Price, Psychology

#### Black and White College Students' Attitudes Toward Same Race Men and Women of Different Ages

Older adults are generally stereotyped as unhealthy, and as relatively dependent on others. Given that women in general are perceived as dependent, we should expect older women to be seen as particularly dependent. However, there may differences in how African Americans perceive older men and women, due to matriarchal structure of African American culture. The emphasis on female leadership should lend itself to higher perceptions of independence and health in older African American women. In this study, white and black college students were compared on their perceptions of different aged (young, middle aged, older) individuals of their own races, as depicted in head and shoulder photographs. The students each viewed 48 stock photographs of same-race men and women in three age groups, 20-35, 40-55, and 65 and over, 4 of each gender and age group combination. Some of the qualities were: dependence/independence, healthy/unhealthy, certain/uncertain etc. We wanted to see if the data supported our hypothesis that older black women would be rated as more healthy, certain, independent, etc. due to the before mention organization of black culture; as well as, the lower life expectancy in black men. We found a main effect for race and age group; as well as, an interaction between age group and race of participant. We found a marginally significant interaction between race, age group, and gender of the stimuli. The least independent of the age groups was the 65+ age range. We found that African American participants rated both men and women in the middle aged group to be highly independent and Caucasians responded that middle aged women were very dependent.

BSE-46 Name: Anna Rourke Major: Biological Engineering Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Lauren B. Priddy, Biological Engineering

#### Surface characterization of magnesium alloys for orthopedic implant applications

Magnesium and its alloys have great potential to be used in orthopedic implants and devices due to their biodegradability and similarity of their mechanical properties to those of bone. Despite the many advantages, the rapid degradation of the metal can lead to complications when implanted. Alloys and surface modifications are being used to alter the degradation rate and decrease the rate of localized degradation. The purpose of this study was to investigate the degradation rate of pure magnesium and four magnesium alloys: AZ91, AZ31, AM60, and AE44. Prior to degradation, acid etching was used to modify the surface. Our hypotheses were that acid etching would decrease the rate of localized degradation, and pure magnesium would degrade more quickly than the magnesium alloys. A sample of each alloy was acid etched, and those samples and unaltered samples were degraded in saline solution for 5 days. To evaluate surface topography, unaltered, unaltered post-degradation, and acid etched post-degradation samples were imaged using a Talysurf (Taylor Hobson), and the average roughness value was calculated. The roughness values for all five pre-degraded samples were relatively similar. Compared to pure magnesium, AZ91, AZ31, and AE44 showed slower degradation rates. Additionally, the acid etched samples post-degradation showed a more homogeneous surface as compared to the unaltered post-degradation samples. This suggests a decrease in localized degradation with acid etching, which will be advantageous for maintaining mechanical support and promoting cell attachment upon implantation. Currently, Energy Dispersive X-Ray Spectroscopy is being done to investigate the chemical composition of the surfaces. Future degradation tests will be performed to evaluate mechanical properties of the degrading alloys over time, and cell behavior after exposure to degradation byproducts.

# BSE-47 Name: Erin Rushing Major: Biochemistry Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Barbara L. F. Kaplan, Basic Sciences Co-Authors: Amye McDonald, Evangel Kummari

#### Effects of Low-Level Aryl Hydrocarbon Receptor (AhR) Ligands in an Autoimmune Disease Model

Multiple sclerosis (MS) is an autoimmune demyelinating degenerative disease of the central nervous system, commonly studied by using the mouse experimental autoimmune encephalomyelitis (EAE) model. It is thought that the disease involves pathogenic T cells producing IFN-gamma and IL-17A and B cells producing IgG. Previously we showed that the severity of EAE was suppressed by the environmental toxin 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), a ligand of aryl hydrocarbon receptor (AhR), following oral administration. In this study, we compared the effects of TCDD with an endogenous AhR ligand, 2-(1'H-indole-3'-carbonyl)-thaizole-4-carboxylic acid methyl ester (ITE), which is less toxic than TCDD. Two doses of ITE and one dose of TCDD were administered by intraperitoneal injection for 12 days following EAE disease induction. TCDD and high dose ITE modestly suppressed EAE disease but low dose of ITE exacerbated disease. Interestingly, activation of AhR using cyp1a1 gene expression in the liver was not detected with either dose of ITE, but AhR activation was readily detected following TCDD. Despite this difference in detectable sustained AhR activation in the liver, there were effects in immune cells in the spleen. For instance, TCDD suppressed IgG production, which could mean there is less circulating MOG-reactive antibody production. TCDD and ITE both suppressed IFN-gamma production in CD4 and CD8 T cells but had little effect on IL-17A production. These results demonstrate that ITE possesses immunosuppressive effects suggesting it could be developed as a therapy for EAE but it is unclear if the effects are mediated by AhR. Future studies will evaluate ITE effects with higher doses using oral gavage in an attempt to ensure sustained AhR activation. Studies funded by NIH R15 027650.

#### BSE-48

Name: Caroline Russell
 Major: Biochemistry
 Project Category: Biological Sciences and Engineering
 Faculty Mentor, Department: Dr. Darrell Sparks, Biochemistry, Molecular Biology, Entomology and Plant Pathology
 Co-Authors: Darren Nakamura, Scott Boone, Ashley Meredith, Ashli E. Brown

#### FT-IR Spectrophotometric Screening of Adulterants in Honey

Honeybees are vital for pollination of fruits, vegetables, and several crops accounting for one-third of crop production in the United States. Not only are bees essential in global agriculture for their impact on crops; they also produce honey. In 2016, honeybees created 152 million pounds of honey in the United States. However, honey adulteration is a growing issue in the United States as well as other countries. According to Washington State, adulteration is the adding of honeydew, glucose, dextrose, molasses, sugar, sugar syrup, invert sugar, or any other similar product. The State of Mississippi is currently working to revise their law for honey adulteration, in order to stop this fraud and protect consumers from mislabeling. For this project, a Fourier transform infrared (FT-IR) spectrophotometric method is being developed to rapidly identify if honey has been adulterated. To determine the feasibility of this method, a preliminary study has been completed. The pure, unadulterated honey of varying types was analyzed as-is and then spiked with increasing levels of adulterants such as corn syrup and water. The samples were analyzed using a Thermo Nicolet 6700 FT-IR spectrometer with a liquid nitrogen-cooled MCT High-D detector, a KBr beam splitter, and the Smart ARK accessory. The spectra were collected from 4000 to 650 cm -1. Spectra were baseline corrected, normalized to the area under the curve, and analyzed using Unscrambler X software. This technique proved to be able to effectively differentiate both types and degrees of adulteration. The models were developed with a Partial Least Square regression to predict the adulteration. Accurate predictions of the adulterations at 20 percent were made with a percent difference of 16.32. With adulterations lower than 20 percent, there was a greater percent error and results were not as consistent.

### PSE-34

Name: Kirill Safrin Major: Mechanical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Omid Askari, Mechanical Engineering Other Competitions: Community Engagement Research Track

#### **Reincarnation of the Rapid Compression Expansion Machine**

Often there is only little data available for an analysis of motor operation phases during a combustion process due to the inability to take measurements. In that case, the Rapid Compression Expansion Machine (RCEM) may be utilized in order to simulate engine-like conditions. The RCEM is capable of performing a single compression stroke with predefined conditions, including an expansion process, which allows collection of the data. The main objectives of this project were to understand all principals and undergoing processes that govern the operation of the RCEM and related systems (fuel supply, direct injection system, etc.), troubleshooting of the total system, and creating operational and maintenance procedures for the machine. This was achieved by obtaining all necessary software and a step-by-step testing of the RCEM functions with assistance from the manufacturer (TESTEM). The outcome of this project was a complete manual for the RCEM and all related systems, which can be utilized by faculty members who may attempt to operate the machine in the future.

PSE-35 Name: Shuvam Saha Major: Aerospace Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Rani W Sullivan, Aerospace Engineering

#### Strain Distributions in Bonded Composites using Optical Fibers and Digital Image Correlation

Adhesive bonding of composite materials is often used in the assembly of primary composite structures in the aeronautical industry. These bonds tend to have a more homogeneous stress distribution compared to joints that use metal fasteners. Monitoring the adhesive joints during service through effective testing techniques is important. The objective of this study is to explore practical methods in which direct measurements from embedded optical sensors can be used to obtain critical parameters to assess composite bonded structures. In this study, strain distributions were obtained from the interface between the adhesive and the adherends using embedded optical fibers and surface strain fields were measured using the digital image correlation technique. Six double lap shear (DLS) specimens were fabricated following ASTM D 3528-96 type B specimen. An eight- ply quasi-isotropic layup was selected for both the adherends and straps. Three articles were produced with embedded optical fibers and three were produced without fibers. The mechanical performance of the joint was not modified due to the embedding of the optical fiber at different positions. The optical fiber placed on the composite adherend and adhesive layer interface captured the strongest strain gradient.

# PSE-36 Name: Ritabrata Santra Major: Petroleum Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Amin Amirlatifi, Chemical and Petroleum Engineering

# Conversion of Natural Gas Storage Sites into Compressed Air Energy Storage as a Solution to Power Shortage and Transmission Overload in the South-eastern United States

To meet the growing energy demand in the south-eastern United States, and to overcome the congestion of the transmission lines with overloads during peak hours, as well as increase the grid reliance against natural disasters, requires importing renewable energy from western states, new localized energy generation and upgrading the existing transmission infrastructure. Compressed Air Energy Storage (CAES) provides a viable and inexpensive alternative to store off-peak renewable wind energy imported from the western states, and using it during peak hours. During off peak hours,

electricity would be used to compress and store air underground. The process is reversed during the peak hours, where compressed air is used to generate electricity. This process, however, is geologically limited and requires locating a suitable salt cavern, aquifer, or depleted oil/gas field, verifying the stability of the storage site, and developing it.

The objective of this study is to evaluate the feasibility of converting existing Natural Gas Storage (NGS) sites into utility scale CAES plants. In this research project, a screening model was developed to select the most suitable NGS facilities which can be converted to CAES facilities in the Southern States Energy Board (SSEB) region. Various parameters like preexisting infrastructure for electricity transmission, proximity to the energy market, and the storage capacity of the candidate sites are considered, to best determine the amount of initial capital required for conversion with maximum return on investment.

This research shows that several existing NGS sites in South Eastern US, which would be uneconomical to run otherwise, have tremendous potential to be converted into a profitable CAES plant.

#### PSE-37

Name: David Saucier
 Major: Computer Engineering
 Project Category: Physical Sciences and Engineering
 Faculty Mentor, Department: John Ball, Electrical and Computer Engineering
 Co-Authors: Dr. Reuben Burch, Dr. Harish Chander, Tony Luczak, Dylan Sewell, Tashfin Iftekhar

#### Investigation and Testing of Soft Robotic Sensors for Ankle Angle Measurements

The purpose of this study was to investigate the application of soft robotic sensors to the tracking of human ankle angle movement. The primary sensor used for this project was a resistance-based fabric sensor that changed with stretch, functioning similarly to a strain gauge. Several methods were tested to determine the best way to capture data from the sensor, which included using a micro-ohm meter, a Wheatstone bridge circuit, and a constant current voltage divider circuit. After validating the linearity of the sensor through these three methods, a microprocessor-based solution was constructed to record sensor measurements over time in conjunction with a Wheatstone bridge circuit, an instrumentation amplifier, and an analog-to-digital conversion (ADC) module. Trials were performed using a "wooden ankle" construct to determine if sensor readings could be correlated with ankle angle movements including plantar flexion, dorsiflexion, eversion and inversion of the foot. Different foot movements were studied to see how they affected the values measured from the sensors. Finally, a printed circuit board (PCB) prototype was designed and constructed to record data from the soft robotic sensor and transmit over Bluetooth. The results verified that strain had a linear relationship with resistance output. Data gathered from the wooden ankle construct proved that plantarflexion could be measured reliably with the sensor. For future work, different sensor placements and mounting methods will be needed to prove that the sensor reliably characterizes dorsiflexion, inversion, and eversion.

BSE-49

Name: Abbey Schnedler Major: Animal & Dairy Sciences Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Thu Dinh, Animal and Dairy Sciences Co-Authors: A. T. Sukumaran, A. J. Holtcamp

#### Using Metmyoglobin Reductase Extract to Improve Color Stability of Ground Beef Model

Previous research in ground beef led to a hypothesis that spoilage bacteria produced reductase reversing discoloration of meat. The objective of the current study was to evaluate the application of extracted reductase to stabilize lean color of ground beef, compared with nicotinamide adenine dinucleotide (NADH) as an electron donor. Seventy-two 85-g ground beef patties on Styrofoam<sup>TM</sup> trays, overwrapped with PVC film were randomly assigned to either a negative control (NEG), 1 mL of enzyme extract (ENZ; approx. 10 mM metmyoglobin reduced/min/g), or 1 mL of 20-mM NADH. They were then displayed under a simulated retail condition (2 ° C, 900-lux fluorescent light) for 7 d. Lean color (L\* - lightness and a\* - redness) and lean color spectra (400 to 700 nm) were recorded before treatment application, at 1 h after application (d 0), and at every 24 h until d 7. Initial color and Mb percentages were similar before treatment application ( $P \ge 0.293$ ). ENZ
and NADH redness was decreased at least 4.2 units ( $P \le 0.02$ ) on d 0, however, overcame dilution effect by d 1 to be similar to that of NEG throughout display ( $P \ge 0.159$ ). Lightness of ENZ and NADH increased by more than 3 units ( $P \le 0.003$ ). Oxymyoglobin of ENZ and NADH was increased by 0.55 and 1.89% on d 0 (P = 0.089 and < 0.001, respectively) and NADH still had 0.64% more of OMb than NEG on d 2 ( $P \le 0.046$ ). Metmyoglobin percentages for NADH treatment were 1.93% less than that of NEG on d 0 (P < 0.001). Reductase extract had a positive effect on lean color, however, needs to be purified for more potent impacts. Electron donor NADH was confirmed to be effective in reducing MMb and increase the proportion of OMb.

Keywords: beef; metmyoglobin reductase activity, meat color

#### **PSE-38**

Name: Minjae Seo Major: Computer Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Donghoon Kim, Aerospace Engineering Co-Author: Jichul Kim

#### Innovative Type of Unmanned Aerial Vehicle Design and Control Algorithm Development

As the Unmanned Aerial Vehicle (UAV) business develops, it needs to reduce its power consumption and lose its weight. A single copter UAV effectively accomplishes these goals. One significant element in making a single copter UAV is to control the single propulsion system. To control the single propulsion system efficiently, a Brushless Direct Current (BLDC) motor, Electronic Speed Controller (ESC), and Pulse-Width Modulation (PWM) signal are necessary. A BLDC motor is quieter and lighter than a brushed direct current motor. Also, ESC can control the UAV's speed by receiving PWM signal. PWM signal can repeat pulses of variable width where either the width of the pulse (most common modern hobby servos) or the duty cycle of a pulse train (less common today) determines the position to be achieved by the servo. The PWM signal might come from common microcontrollers such as Arduino. After that, it is important to gather information about the mass budget of other single copter UAV's parts and estimate its final mass. Additionally, using the estimated mass, a single copter UAV can set the margin mass and can receive the signal through Arduino Mega while doing serial communication. If the margin mass is not set, it is hard to estimate a single copter UAV's thrust and efficiency. Therefore, the single propulsion system is used to test and control the single copter UAV's thrust when it hovers and moves. Finally, my goal in the development of single propulsion system is to find out the appropriate input signal to control a single copter UAV's thrust successfully.

PSE-39 Name: Aditya Shah Major: Aerospace Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Rani Warsi Sullivan, Aerospace Engineering

#### Strain Distributions from Thick and Thin Adhesive Layers using Optical Fiber

The use of composite materials for primary structural components has greatly increased in recent years in the aerospace industry. These primary structures often require joining of integral parts through adhesive bonding, and thus it is important to assess their structural integrity. The effect of varying thicknesses on the bond needs to be investigated to understand its effect on the overall strength and integrity of the bond. To investigate the effect of bond thickness on the strength of the bond, double lap shear (DLS) joint specimens were fabricated with embedded optical fiber sensors to obtain strain data directly from the adhesive layer. The specimens were fabricated in accordance with ASTM 3528-96 B standard for double lap shear composite testing. Optical fibers were embedded in the DLS specimens to monitor the strain inside the adhesive bond. The LUNA ODISI-B fiber optic sensing system embedded in adhesive layer was used for obtaining the strain distributions. The ARAMIS digital image correlation system (DIC) was used to analyze the surface strain of the specimens. Eight total specimens were fabricated with four having 4 layers of adhesive film and the other four with 6 layers of adhesive films to obtain specimens with different bond thicknesses. Of the four specimens for each thickness, two specimens were embedded with fiber-optic sensors to understand the effect of fiber-optic sensors on the bond

strength. The DLS specimens will be tensile tested according to ASTM 3528-96 B standards. Strain data from the fiber optic sensors and the DIC system will be used to analyze the strain distribution in the adhesive layer with different bond thicknesses. The study helps to understand the effect of bond thickness on the overall strength of the bond.

#### BSE-50

#### Name: Ashley Shannon

Major: Wildlife & Fisheries Science/Aquaculture & Fisheries Science
Project Category: Biological Sciences and Engineering
Faculty Mentor, Department: Michael Colvin, Wildlife, Fisheries and Aquaculture
Co-Authors: Ashley N. Shannon, David A. Schumann, Michael E. Colvin

#### Debunking angler lore: Can the Farmer's Almanac really forecast catch rates?

Environmental and social factors impact angler catch-rates, thus several resources are available that claim to forecast angler success. The Farmer's Almanac "fishing calendar" predicts daily fishing condition and while the exact formula is unknown, the forecasts are widely accepted in popular culture. We attempted to corroborate historic fishing conditions using creel data collected from Enid Lake, northcentral Mississippi. We calculated catch per unit effort (CPUE) for boat anglers over three years (2006, 2010, 2014) and compared them to corresponding predicted fishing conditions (poor, fair, good, best) using linear regression. The influence of year and fishing condition was evaluated by parameterizing models that included and excluded their effect on catch rates. Model performance was assessed in comparison to the interceptonly, model using likelihood-ratio tests. Mean CPUE did not vary among years (range:  $1.5 \pm 0.09 [2014] - 2.0 \pm 0.16 [2006]$ ) nor between forecasted fishing conditions (Poor: 1.8 ± 0.13, Fair: 1.9 ± 0.13, Good: 1.5 ± 0.12, Best: 1.9 ± 0.14). Negligible separation between models that included the influence of year (likelihood-ratio test [LRT] = 0, df = 2, p = 1), forecasted fishing condition (LRT = 4.7, df = 3, p = 0.19), and year + fishing interaction (LRT = 4.8, df = 5, p = 0.44) when compared to the null model suggests that these factors had little effect on catch rates. Large news corporations (WTVA, Tupelo MS) and numerous web based resources provide fishing forecasts that are largely unsubstantiated. Each provide caveats, such as local conditions and weather, that influence fishing conditions, but other abiotic factors, including water temperature, light intensity, and barometric pressure, may better predict fishing success. Until we better understand mechanisms behind fishing success, the Farmer's Almanac "fishing calendar" should not be the sole resource used by anglers.

#### SS-29

Name: Margaret Skidmore Major: Interdisciplinary Studies Project Category: Social Sciences Faculty Mentor, Department: Dr. Rebecca Robichaux-Davis, Curriculum, Instruction and Special Education Other Competitions: Community Engagement Research Track

#### **Mathematical Practices in Elementary Education**

The purpose of Mathematical Practices in Elementary Education was to promote and evaluate the students' ability to use specific Common Core State Standards for Mathematical Practices (CCSSMP). The four specific mathematical practices that were studied were (1) "make sense of problems and persevere in solving them"; (2) "reason abstractly and quantitatively"; (3) "construct viable arguments and critique the reasoning of others"; (4) "attend to precision". This research reports the results and interpretations of eight mathematical activities as well as a pre-test and post-test created by Dr. Robichaux-Davis. The activities were completed by selected students at the Skate Zone After-School Care program in Columbus, Mississippi over the course of ten weeks during the fall of 2017. For the privacy of these students, I have altered their names to the following: Andrew, Brandon, Catherine, and David. Andrew and Brandon are in the third grade while Catherine and David are in the fourth grade. Brandon did not complete all of the eight administered activities or the post-test due to absences; a qualitative analysis of his behavior is included, but his quantitative test scores are not included in the average. To record the data collected for each activity, I used a combination of written notes as well as audio recordings for precision. The results of the pre-test indicated an average multiple-choice accuracy of 27.3%, an average short answer accuracy of 0%. The results of the post-test indicated an average multiple-choice accuracy of 37.0%, and an average short answer accuracy of 37.0%, and an average short answer accuracy of 37.0%, and an average short

answer referent accuracy of 18.5%. Through the interpretation of this data, I conclude that an emphasis on the four listed mathematical practices within a small group setting increases students' ability to accurately answer multiple-choice mathematics problems and short answer referents.

SS-30 Name: Ciarra Smith Major: Biochemistry Project Category: Social Sciences Faculty Mentor, Department: John Bickle, Philosophy and Religion

#### Effects of Scientific Explanations on Judgments of Individual Accountability

The field of neuroscience provides insight as to the processes of the mind. While only a small percent of Americans can call themselves neuroscientists, the subject is attractive to many. Recently it has been argued that the seductive nature of neuroscience is due in large part to the field's apparent ability to explain the basis of human nature and behavior. The allure of neuroscientific information is so distracting that it has been shown to sway a person's judgment about a number of moral and legal concerns. The proposed study seeks to assess the influence of neuroscientific information in assessments of moral responsibility, but also of other types of scientific explanations of behavior. The study will investigate changes in person's judgments of moral responsibility for actions using a 3 (explanation of behavior: neuroscience, genetics, environmental) X 4 (morality of outcome: very good, good, bad, very bad) experimental design. We hypothesize that when participants are presented with an explanation for behavior that includes neuroscience, they will be more inclined to reduce an individual's accountability, even in the case in which the result of the agent's action is judged to be morally wrong.

#### BSE-51

#### Name: Hunter Smith

Major: Agricultural Engineering Technology & Business Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Joel O. Paz, Agricultural and Biological Engineering

#### **Biochar For Removing Contaminants in Agricultural Runoff**

In Mississippi, agricultural runoff is a large contributor to the pollution in the streams, rivers, and waterways in the state. As the issue has grown to be more prominent, an effective solution to help mitigate the pollutants that are entering our surface water resources has become more urgent than ever before. In the past, carbon has been used as a filtration medium to help solve a multitude of water quality issues. Biochar which is generated from fast pyrolysis of feedstock, has a microporous structure and large surface are with excellent absorptive properties, is being researched. The objective of this research was to examine the effectiveness of biochar in removing contaminants in agricultural runoff. In this study, a rainfall simulator precipitates on soil samples from agricultural fields to simulate the runoff that would occur during a rainfall event. Runoff from soil samples in Brooksville and Indianola, Mississippi were filtered through a 6-inch thick pinewood biochar medium. The biochar was tested for two different reduction capabilities, namely, turbidity reduction and total nitrate (NO3-N) reduction. In both tests, the results show that biochar can be a very effective way to mitigate pollution issues in agricultural runoff and reduce the waste that is entered into our landfills. Biochar reduced the turbidity by an average of 96.69% in both locations. When attempting to reduce total nitrate levels in the runoff, the biochar was able to reduce the concentration of NO3-N by an average of 96.45%. Although the biochar has shown excellent potential in reducing pollutants from agricultural runoff, further research needs to be done regarding the possible pollutants, in the form of dust, that the biochar puts back into the surface water resources.

Name: Jesse Smith Major: Biological Engineering Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Raj Prahbu, Agricultural and Biological Engineering Co-Authors: Dr. Krish Krishnan, Sonja Jensen

### Differential DNA Methylation in the Rat Amygdala Following Traumatic Brain Injury

Characterized by a mechanically-induced biochemical cascade, Traumatic Brain Injury (TBI) has been implicated in various neurobehavioral changes, including depression, anxiety, and post-traumatic stress disorder (PTSD). Building a foundational understanding of the relationship between TBI and these behavioral changes is essential for therapeutic development. Recent interest in the convergence of genetic and environmental factors (epigenetics) has deepened our understanding of the effects of TBI on anxiety-controlling neural circuits; however, little attention has been paid to the amygdala, a key mediator of fear conditioning and response in the brain.

The present study aims to bridge this gap in knowledge by profiling progressive alteration in DNA methylation, a common epigenetic modulator, in the amygdala of adult male Sprague-Dawley rats across a two-week time course following a single closed-head mild TBI. Six timepoints (0, 0.5, 1, 4, 7, and 14 days post-impact) were compared with a control group (n=3 per group, total 21 rats), with the DNA methylation state of the amygdala examined through the quantification of 5-hydroxymethylated cytosine (5-hmC) in each sample for all specified timepoints.

Our results show a time-dependent increase in 5-hmC levels following experimental mTBI, which indicate a concurrent increase in DNA methylation (5-mC) in the amygdala. These findings warrant detailed interrogation of the epigenome via next-generation sequencing, which should illuminate gene-specific changes and may provide potential therapeutic targets.

### SS-31

Name: Lainey Smith
 Major: Human Sciences/Apparel Textiles & Merchandising
 Project Category: Social Sciences
 Faculty Mentor, Department: Charles Freeman, Human Sciences; Joe Wilmoth, Human Sciences
 Co-Authors: Sarah Murphey, Chaurieal Jenkins, Hannah Scott, Madison Allmand

### **Dress Code Expectations in a Professional Environment**

The title of our study is, Dress Code Expectations in a Professional Environment. Our purpose is to learn the expectations for dress between men and women in a professional environment, specifically, the staff, faculty, and administration at Mississippi State University. We want to find out if men or women feel obligated to dress a certain way in their workplace and why. Our research includes qualitative data. We obtained this information by creating a survey with open-ended questions for our participants. We reached out to both men and women from each profession at Mississippi State University via email and sent them links to our survey. After receiving most qualitative data, we were able to read through them and interpret the responses. As of now, our results are mostly inconclusive and have discovered no major findings. In summary, we have a range of qualitative responses that will ultimately answer the purpose of our study.

### BSE-53

Name: Samantha Sockwell
 Major: Human Sciences/Food Nutrition & Dietetics
 Project Category: Biological Sciences and Engineering
 Faculty Mentor, Department: Terezie Mosby, Food Science, Nutrition and Health Promotion

### The Relationship Between Sucrose and Caffeine Consumption in Female College Students

College students are always finding a way to get as much energy as possible due to lack of sleep. They are a population with a reputation of a high consumption rate of sweetened coffee beverages and energy drinks. Excessive sugar and caffeine intake can both be detrimental to health and are both consumed in significant amounts by young adults. The

purpose of the study was to investigate the association between sugar consumption, caffeine consumption, and body fat percentage among female college students.

Female college students enrolled at Mississippi State University (n=203, mean age 20.62±3.27 years) completed the NIH Diet History Questionnaire (DHQ) and had body fat percentage measured via a Bioelectric Impedance Analysis (Tanita) scale.

There was no significant difference in caffeine or sucrose intake between the healthy weight group (body fat <30%, n=131) and overweight group (body fat  $\geq$ 30%, n=72); however, regardless of body fat percentage there was a significant positive linear correlation between caffeine intake and sucrose intake among all subjects (p<0.01, r= 2.54). Caffeine intake ranged from 0-892.69 mg/day (mean intake= 128.77 ± 159.84 mg/day) and sucrose intake ranged from 4.72- 247.53 g/day (mean intake= 37.50 ± 31.81g/day).

The findings of the study provide further information on the dietary habits of young, female adults which may be used to help tailor obesity interventions in this population.

SS-32

Name: AlliGrace Story Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Dr. Cliff McKinney, Psychology Co-Authors: Ellen H. Steele, Melanie Stearns

#### Differential Effects of Maternal Warmth on Relationship between Maternal and Emerging Adult Depression

*Introduction.* Previous research showed the relationship between maternal depression and internalizing problems (Goodman et al., 2011) and the protective role of maternal warmth in the development of depression in children and adolescents (Pargas, Brennan, Hammen, & LeBroque, 2010). The current study proposed that maternal warmth would mediate the relationship between maternal depression and depressive symptoms in emerging adults and that maternal warmth would share stronger associations with maternal depressive symptoms and warmth in females than males.

*Method.* Participants included 434 undergraduate students (65.2% female, 34.8% male) aged 18 to 25 years attending a Southern university. Participants predominately identified as Caucasian (77.9%). Emerging adult depressive symptoms, maternal depressive symptoms, and maternal warmth were measured using online surveys.

*Results.* Results indicated a direct effect of maternal depression on emerging adult depressive symptoms in females,  $\beta$  = .65, S.E. = .05, p < .001, and males,  $\beta$  = .59, S.E. = .07, p < .001. Results supported significant direct effects to maternal warmth on male depressive symptoms,  $\beta$  = -.23 S.E. = .04, p < .001, d = .47. Results did not support the mediation hypotheses.

*Discussion.* Results showed that maternal depression significantly affected report of depressive symptoms in both males and females, and maternal warmth had an effect on depressive symptoms in males but not females. Inconsistent with hypotheses, mediation effects were not found.

Goodman S. H., Rouse, M. H., Connell, A. M., Broth, M. R., Hall, C. M., & Heyward, D. (2011). Maternal depression and child psychopathology: A meta-analytic review. *Clinical Child and Family Psychology Review*, 14, 1-27. doi: 10.1007/s10567-010-0080-1

Pargas, R. C. M., Brennan, P. A., Hammen, C., & Le Brocque, R. (2010). Resilience to maternal depression in young adulthood. *Developmental Psychology*, 46, 805-814. doi:10.1037/a0019817

#### AH-10

Name: Arielle Striplin Major: Human Sciences/Apparel Textiles & Merchandising Project Category: Arts and Humanities (Oral Presentation) Faculty Mentor, Department: JuYoung Lee, Human Sciences Co-Author: JuYoung Lee Other Competitions: Thesis Research Competition (TRC)

#### **Organic Cotton Apparel and Consumers**

In today's time, consumers are progressively becoming more conscious about how their buying decisions impact the environment and the workers that produce those products (Ellis, McCracken, and Skuza, 2012). Producing organic cotton is more advantageous to the environment because it employs different methods and substances that are less toxic (Ellis, McCracken, and Skuza, 2012). There are not many studies that have specifically targeted organically grown cotton rather most of the research comes from studying consumer behavior with organically grown food (Ellis, McCracken, and Skuza, 2012). Studies were conducted and concluded that only roughly about ten percent of consumers would not be willing to pay the premium for organic cotton apparel (Ellis, McCracken, and Skuza, 2012).

Based on the previous literature, the purpose of these paper is to figure out the correlation between consumers either not being informed about organic cotton apparel or not buying the product. The study used theory of reasoned action as a theoretical framework to investigate consumers intention to buy organic cotton apparel, if they actually buy said product, and how much they know about organic apparel. Based on multiple other researches it has been found that the main points that inflict consumers attitudes on organic cotton apparel are subjective norms, their attitudes towards the product, and the accessibility of the product. Furthermore, with the trend of organic products circulating in today's time the focus is now becoming broader and incorporating organic apparel too. The study is planning to use survey to collect data from consumers on their purchase intention on organic cotton products. The result of this research will benefit businesses in terms of understanding consumers better in green product purchases. They can use it to improve their business strategies to promote their products and educate consumers.

SS-33 Name: Olivia Stuart Major: Biochemistry Project Category: Social Sciences Faculty Mentor, Department: Ashli Brown, Biochemistry Other Competitions: Community Engagement Research Track, Public Health Research Competition

#### Who Deserves Quality Health Care?

Aging represents the process by which an individual bares witness to the culmination of life's endeavors. Ultimately, people often become unable to care for themselves due to physical as well as mental digression. To better serve the elderly population and community, I began volunteering at a local assisted-living facility, helping staff provide daily patient care to their residents. To better educate myself on proper techniques, I sought a Certified Nursing Assistant (CNA) licensure in Mobile, Alabama. Nearing the end of the CNA course, students were required to participate in hands-on training in a clinical environment. Although I had previously volunteered in a similar, private retirement community, I was shocked at the disparity present between the living conditions of the residents in Mobile, AL and those of Starkville, MS. The Mobile facility was extremely understaffed, so at the time, unlicensed students were left caring for residents without help, meaning residents had yet to receive hygiene care, a stark contrast from the attentive care received by Starkville residents. Notably, differences between these and other facilities may be attributed to several factors, including an old versus new model of care delivery, the facility's number of trained health care workers, amount of patient care required by residents, as well as residents' socioeconomic statuses and demographic profiles. Observing this discordance in care has broadened my perspective of the discrepancies within health care, propelling myself and others to ensure the well-being of those within not only the elderly community but all communities.

## BSE-54 Name: William Swann Major: Agronomy Project Category: Biological Sciences and Engineering Faculty Mentor, Department: W. Brien Henry, Plant and Soil Sciences

Co-Authors: John J. Williams, Omar N. Ali, W. Brien Henry

Other Competitions: Community Engagement Research Track

#### Drought-Tolerant Corn (Zea mays L.) Hybrid Assessment in Optimal Growing Conditions

Growers in the Mid-South seek methods to limit the negative effects of drought, whether it be planting early or using drought-tolerant hybrids. Drought-tolerant corn hybrids have been selected to perform well in water-stressed environments. These products are marketed in Kansas, Colorado and Nebraska to mitigate frequently occurring drought stress. In some years, growers in the Mid-South also experience periods of drought, especially in rain-fed, dryland production systems. However, in our geographic region, we receive approximately 55-60 inches a year. Some years, moisture is not limiting and in other years, drought negatively affects corn during June and July. This study was designed to evaluate drought-tolerant hybrids in optimal growing conditions to determine if this technology in any way limits our growers in good years. Drought-tolerant hybrids were selected and compared against a check, which was a high yielding, southern adapted hybrid DKC67-72. This hybrid has been at or near the top of yield trials at the majority of the Mississippi official variety trial locations the past several years. Corn was planted timely on March-21, March-22, and April-13, at high populations of 40K plants ac<sup>-1</sup> in Brooksville, 45K in Starkville, and 45K in Verona, MS, respectively. Because our objective was to evaluate these hybrids in a high-yield environment, 300 lbs N ac<sup>-1</sup> were applied in split-application. Relative maturity (RM) of evaluated hybrids ranged from 97 to 117 days. Across all three locations, the RM group 97-105 day hybrids on average produced 12% less corn grain yield than the control hybrid. The RM group 107-116 day hybrids on average produced 5% less corn grain yield than the check. In conclusion, in growing seasons with favorable environmental conditions and optimal agronomic inputs for fertility, weed control, and plant population, drought-tolerant hybrids do not perform as well as the southern-adapted hybrid.

BSE-55

Name: Sabrina Swistek

Major: Biochemistry (Pre-Vet)

#### Project Category: Biological Sciences and Engineering

**Faculty Mentor, Department:** Dr. Ashli Brown, Biochemistry, Molecular Biology, Entomology and Plant Pathology **Co-Authors:** Abbey Wilson, PhD., Dan Morina, Darrell Sparks, PhD., Todd Mlsna, PhD., Steve Demarais, PhD., Bronson Strickland, PhD.

#### Investigation of Estrus Linked Chemical Cues in White-Tailed Doe Urine

White-tailed deer, Odocoileus virginianus, use chemical communication as a primary means of eliciting social and sexual encounters. Hunters often use urine-based scents to attract bucks; however, this may introduce CWD into uninfected areas and current synthetic non-urine based lures are ineffective. Therefore, this study aims to characterize volatile compounds present in doe and buck urine as well as commercially available synthetic lures. We hypothesized that certain doe urinary volatile compounds are used to communicate reproductive status and/or sexual receptivity. To test this hypothesis, we examined differences in volatile compounds detected in female estrus urine (n=3 samples), female nonestrus urine (n=6 samples), and buck urine (n=2 samples). Does were estrus induced with progesterone CIDR inserts for estrus urine collection. Volatile compounds were identified with solid-phase microextraction coupled to gas chromatography-mass spectrometry. The estrus urine samples contained an average of 139±31 compounds, while the non-estrus urine samples contained an average of 126±52 compounds, and the buck urine samples contained 138-139 compounds. Seven volatile compounds detected in estrus urine were significantly elevated (p<0.05) by a fold change greater than two compared to non-estrus urine, two of which were shown to be estrus specific within the samples as these compounds only occurred across all estrus samples compared to other sample groups. These elevated estrus compounds may be used to communicate reproductive status. Estrus associated compounds consisted of aromatic, aliphatic cyclic, and aliphatic acyclic compounds. Additionally, commercial synthetic lures only contained 70±20 compounds with little compound overlap across the remaining sample groups. This may explain the ineffectiveness of current commercial synthetic scents. Estrus specific compounds identified in this study will be exposed to bucks in future trials to investigate male behavioral responses. Candidate pheromones combined into a synthetic formula may serve as a buck lure and ultimately reduce the spread of CWD.

#### SS-34

Name: Katherine Tackitt Major: Educational Psychology Project Category: Social Sciences Faculty Mentor, Department: Kasia Gallo, Counseling, Educational Psychology and Foundations

#### Effectiveness of Police Training and Knowledge of Disabilities

The relationship between police officers and minority populations is an important aspect of society's functioning. The purpose of the present research is to highlight issues pertaining to police officer's preparedness for interactions with persons with mental illness and intellectual disabilities. Generally, society has high expectations of police officers regarding how they approach and interact with people who are diagnosed with Mental Illness (MI) and Intellectual Disabilities (ID). However, many of the 1.7 million American officers are expected to tell the difference between a person with a disability and a criminal without proper training. People with MI and/or ID often have difficulties with communication, social skills, behavior, and appearance. For example, a person with autism could have trouble maintaining eye contact, lack communication skills, and be unable to interpret common social ques. These characteristic may resemble the behavior of someone who is guilty of a crime; something that police officers may come into contact with daily. Despite the lack of proper training, officer's confidence level in being able to handle a situation with MI and ID is high, which may deter them from seeking becoming properly educated on the subject. Additionally, the attitudes officers have toward this minority population affect the interactions. The false belief of common delinquent behavior associated with MI and ID may result in impression of resisting arrest therefore causing officers to use unneeded force. Future research areas include long term effects of training programs and the MI and ID population's perception of police offices.

AH-11 Name: Duncan Thomas Major: Architecture Project Category: Arts and Humanities (Poster) Faculty Mentor, Department: Alexis Gregory, School of Architecture Co-Authors: McKenzie Johnson, Madison Holbrook, Blake Farrar Other Competitions: Community Engagement Research Track

#### Post-Occupancy Analysis - Learning From the Existing and Fixing for the Future

Post occupancy analysis is the process of obtaining feedback on a building's performance by those using it, and analysis by architects of the data gathered. It closes the loop between design and performance based on feedback by letting the architect know how the final product is performing for the user. We started the post-occupancy analysis by visiting the Boys and Girls Club Learn and Grow Educational Garden, documenting the area, researching, and creating our own individual analysis. The individual analysis was done because our faculty wanted us to look at it independently to see what we thought were the issues of the existing built garden. Part of the initial analysis was to sort and inventory the materials left over from the original project. This was done so that we could figure out what was usable. The analyses were studied to find trends among the student's initial thoughts. Some of the major problems noted were the rotting legs on the garden bed benches, the ramp, and the brittle wood on the garden bed storage boxes. We concluded that these flaws were due to inadequate wood choice, burning of the wood, and level change of the ground around the garden beds. These discoveries led us to cut off the legs of the benches and redesign them based on the critiques of the original designs. The ramp was deconstructed and rebuilt using concrete instead of wood for durability. The garden bed boxes were also deconstructed, redesigned, and installed to correct the problems we discovered. A survey was also created for the staff at the Boys and Girls Club to figure out how satisfied they are with the Learn and Grow Educational Garden. Once this data is gathered all of the information will be analyzed to create a final post-occupancy evaluation.

Name: Bryce Thornton Major: Human Sciences/Food Nutrition & Dietetics Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Terezie Mosby, Food Science, Nutrition and Health Promotion Co-Authors: Ahmed Saddam, Nicole Reeder

## Effect of Race on Dietary Patterns, Body Composition, and Alcohol Consumption in College Students

The aims of this study were to investigate the effect of race on body composition, diet quality and alcohol consumption in college students.

525 participants were enrolled in the study. The population consisted of 433 (83%) females and 92 (17%) males. In terms of race, 324 (71.5%) identified as Caucasian/white, 113 (24.9%) African American, 9 (2%) Asian, 2 (0.4%) Hispanic/Latino, and 5 (1.1%) identified as "other". 72 (13%) participants chose not to answer the race question and were excluded from the study. The mean age was 20 years. Body mass index (BMI), body fat percentage (BF%), and fat free mass (FFM) were measured using TANITA body composition scale. Dietary habits were examined using NIH Dietary History Questionnaires (DHQ). Alcohol use disorder identification test (AUDIT) was used to determine alcohol consumption.

Using SPSS software, results were recorded and showed that African American participants had 4.3% more body fat than the Caucasian/white participants and 12.7% more than the Asian participants. There were no significant differences in fat free mass. African Americans' BMI was, on average, 3.14 kg/m<sup>2</sup> higher than Caucasian/white and 6.07 kg/m<sup>2</sup> higher than Asians. Asian participants were significantly more likely to consume dark green vegetables than all other races and Caucasians were more likely to consume potatoes. African Americans were significantly more likely to consume druits more often than did Caucasians and African Americans. However, African Americans were significantly more likely to consume citrus fruits. Caucasian participants consumed alcoholic drinks significantly more often than African American and Asian participants.

Race plays an important role in dietary patterns and body composition and it is important to recognize racial differences in regards to dietary recommendation/education and obesity prevention.

SS-35 Name: D'Atra Triplett Major: Educational Psychology Project Category: Social Sciences Faculty Mentor, Department: Kasia Gallo, Counseling, Educational Psychology and Foundations

### Therapy Effectiveness with Parent-Child Relationships: Parents Your Children Need You!

One of the possible contributing factors to childhood misbehavior and defiance is poor child-parent relationship; therapy may help to resolve some of the conflicts. This literature review summarizes fifteen empirical studies on the effectiveness of parent therapy alone, child therapy alone, and parent-child combination therapy. The studies included participants of varying ages, ethnic backgrounds, and socioeconomic status. Children ages ranged from preschool to late adolescents and parent ages ranged from seventeen to sixty-two-year olds. Ethnic groups were European, Caucasians, and African Americans, and socioeconomic status of participants ranged from low to high. The results suggest that therapy was very beneficial to involved participants, and effective at reducing parent-child conflict. Parent's awareness of the benefits of therapy and practicing social life skills with children are essential for healthier parent- child relationships. Therapy also aids in synchronizing feelings and behaviors of parents and children that experience bad relationships. The common self-reported outcomes of therapy included increased communication skills of both parents and children, and higher levels of parental involvement in children. Future research is needed to establish whether the effects of therapy last. It would also be helpful to know whether the parental communication tools that are appropriate for a younger child continue to work as the child gets older.

Keywords: parent-child relationship, therapy

## BSE-57 Name: Maggie Tu Major: Animal & Dairy Sciences Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Caleb Lemley, Animal and Dairy Sciences Co-Authors: Caitlin G. Hart, Robyn C. Thompson, Derris D. Burnett

## Dietary melatonin supplementation increases average fetal weight and decreases uteroplacental blood perfusion in sows

The number of offspring born is an important economic factor in livestock, which has led to the selection of prolific sows with an increased risk of intrauterine growth restriction. The objective was to examine uteroplacental blood perfusion using Doppler ultrasonography in sows supplemented with (MEL) or without (CON) dietary melatonin. Additionally, a subset of pregnant sows were euthanized to examine fetal weight, placental weight, and placental efficiency. Sows housed in gestation crates beginning on day 30 (n = 6) or day 60 (n = 6) of gestation were supplemented daily with 20 mg of dietary melatonin. At 28 days post-supplementation, sows underwent trans-abdominal ultrasonography. Images were collected for analysis of percent area of blood perfusion and integrated pixel density. On day 90 of gestation, 6 sows (n = 3 per treatment) were slaughtered for collection of uterine weight, litter number, fetal weight, and placental weight. Placental efficiency was calculated as fetal weight divided by placental weight. The sum of integrated pixel density of the uteroplacenta, which indicates blood velocity, was decreased (P < 0.05) in MEL (69.4 ± 26) vs CON (136.5 ± 26). Average fetal weight was increased (P = 0.05) in MEL  $(1,231 \pm 11 \text{ g})$  versus CON  $(956 \pm 11 \text{ g})$  supplemented sows, while average placental weight ( $266 \pm 28$  g) was not different between treatments. Average placental efficiency tended (P = 0.06) to be increased in MEL  $(5.11 \pm 0.21)$  vs CON  $(3.61 \pm 0.21)$  supplemented sows. In summary, fetal weight and placental efficiency was increased in sows supplemented with dietary melatonin from day 60 to 90 of pregnancy and may be independent of uteroplacental blood perfusion. Therefore, other pathways such as placental surface area and nutrient exchange may potentially contribute to the alterations in fetal weight during dietary melatonin supplementation.

AH-12

Name: Auriana Tucker Major: Biochemistry (Pre-Vet) Project Category: Arts and Humanities (Poster) Faculty Mentor, Department: Sally Gray, Classical & Modern Languages and Literature Co-Authors: Brian Harris, Kathryn Wojtanik, Luke Mackay, Nickolas Monigold

### Grimms Tales Made Anew: A Benjaminian Analysis of Contemporary Video Games

In the first chapter of his book, From Mouse to Mermaid: the Politics of Film Gender and Culture (1995), Michael Zipes uses a framework created by Walter Benjamin in 1936 in his famous treatise The Work of Art in the Age of Mechanical Reproduction to argue that the changing medium of the folktale over time, from oral to written and then to film, has ended with the institutionalization of a once dynamic, imaginative and community-building form of art. Using this idea, our study will show how video games incorporate elements of traditional German folktales, found in the original Grimm collection, telling a story, exploring morality and social issues, and thereby creating communities who are able to bond over a central experience which may be either reflected or created by their transference. Due to technological advances, video games, such as Wolfenstein, Grand Theft Auto, Fallout and Skyrim, have become the newest medium for folk tales to date. Unlike film which creates a passive audience, the virtual world is a playground that allows for anything to be possible.

Clearly fairy tales play many roles in today's society in a variety of ways, for instance, they provide popular entertainment in movies, inspire participation in video games, and depict mores of our societies. As with the folktales of the German oral tradition, the manipulation of folktale elements today engenders fundamental connections among video game players, and thus creates communities. Showing these parallels, this study will then question how video games might bring awareness to social changes and struggles, by recreating and rewriting historical events to influence the acquisition of new perspectives in today's world.

## AH-13 Name: Emily Turner Major: Architecture Project Category: Arts and Humanities (Oral Presentation) Faculty Mentor, Department: Alexis Gregory, School of Architecture

#### Eileen Gray and Lina Bo Bardi: Modernism and the Patriarchal Tendencies of Architecture

Eileen Gray and Lina Bo Bardi were influential architects in the modern movement, whose work has recently been restored to its "original" intent. While Gray's vision for the home she designed , E-1027, has been superseded by the restoration of the Corbusier murals that exist on its walls, Bo Bardi's vision for her museum MASP has been re-realized, with paintings hanging on glass sheets anchored by concrete blocks. This research shows the connection between conservatism, culture, and the patriarchal nature of modernism and their impact on these two important architects in the modern movement. Gray hated the murals done by Corbusier, a revered modern architect, and thought they violated her original design intent. In the case of Bo Bardi, her original design intent for MASP (Museum of Art São Paulo) was kept intact for much longer, and when it was removed, was restored to its original intent without additions from other (male) architects. This difference in treatment of two female architects of the modern movement can be explained through differences in the culture of the two countries they practiced in and also in the philosophies of the two architects themselves. While Bo Bardi differed greatly from the modern architects in her country, distinguishing herself through her signature blending of modernism and regional style, Gray's work was very similar to her most famous contemporary and mentor, Le Corbusier. The eclipsing of Gray's most famous work by Corbusier's amateur murals, demonstrates the far-reaching patriarchal tendencies of Corbusier, one of the titans of modern architecture.

BSE-58 Name: Troy Viger Major: Biological Engineering Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Hyeona Lim, Mathematics and Statistics

#### Image segmentation methods for bio-inspired materials design

Bio-inspired materials design of the protective gears (e.g., helmet, body armor, etc.) is at the forefront of state-of-the-art research. Unlocking the hierarchical design also involves a detailed study of microstructural feature and morphometry in diverse mechanical loads. However, image analysis in bio-inspired materials design is in a nascent stage; especially, in capturing the physics of the hierarchical-based design of bio-materials. Medical and bio-materials images can involve different types of noise and unclear edges. Therefore, their segmentation is often challenging, and images cannot be efficiently processed using the conventional segmentation methods. For this purpose, accurate segmentation algorithms for different types of cells are important primary tools to extract various information from bio-materials or medical images. Such information could be used to design better protective gears. In this work, we will investigate different kinds of segmentation methods and compare their performances when the methods were applied to bio-materials images. We will specifically use human placenta images to quantify tissues in the images. The commercial software ImageJ will be used for tissue identification and the outcomes will be compared to the mathematically based segmentation methods called 'level set method' with appropriate post processing.

#### Name: Matthew Virden

Major: Wildlife & Fisheries Science/Aquaculture & Fisheries Science Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Peter J. Allen, Wildlife, Fisheries and Aquaculture Co-Author: Brittany Chesser

#### Removing the Adhesive Layer of Gulf Killifish (Fundulus grandis) Eggs to Increase Collection

Gulf Killifish (Fundulus grandis) are an intertidal spawning fish found in estuaries in Northeast Florida and along the northern Gulf of Mexico coast. Gulf Killifish are in high demand from bait shops and anglers as live bait for sport fishes. Demand has led to a shortage in supply of Gulf Killifish, creating an increased interest in aquaculture production. Adult Gulf Killifish enter interior marshes during spring high tides to spawn and lay eggs on marsh grasses. The eggs have an adhesive layer, allowing them to stick to the vegetation for incubation until the next high tide. Hatching occurs once the eggs are re-submerged. While this adhesive layer is beneficial in their natural habitat, this layer makes it difficult to collect the eggs from aquaculture spawning mats. Currently, mats are shaken or tapped against a mesh screen; however, clumps of eggs are still visible within the mat. This research will assess the ability of different treatments to remove the adhesive layer, increasing the number of eggs available for collection. Gulf Killifish eggs will be collected on 8"x4" spawning mats placed below the water's surface in 9, 3600-L recirculating aquaculture systems. Mats will be shaken to mimic current practices and amount of eggs will be recorded. Treatments consisting of solutions of urea, tannic acid, and powdered milk will be randomly assigned and additional collected eggs will be counted and recorded. Mats will be dismantled to determine how many eggs remained in the mats after treatments. Embryo survival and hatching success will be evaluated after incubation. Proportions of eggs collected initially, after treatment, and total amount of eggs for each mat will be compared between treatments. The optimal treatment will be determined based on the highest proportion of eggs removed.

#### BSE-60

Name: Evangelin Von Boeckman
 Major: Wildlife & Fisheries Science/Wildlife Science
 Project Category: Biological Sciences and Engineering
 Faculty Mentor, Department: Heather D. Alexander, Forestry, College of Forest Resources
 Co-Author: Jennifer McDaniel

## Shifting Composition in Upland Oak Forests: Potential Impacts on Forest Flammability Due to Changing Fuel Moisture and Drying Rates.

Fire-sensitive, shade-tolerant species (i.e. mesophytes) are increasing dominance in historically fire-maintained and oakdominated (Quercus spp.) forests in the eastern U.S. This could have large impacts on forest flammability, and thus maintenance of oak forests, if mesophyte leaf litter traits influence fuel moisture. The primary objectives of this study were to determine (1) how increased mesophyte contribution to fuel beds impacts moisture content and drying rates, and (2) if fuel bed wetting method (soaking, rainfall simulation, natural rainfall event) influences these response variables. We hypothesized that as mesophyte contribution increases, moisture would be retained longer causing slower drying rates. We also anticipated that the natural rain event method would most closely represent the conditions leaf litter would normally experience, so differences among fuel bed types would be most distinct. To test these hypotheses, we constructed fuel beds in the lab comprised of upland oak litter (Q. stellata, Q. coccinea) and increasing amounts of mesophyte (Liquidambar styraciflua, Carya spp, Ulmus alata) litter (0%, 33%, 66%, and 100%). We wetted fuel beds by, (1) soaking for 24 hr, (2) simulating a summer precipitation event (0.0072 cm over 10 min), and (3) exposing litter to a natural winter rain event (0.19 cm over 4 hr). All treatments exhibited a rapid initial (within 4 hr) decrease of moisture followed by a more gradual decline over the 48 hr drying period; however, beds comprised only of mesophyte litter dried slowest, while those with high oak contribution (66% and 100%) dried fastest. The simulated rainfall and rain event produced similar drying rates; soaking, however, showed the highest moisture content initially and less distinction and separation between drying rates. These findings suggest that increased contribution of mesophyte leaf litter to fuel beds will increase moisture and slow drying rates, which could hinder forest flammability in upland oak systems.

Name: Natalene Vonkchalee Major: Microbiology Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Justin A. Thornton, Biological Sciences Co-Author: Jordan A. Coggins

#### Identification of Novel Mechanisms for Antibiotic Uptake by Streptococcus pneumoniae

Streptococcus pneumoniae (pneumococcus) is a Gram-positive bacterium that asymptomatically colonizes the human nasopharynx and is also capable of causing invasive disease including pneumonia and meningitis. Antibiotic resistance is increasing significantly and finding novel ways to treat infections is therefore crucial. Due to the inability of many antibiotics to freely diffuse through the bacterial cell wall, we hypothesized that certain antibiotics may be imported by specific transporters normally used to transport other substrates. To test this hypothesis, we have utilized a magallan6 transposon mutant library of strain D39 to screen for mutants capable of growing on various antibiotics. We isolated several pneumococcal mutants capable of growing at concentrations of fosfomycin well above the minimum inhibitory concentration (MIC) for this species (<1µg/mL). One mutant, Fos1, could grow in concentrations up to 500µg/mL as determined by 24 hr growth curves. A second mutant, Fos2, had delayed growth, but still grew at 250 µg/mL concentration. Chromosomal DNA flanking the transposon insertion sites was sequenced and revealed SP1208 (uridine kinase) and SP1888 (AmiE oligopeptide transporter) as the genes interrupted in Fos1 and Fos2, respectively. We are currently creating deletion mutants in these two genes to confirm the phenotype and plan to extend this research to identify transporters for additional classes of antibiotics. Identifying compounds that can induce expression of such antibiotic transport/modification systems will allow us to dramatically increase the concentration of the antibiotics within bacteria, thus overriding resistance mechanisms and resurrecting antibiotics rendered useless against many drug-resistant pathogens.

#### SS-36

Name: Maggie Walgren Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Dr. Hilary DeShong, Ph.D., Psychology

#### The relationship between personality, rumination, and general mental health

Previous research shows that maladaptive personality traits play a role in the development of negative consequences regarding physical and mental health (Lengel et al., 2016). Understanding how personality influences patterns of cognition to become maladaptive is integral in the development of effective treatment for affected individuals. Rumination is one maladaptive cognitive behavior often associated with various forms of mental illness (Muris et al., 2005, Selby et al., 2009). Several measures exist to assess beliefs about general thinking and rumination, as well as to appraise how one responds to and controls negative thoughts. However, it is unclear the role that personality may have in determining these different beliefs and responses. The current study aims to evaluate how Five Factor Model (FFM) personality traits relate to beliefs about rumination and methods of responding to negative thoughts. Furthermore, this study aims to determine whether these beliefs or methods of rumination can be predicted by general personality beyond current levels of psychopathology. Data collection is currently in progress, with about 125 completed participants currently and an anticipated 100 more over the next 4 weeks. Participants complete the following measures: The Item Response Theory-Driven Short Form of the International Personality Item Pool (Maples, et al., 2015), the Personality Assessment Inventory (Morey, 2007), the Positive Beliefs about Depressive Rumination Scale (Papageorgiou & Wells, 2001), the Meta-Cognitions Questionnaire (Cartwright-Hatton & Wells, 1997), the Need for Cognition Scale (Cacioppo & Petty, 1982), the Thought Control Questionnaire (Wells & Davies, 1994), the Self-Critical Rumination Scale (Smart, Peters, & Baer, 2016), and the Ruminative Responses Scale (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Based on the results of previous research, it is expected that elevated levels of neuroticism will be linked to beliefs and response techniques that are associated with engagement in rumination, above and beyond current levels of depressive symptoms.

## PSE-40 Name: Nanqiao Wang Major: Mechanical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Yucheng Liu, Mechanical Engineering

## Computational Investigation of Ballistic Performance and Penetration Mechanism of Copper Targets Penetrated by Nickel Projectiles

The ballistic performance and penetration mechanism of copper (Cu) targets penetrated by nickel (Ni) projectiles were investigated through computational modeling and simulations. The objectives of this research are to: (1) validate an equation developed by Boeing for predicting the threshold penetration velocity of metallic materials; and (2) obtain a complete understanding of penetration behavior of copper and the copper-nickel interactions during the penetration process. A computational modeling framework was established for this study. In that framework, the Johnson-Cook constitutive model was used to predict the plasticity performance of the copper, while the Johnson-Cool damage model was applied to capture the penetration and fragmentation behavior of the copper; failure mechanisms of the copper was defined by the Bao-Wierzbicki failure criterion, and the temperature raise during this adiabatic penetration process was estimated using the Taylor-Quinney method. Finite element analysis software package ABAQUS was used for modeling and simulation of this penetration process. Numerical results yielded from this analysis was recorded and documented. Dr. Liu has generated molecular dynamics data that characterize the high strain rate performance of a collection of copper atoms subjected to impact from a collection of nickel atoms. The simulation results obtained from this study will be linked to the molecular dynamics results to map the micromechanisms that govern the high-rate performance of the copper at the atomistic scale to its penetration behavior and copper-nickel interactions at the continuum scale. The simulation and comparison results showed that the ballistic limit velocities of Ni projectiles were higher than steel projectiles. In other words, the ballistic resistance of steel projectiles was higher than Ni.

SS-37

Name: Mariah Warner Major: Criminology Project Category: Social Sciences Faculty Mentor, Department: Dr. Holli Seitz, Communication

### "Started from the Bottom, Now We're Here": Depictions of Success in Popular R&B/Hip-Hop Music

Adolescents and young adults are especially avid consumers of popular R&B and Hip-Hop music. As such, the themes presented in these genres can be particularly influential on the way listeners think and thus how they behave. These genres of music have been studied in some detail, but prior research has not examined the prevalence of lyrics that might perpetuate strain by depicting unrealistic "rags to riches" stories. This research addressed the following question: What is the prevalence of themes regarding success in popular R&B and Hip-Hop music? The researcher collected lyrics for the top 100 R&B and Hip-Hop songs from 2016 and 2017 from Billboard Music. Using NVivo qualitative coding software, the researcher used thematic analysis to identify the presence of themes related to expressions of artists' wealth and status, their desire for these, and how they were able to overcome barriers to achieve financial success. Preliminary results show that almost all of the songs contain lyrics that either demonstrate a desire for wealth or express wealth or status already accumulated. Over one-third of the songs contain lines portraying a story of achieving success despite being born into poverty. This research demonstrates that popular R&B and Hip-Hop music contains lyrics with a large prevalence of "nothing to something" themes. Deficiency in the means necessary to achieve society's goals can lead to strain and progress to anomie. Historically, it was believed that groups with ample means were the ones setting the goals – goals that those without the same socioeconomic resources were unable to achieve. However, this research suggests that these unrealistic expectations may be perpetuated by artists who themselves once seemingly lacked the means to achieve society's goals, but overcame this deficiency. Further research should examine the effects this could have on listeners, including whether exposure to these lyrics increases strain.

Name: Katie Webb Major: Biological Engineering Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Allen Crow, Basic Science, College of Veterinary Medicine Co-Authors: Dr. Matthew Ross, Abdolsamad Borazjani

## Silencing Carboxylesterase (CES)1 or Peroxisome Proliferator Activated Receptor (PPAR)γ Expression in Macrophages Can Affect its Polarization State

Macrophages are phagocytic cells of the innate immune system that play a dynamic role in chronic inflammatory diseases such as atherosclerosis, the deposition of lipid in arterial walls responsible for most heart attacks and strokes. Macrophages can be classically (M1) or alternatively (M2) activated. The M1 phenotype is cytotoxic and pro-inflammatory, whereas the M2 phenotype suppresses inflammation and is involved in wound healing. The nuclear receptor PPARy has been reported to play an important role in alternative activation of macrophages to the M2 phenotype. In atherosclerosis, macrophages take up cholesterol and store any excess as cholesteryl esters in lipid droplets. CES1 is one of several candidate enzymes for hydrolyzing these cholesteryl esters, generating free cholesterol for efflux. Our lab found that knocking down the expression of CES1 in lipid-loaded human THP1 macrophages resulted in the decreased expression of several genes whose transcription is regulated by the nuclear receptor PPARy. Therefore, we hypothesize that silencing CES1 reduces PPARy signaling because of the decreased availability of CES1-generated PPARy endogenous ligands. Because PPARy is important in the development of the M2 phenotype, silencing either CES1 or PPARy expression in macrophages is predicted to favor the M1 phenotype. Here, we report the effects of silencing either CES1 or PPARy on the activation state of THP1 macrophages, as determined by multiple phenotypic markers. Wildtype (non-transduced) and control (transduced with lentivirus containing scrambled shRNA) THP1 macrophages, with normal levels of both CES1 and PPARy expression, exhibited increased levels of M1 or M2 markers when treated with TNF $\alpha$ /IFNy or IL-4, respectively. Silencing CES1 expression had little impact on predisposing macrophages to M1 or M2 activation states. However, silencing PPARy expression resulted in macrophages more prone to M2 activation, the opposite of what was hypothesized. Further studies are underway to identify the mechanisms responsible for these unexpected results.

SS-38 Name: Steven Weirich Major: Economics Project Category: Social Sciences Faculty Mentor, Department Claudia Williamson, Finance and Economics

#### Remittances and Entrepreneurship in sub-Saharan Africa

My research poster will be an overview of my undergraduate Honors Thesis project. It will be an economic analysis of the connection between remittances and entrepreneurship in sub-Saharan Africa. Over the past few decades, remittances have become an increasingly important component of the analysis of migration, and how migration and labor fit into the research fields of international and development economics. Due to the improvement of data collection by groups such as the World Bank, there is now much more accurate data on remittance flows available for economists to analyze. Thus, it is important for economists to examine all of the ways in which remittances are used by their recipients. For my poster presentation, I will discuss how recipients of remittances can choose to use those transfers to pursue entrepreneurial ventures. In my thesis, I began with a thorough literature review of other scholars' research on the subject, followed by an empirical analysis of entrepreneurship and its connection to remittances in sub-Saharan Africa. I chose this region because I felt there was a gap in the development economics literature on this subject, and I could attempt to fill it with my research. I will attempt to lay out the findings of my paper the best I can in my poster presentation, and I will answer the questions of the attendees to the best of my ability.

#### Name: Branson Wetzstein

Major: Forestry/Forest Management Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Jason Street, Sustainable Bioproducts Other Competitions: Community Engagement Research Track

#### Evaluation of Additives and Storage Conditions on Southern Yellow Pine Energy Pellets

Southern pine energy pellet production is a continually growing industry in the United States, and each day millions of dollars of this material is shipped to countries overseas to run industrial boilers. Recently, there has been a push in the pellet industry to use additives to improve durability of this product as it moves overseas (lower the amount of fines), improve the BTU content, and lower the overall energy required to create the biomass pellets. Southern pine pellets were produced with bio-oil and cornstarch additives to attempt to improve these qualities and tested in storage barrels at temperatures of approximately 52 °C and 62 °C in a sealed and an airflow condition. Pellets were produced using a Sprout Walden (Andritz Sprout) model 501H with a 125 HP motor. Energy content of the pellets was evaluated with an adiabatic bomb calorimeter ASTM 5373 (2013a). The electrical power consumption was measured with an Extech model 382090 3phase power analyzer. The amount of pellets created was recorded and the amount of energy required to form the pellets was be determined in terms of kWh/ton. The feed rate, the moisture of the feed falling into the pelletizer, and the resultant moisture of the pellets was found and recorded. Moisture content assessment followed the ASTM E871 standard. Overall out of three types of pellets created (control, bio-oil additive, cornstarch additive), the pellets with the cornstarch additive at 1.8 wt% required less energy to form and also had the best durability. The control had the highest energy content, however the ratio of energy content to the energy used was the lowest. The cornstarch had the highest ratio of energy content to the amount of energy used. While airflow through the barrels influenced moisture content of the pellets, the bulk density and durability characteristics did not change.

#### BSE-64

Name: Branson Wetzstein Major: Forestry/Forest Management Project Category: Biological Sciences and Engineering Faculty Mentor, Department: John Willis, Forestry Co-Author: Justin Yow

## Seed Predators Constrain the Establishment of Longleaf Pine Following Prescribed Burning In the Sandhills of North Carolina

The availability of bare mineral soil has long been considered an important factor in longleaf pine seedling establishment. While there is little doubt that mineral soil is an ideal substrate for longleaf establishment, increases in seed predation from small mammals or birds, resulting from an increase in seed visibility, may offset any potential advantage created by prescribed burning. To explore this notion, we established a manipulative seed addition experiment in a longleaf pine dominated stand in the Sandhills of North Carolina. Beginning in October 2017, we established 104 plots (4m<sup>2</sup>) across a gradient of overstory density. Each plot was randomly selected to be receive one of four treatments: no predators no fire (NPNF), no predators fire (NPF), predators fire (PF), and predators no fire (PNF). Fire was simulated by removing the litter layer and all woody vegetation from plots. Seed predators (small mammals and birds) were excluded by caging each plot with 1.27 cm hardware cloth. Following treatment, each plot was seeded with longleaf seed at a rate consistent with a mast seed year (45 seeds/1m<sup>2</sup>). Seedling germination and seed predation were tracked monthly in each plot until March, 2018.

Seed predation averaged 78% across treatments. Among treatments, seed predation varied significantly (P < 0. 0001) and was significantly higher in PF (90%), compared to NPF (68%) (P =0.0329). Seedling germination averaged 4 germinants/1m<sup>2</sup> across treatments. Among treatments, germination differed significantly (P < 0. 0001), with seedling density being significantly higher in NPF (10 germinants/1m<sup>2</sup>) than all other treatments (P < 0.0001). The disparity in seedling density was largest in comparison to PF, which averaged less than 1 germinant/1m<sup>2</sup>. Collectively, at least for one site, this study provides strong evidence that seed predation does increase following prescribed fire and can lead to lower densities of longleaf seedling densities.

#### SS-39

Name: Jamie Wilburn Major: Human Sciences/Human Dev & Family Studies Project Category: Social Sciences Faculty Mentor, Department: Charles Freeman, Human Sciences; Joe Wilmoth, School of Human Sciences Co-Authors: Emily Davis, Carmen Hillhouse, De'Andrea Barr, Tasia Carter

#### **Education Levels and Parenting Styles**

There are four recognized parenting styles, in this study we are looking at three different styles of parenting. We are looking at the relation of education levels in parents to their style of parenting. From this research we hope to conclude if obtaining higher education has any effect on how a person chooses to parent their child. Research shows that the quality of time spent with a child is more important than the amount of time. Parenting Styles are a clear indicator of what the quality of time spent looks like in a parent-child relationship. We think that the higher the level of education a parent has the more likely they will be to exhibit the Authoritative style of parenting. The Authoritative style of parenting is known as the most effective and beneficial style of parenting for children who are developing normally. Authoritative parents have high expectations of their children, but support their children with understanding and a caring environment. This particular style of parenting helps to build and maintain a healthy relationship between the child and the parent and generates a healthy environment for the child to grow. The other two types of parenting styles that we are looking at are Authoritarian and Permissive. Permissive parenting is also known as indulgent parenting. This style of parenting is very harmful to both the child and the parent, along with their relationship. Authoritarian parenting is strict parenting where the parent is demanding and not responsive. These parents usually use punishment to teach lessons to their children. Our survey seeks to identify parenting styles and level of education; this survey is available through Qualtrics. We think that as a result of parents obtaining higher education and being exposed to broader ways of thinking it will result in Authoritative parenting.

#### PSE-41

Name: Devarsionta Williams Major: Chemical Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Rangana Wijayapala, Chemical Engineering

### Linear Cottonseed Oil Polymer Synthesis and Characterization

Traditional plastics are usually obtained from petroleum feedstocks. The petroleum-based plastics are not readily degradable and can stay in landfills for long time without any significant deterioration. In this study, a linear polymer was synthesized from Cottonseed oil. Fatty acids, the major components of Cottonseed oils, were initially separated by breaking the glycosidic bonds by using NaOH and the extracted into ethyl acetate. After separating, C=C bonds were activated by using an epoxidation reaction with hydrogen peroxide and formic acid. The Linear process is followed by the titanium catalyst polymerization steps. The polymer was characterized using gel permeation chromatography (GPC). Our results provide a new synthetic scheme to obtain a polymer from Cottonseed oil.

SS-40 Name: Emily Williamson Major: Psychology Project Category: Social Sciences Faculty Mentor, Department: Danielle K. Nadorff, Ph.D., Psychology Co-Author: Ian T. McKay, B.A.

## The wear and tear of raising grandkids: Impact of custodial grandparent status on physical and cognitive difficulties in a nationwide sample

There are approximately 7.2 million grandparents living with their grandchildren in the United States. Of these, roughly 2.5 million are skipped-generation households in which grandparents are solely responsible for meeting the needs of their

grandchildren (U.S. Census, 2017). Previous research has established that custodial grandparents suffer from added strain and burden compared to their peers, which negatively impacts their health (Musil et al., 2009). A decline in functional ability has a negative impact in not only the lives of these older adult grandparents but also affects their family members who are dependent upon them for care. The current study examines adults aged 65 and older using data from the American Community Survey 2016 to assess the extent to which raising one's grandchildren is associated with four areas commonly subject to decline in older adulthood: cognitive performance, self-care ability, ambulatory difficulty, and independent skills performance. Hierarchical binary logistic regression analyses found that custodial status (whether a grandparent reported both living with and being responsible for their grandchildren versus a grandparent reporting neither of these conditions) significantly affected the likelihood of both cognitive and physical difficulties, after controlling for the effects of age, sex, race, and income-to-poverty status. Specifically, custodial grandparents were 9.58 times more likely than non-custodial grandparents to report a cognitive difficulty, 9.55 times more likely to report ambulatory difficulty, 10.20 times more likely to report difficulty with independent living, and 9.58 times more likely to report a selfcare difficulty. Details of each model and clinical implications will be discussed.

PSE-42

Name: Joshua Wilson Major: Aerospace Engineering Project Category: Physical Sciences and Engineering Faculty Mentor, Department: Dr. Rani Sullivan, Aerospace Engineering

#### Varying Optical Fiber Configurations for Strain Measurement Comparison

Strain distributions obtained from distributed optical fibers arranged in unique pattern configurations were investigated and compared in this project. Typical strain measurement sensors, such as strain gauges, are limited to measuring discrete points on a structural member. However, distributed optical fibers have the ability to measure high-spatial (~1.25 mm spacing) strain or temperature distributions that would otherwise be cumbersome with traditional foil strain gauges. This research investigated optical fiber configurations in grid, spiral, and rosette configurations that are bonded to the surface of aluminum cantilever beams. A tip load is applied to the end of the cantilever beams using a beam testing apparatus. Strain distributions obtained from the optical fibers are measured using a swept-wavelength coherent interferometry technique using the Luna Technologies' ODiSI-B System. Uni-axial strain gauges are bonded on the opposing surfaces from the optical fibers on the beams to compare discrete strain measurement locations on the optical fibers. The strain distributions from the optical fibers have good correlation with strain measurements obtained from each strain gauge. Each pattern could serve as unique templates for various structural applications.

BSE-65 Name: Emma Winterhalter Major: Wildlife & Fisheries Science/Wildlife Science Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Marcus Lashley, Wildlife, Fisheries and Aquaculture

#### Vertebrate Succession in Carrion Food Webs

Succession is the directional process of change within an ecological community over time. Carrion is an important basal resource with many vertebrates specializing as scavengers, predators of scavengers, both scavengers and predators, or animals responding to plant community changes caused by carrion. However, little is known about vertebrate succession in the carrion food web as most studies only consider scavengers being affected. We monitored vertebrate use of carrion with camera traps to document vertebrate succession. In July 2016, we distributed varying amounts of donated feral swine carrion in five circular 20 m2 plots at John Starr forest, Mississippi. Each plot was equipped with a camera trap taking photographs of animals using carrion. A clear pattern of vertebrate succession emerged. Scavengers (e.g. vultures, coyotes) arrived within hours and likely were eating primarily carrion. Insect abundance also increased exponentially stimulating the arrival of their predators (e.g. armadillos, brown thrashers) around five days after carrion deployment. Vertebrates that were predators and scavengers (e.g. opossums) consumed carrion and insects, and were consistently present from deployment for three months. White-tailed deer and gray squirrels, which were not consuming carcasses or

insects, appeared last, well after carrion was fully decomposed. Interestingly, vertebrate succession in the carrion food web closely followed the succession of resource availability with scavengers arriving first to consume carrion, predators second to consume scavengers, scavenger/predators present for both resources, and other nonscavenger, nonpredator vertebrates responding to plant community changes after decomposition. Our data demonstrate that carrion food webs extend much further than to just scavengers.

BSE-66 Name: Luke Wojohn Major: Microbiology Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Barb Kaplan, Basic Sciences

#### Characterization of Cannabinoid Effects on CD24 Expression in B Cells

Cannabinoid compounds, such as  $\Delta^9$ -tetrahydrocannabinol (THC) and cannabidiol (CBD), are derived from *Cannabis sativa* (i.e., marijuana) and possess immune suppressive effects. The mechanisms for immune suppression are not clear but have been shown to involve induction of regulatory cells such as T regulatory cells and myeloid-derived suppressor cells. The initial goal of this work was to examine the effect of THC and CBD on regulatory B cell populations, including B cells that express CD24 and CD38 which can promote T regulatory cells. Preliminary results demonstrated that neither THC nor CBD induced CD24+CD38+ B regulatory cells, but that cannabinoids specifically inhibited CD24 expression in B cells. CD24 is also known as heat stable antigen and is expressed at high levels in immature cells, including lymphocytes. Thus, additional studies were conducted to investigate the effect of cannabinoids on CD24 expression. Mouse splenocytes were isolated and treated with CBD or THC followed by activation with either lipopolysaccharide (LPS) or recombinant CD40 ligand (CD40L) to stimulate B cells. After 3 days, cells were analyzed for CD24 expression by flow cytometry, which showed that both CBD and THC modestly suppressed CD24 expression. Future studies will compare cannabinoid effects in B cells purified from adult and juvenile mice in order to determine if cannabinoids alter CD24 in a developmentally-dependent manner. Studies funded by MSU-CVM.

BSE-67 Name: Julie Wyse Major: Mechanical Engineering Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Dr. Matthew Priddy, Mechanical Engineering Co-Authors: Frank Brinkley, Ben Brainerd, Weitong Chen, Dr. Lauren Priddy

#### Biodegradable Implant to Support Bone Deficit and for the Promotion of Bone Regrowth

In recent years, researchers have focused on creating bioimplants that are biodegradable while maintaining the strength necessary to support the load for which they are designed. The goal of this project is to design a bioimplant that can be used as a fixation device for bones or provide support where bone is missing due to cancer, injury, or other diseases. Through our research, we have found a few material options for the bioimplants including hydroxyapatite (HA) and tricalcium phosphate (TCP) ceramics, as well as Mg-Ca-Zn alloys. These materials show promise because of their ability to degrade and promote bone growth as well as their mechanical properties that closely match bone. The products of its degradation cannot be cytotoxic or corrosive, and the degradation should be slow enough that the bone can form before the material loses its mechanical strength. Based on literature, we have also determined that the lattice structure used for the implant should have at least 70% porosity to allow the movement of cells and nutrients. We are using SolidWorks and Inventor 3DS Max to design lattice structures with the desired porosity, and we have used both simulations and mechanical testing to determine the compressive elastic modulus of our designs. Currently, we are working to find a relationship between the simulation data and the experimental data for mechanical properties so that determining whether or not a design meets the requirements can be done computationally. The ideal design will be able to be additively manufactured so that it can be tailored to each patient's needs and injury. Instead of creating a basic screw to fix bones, this implant will be the exact shape of the bone deficit that it is meant to repair.

#### SS-41

Name: Taylor Yarbrough
Major: Not Listed
Home Institution: Mississippi University for Women
Project Category: Social Sciences
Faculty Mentor, Department: Kathleen Ragsdale, MA PhD, Social Science Research Center
Co-Author: Kathleen Ragsdale, MA PhD, Mary R. Read-Wahidi, Kelly Lower, Emily Feher, Sara Miller, MacKenzie S. Hines
Other Competitions: Community Engagement Research Track, Public Health Research Competition

### Perspectives from Parents in the Mississippi Delta: How Parents Engage Teens in Sexual and Reproductive Health Communication

Background: Focus4Teens is a Centers for Disease Control and Prevention (CDC) funded initiative to deliver high-quality sexual and reproductive health services (SRHS) to Mississippi Delta teens. The 2014 teen birth rate for the targeted counties of Coahoma, Quitman, and Tunica (58 births per 1,000 girls aged 15-19) (MSDH, 2016) is twice the national rate (24 births per 1,000) (Hamilton et al., 2015). To close the knowledge gap on how parents' approach parent-child SRH communication, we sought input from Mississippi Delta parents. Methods: We used the Ecological Model (Rimer et al., 2005) to develop two theory-driven needs assessments. The Parent In-Depth Interview Guide and Parent Survey captured parents' perspectives on 1) parent-child SRH communication, and 2) factors that constrain delivery of SRHS to teens. We conducted 8 interviews and administered 23 surveys. Results: Although 83% of surveyed parents reported feeling "very comfortable" talking to their teens/pre-teens about SRH, interview results suggested that "a lot of parents don't know how to talk to their children" effectively about sex and birth control. Eighty-seven percent of surveyed parents reported a need for parent-focused education on effectively engaging in parent-child SRH communication. Other interviewed parents believed that school-based SRH education is not as effective as "just sit[ting] them down and talk[ing] to them." Conclusions: Results indicate a need for greater understanding of how parents approach SRH communication with their children. The majority of surveyed parents (83%) reported confidence in talking to their children about SRH; however, most (87%) did not feel they had the tools to communicate well. Parents recognized the need to provide their children with science-based SRH information and a lack of resources to effectively improve parent-child SRH communication. Our findings add to the limited body of research on how parents in communities with high teen birth rates approach parentchild SRH communication.

#### BSE-68

Name: Justin Yow Major: Forestry/Wildlife Management Project Category: Biological Sciences and Engineering Faculty Mentor, Department: Heidi Renninger, Forestry Co-Author: Zeima Kassahun

## Relationships between leaf stomatal properties and whole-tree water use in a southern bottomland hardwood ecosystem

The collection of physiological response data from trees can be a challenging and time-consuming task particularly in ecosystems with high species diversity. Leaf stomatal properties are more easily obtained and may inform forest water use and productivity models if they exhibit enough correlation with physiological functioning. The goals of this research were to compare stomatal properties across various tree species from three plant families growing in a bottomland forest and determine if stomatal properties correlate with physiological functioning. Sapflow was measured in seven hardwood species (American elm, winged elm, shagbark hickory, willow oak, water oak, cherrybark oak and swamp chestnut oak) using heat dissipation sensors. Vapor pressure deficit (VPD), soil moisture, and photosynthetically active radiation (PAR) were monitored simultaneously. Seasonal water use per unit leaf area and relationships between daily water use and environmental parameters were estimated to determine the response of sapflow to environmental drivers. Leaves were collected from tree canopies at the end of the growing season. Epidermal peels were made and analyzed to quantify stomatal density and length.

Among species, stomatal density varied significantly, with American elm having a significantly lower density than all the oaks. Shagbark hickory also had a significantly lower stomatal density than all oak species except water oak. Across all tree

species, stomatal density had a significantly negative correlation with seasonal water use per unit leaf area and daily sapflow responses to VPD and PAR. These results show that in an area of rich tree species diversity, density measurements tended to be similar within tree families but significantly different across families. Based on these findings, stomatal parameters may be used to predict seasonal water use per unit leaf area and responses of water use to environmental parameters across tree species to increase understanding of relationships between leaf structure and physiological functioning.

#### SS-42

Name: Feifei Zeng Major: International Business Project Category: Social Sciences Faculty Mentor, Department: Vasabjit Banerjee, Political Science and Public Administration Other Competition: Thesis Research Competition (TRC)

#### China's One Belt One Road and its implications to the U.S.

This thesis examines U.S. involvement in China's One Belt One Road Initiative (一带一路) with an emphasis on analyzing the benefits and costs associated with U.S. involvement, lack of involvement, and U.S.' maintenance of current status through the case study method. As a rising power, China is hoping to further expand its influence through OBOR. Historically, whenever there is a rising power and an existing dominant power, there has been potential risk of war. What does this mean for the U.S.? Should the U.S. oppose this initiative to lessen China's power? Or should the U.S. be involved in the infrastructure initiatives to help with the development of the countries involved in the OBOR? Or should the U.S. stay in standby and observe where the OBOR will lead? Three case studies are generated based on the following hypothetical scenarios: (a) the U.S. actively supports OBOR, (b) the U.S. actively opposes OBOR, and (c) the U.S. maintaining the current status.

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