

# Oral & Poster Presentation Abstracts

## *Emerging Scholars Division*

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**Daniel Aguillard**, Economics, Finance and Legal Studies

Faculty Mentor: Jonathon Halbesleben, Management and Marketing

*Understanding Safety Behaviors in the Workplace*

Despite the importance of safety of in the workplace, we know surprisingly little about why workers engage in safe behaviors. Dr. Jonathon Halbesleben conducted a series of interviews with employees from multiple sites of a heavy equipment sales and service firm in order to find out how the employees as a whole viewed safety and how their view of safety correlated with safe behaviors. I engaged in qualitative coding of the interview transcripts to find themes related to safety in the workplace. From the interviews, we were able to discover the two main causes of accidents on site and also which teaching methods were most effective in making employees constantly think about safety. As a whole, there was a consensus among the employees that most of them were very safe on the job and that the company did a good job of stressing the importance of safety to them. We found that safety awareness led to safe behaviors and also that when employees are aware of their surroundings they will also look after coworkers.

**Matthew Anderson**, Biological Sciences

Faculty Mentor: Beverly Thorn, Psychology

*The Effect of Chronic Pain on Sleep in Emerging Adults*

There is a body of evidence corroborating the significant association between chronic pain and sleep in older adults. Such a relationship has not been investigated in emerging adults, individuals between the ages of 18 and 29. Given that emerging adulthood is a critical developmental period, sleep difficulties and chronic pain can be detrimental. The primary hypothesis of the present study was that the participants who experience chronic pain would have a lower quality and quantity of sleep than those without pain. Also, for those with pain, it was hypothesized that greater pain intensity would be associated with lower sleep quality and quantity. A demographic, sleep, and pain survey designed for this study were completed by 301 participants from the Introductory Psychology classes, differentially recruiting for those with pain. Approximately 60% (N=183) of the participants reported experiencing chronic pain. Multivariate analysis of variance and Pearson's correlations were employed for data analyses. The results indicated that participants with chronic pain had significantly fewer hours of sleep, more minutes of awake time, and poorer sleep quality than those without pain. The results also revealed that participants with a higher pain intensity reported poorer sleep quality. However, no relationship was found between pain intensity and sleep quantity. In conclusion, chronic pain affects sleep adversely in emerging adults and has significant clinical implications.

**Matthew Baird**, Computer Science

Faculty Mentor: Jeff Gray, Computer Science

*Using the Pebble Smart Watch to Automate Hospital Care*

Smart watches and mobile computing provide a new context for replacing pagers and intercom calls in hospitals. The aim of this project is to create a way for hospitals to dispatch the alerts around the hospitals quickly and efficiently through individual personalized messages. The watch is a two way communication device that can vibrate and track the worker anytime of the day (while at work). Currently, the watch that is being used is the Pebble smart watch, which can be connected to a smart phone for internet access. In this project, alerts are pushed from a central server to the Pebble watch.

When an alert is received, the Pebble will vibrate and display the image on its screen. The benefit of using the Pebble watch are numerous: it is water proof, has remarkable battery life, and it has many different sensors built into it. Example tasks in the hospital context include: remind the wearer on a set time to wash their hands, take their breaks/lunches at appropriate times, inform what patients are nearby requesting assistance, as well as a beeper replacement. Security issues are also being explored in the project in terms of connecting the watch to a central database.

**Jared Beach**, Computer Science

Faculty Mentor: Jeff Gray, Computer Science

*Leap Motion Controller Impact On Digital Music and Music Education*

The purpose of this research is to show the potential impact that the Leap Motion 3D controller has on the realm of digital music and music education. The approach of this research is to create a digital theremin in order to exemplify the ease of Leap application development as well as to explore some practical uses of the Leap in digital music and music education. For digital musicians, the Leap has the potential to reduce the time it takes to trigger an event (such as queueing a song or changing an effect's properties without the need of multiple knobs and buttons). The Leap benefits musical education through the emulation of traditional instruments that any student with a computer could interact with. Both musical educators and digital musicians benefit from the Leap controller's free and well-documented API which allows for faster development time. We conclude that the Leap Motion 3D controller has great potential as a learning tool for music education and as an aid to digital musicians.

**Mikaela Becker**, Human Development and Family Studies

Faculty Mentor: Matthew Jarrett, Psychology

*Attention-Deficit/Hyperactivity Disorder (ADHD) and Comorbid Anxiety: Associations with Academic Functioning in College Students*

Attention-deficit/hyperactivity disorder and anxiety disorders are associated with academic impairment in both children and college students (Mychailyszyn, Mendez, & Kendall, 2010; Weyandt & DuPaul, 2013). The current study examined how undergraduate students with attention-deficit/hyperactivity disorder (ADHD), anxiety disorders, and comorbid ADHD and anxiety disorders differed on measures of objectively measured and self-reported academic functioning. 500 undergraduate students participated in an Institutional Review Board-approved research study. Participants were from the Psychology 101 Subject Pool. Participants were grouped into those meeting criteria for ADHD (n = 45), those with clinically-elevated anxiety symptoms (n = 64), those with both ADHD and anxiety (n = 47), and those not meeting criteria for ADHD or anxiety (n = 307). Participants were compared on grade point average (GPA), self-reported educational impairment, and self-reported executive functioning deficits relevant to academic functioning (e.g., time management, organization/problem solving, and motivation). ADHD was uniquely associated with lower GPA and greater self-reported motivational deficits, while both ADHD and anxiety were associated with self-reported educational impairment and difficulties with time management. Interestingly, ADHD and anxiety were associated with greater problems in organization/problem solving than anxiety alone, and there was a trend towards greater problems than ADHD alone.

**Dustin Bennett**, Computer Science

Faculty Mentor: John Lusth, Computer Science

*Development of an Open-Source Auto-tuning Program*

Despite the massive resources available on the Internet, an open-source auto-tuning program doesn't currently exist for public use or modification, where "open-source" is a term denoting a program with all of its code released to the public. The goal of this research was to implement an open-source program

that could eventually process and pitch-correct the human voice. To reach that goal, the program uses a modular structure so it can be modified as it's developed. As it stands, the program generates a table of notes and can correctly tune a file of numbers that represents a note that consists of a simple sine wave. The modular structure will make it simple to remove, add, replace, and modify parts of the program to easily transition from processing individual notes to pitch-correcting the human voice. It was developed with the high-level Python programming language and uses circular arrays and interpolation for data manipulation.

**Deanna Bowen, Journalism**

Faculty Mentor: Kimberly Bissell, Journalism

*Using New Media Technologies to Reduce Health Disparities and Obesity in Rural Alabama Children.*

Childhood obesity is a growing problem in America and across the globe. According to the CDC, the rate of obesity in children has more than doubled in the United States. Along with regular exercise, nutrition plays a key role in fueling this epidemic. Children and parents need to be educated on the amount of fats and sodium in the food they consume as well as the appropriate portion size. This research is designed to create a child-friendly app for Apple and Android software that will help children understand the importance of what they put on their plate and further help them have a better picture of the foods they consume throughout the day. The app strives to keep users' interest while educating them on the nutritional value of the food they are consuming. The age we targeted is between five and seven years of age; therefore, the graphics are designed to hold an elementary student's attention. The user will have a pre-made selection of foods and drinks to choose to place on their plate, and the app will then calculate the nutritional value of that meal. We used an online tool called "Pick Chow!" as a basis for our research. The first stage of this research is to just have children become more aware about the foods they consume throughout the day. The website featured a similar layout to what we are hoping to accomplish. The ultimate goal is to have children and parents use this app on a daily basis to maintain a healthier lifestyle.

**Ellisa Bray, Journalism**

Faculty Mentor: George Daniels, Journalism

*The "Black Twitter" Phenomenon*

As social media reigns in the 21st century, there is a significant shift in the way people determine identity. In a system with user-generated content, individuals can choose who they portray online, from the pictures on their avatar to the messages they send to others. On Twitter, this individuality is restricted to 140 characters, requiring even more precision. My research focuses on the "Black Twitter" phenomenon: what is it? How do people become part of it or identify with it? Is it exclusive to African Americans or simply an overarching cultural effect, and most importantly, how is it being used as a protest platform in light of recent political, social and cultural events? By following both hashtags related to recent events (the George Zimmerman and John Dunn trials; the Paula Deen incident; the 2014 Academy Awards; the 2014 Winter Olympics) and influential people within the "Black Twitter" community, I was able to see a clear distinction between the trends of conversation on Twitter in general and within Black Twitter. While Black Twitter cannot be confined to one page or one number of people, it is a microcosm of African American culture, a tool for people to share relevant news and opinions that may not get coverage from mainstream media, a protest platform used to speak out as a group, and a movement to solidify the presence and identity of those who contribute.

**Matthew Bries, Electrical and Computer Engineering**

Faculty Mentor: Edward Sazonov, Electrical and Computer Engineering

*Impedance Based Food Nutritional Analysis*

The viability of characterization of food nutritional content using its electrical properties at different radio frequencies was evaluated using the Texas Instruments AFE4300 evaluation module. Since beverages are the simplest form of food, liquids were evaluated first to determine the merit of this method. The complex impedance of each sample was measured at various frequencies and statistical analysis was performed to determine relationships between the values and the composition of each sample. Multiple trial measurements were performed with each liquid. The magnitude of the impedance was steady between trials and was unique for each liquid, but the impedance phase angles varied widely between the trials.

**Ashley Brown**, Economics, Finance and Legal Studies

Faculty Mentor: Rachel Frazier, AIME

*Determining Potential Profitability and Success of UA High Tech Spinoff Companies*

Startup companies face a large amount of internal decisions and external forces that ultimately make it more difficult to establish themselves in a market and maintain operations. The goal of this research with the Alabama Innovation and Mentoring of Entrepreneurs (AIME) center is to work with several prospective business models and help determine which course of action will be best for financial success of UA spin off companies. Four of nine business models were chosen for analysis of technological application, potential markets, customer value, key market drivers, and purchasing incentives. Of the four, two up and coming companies, one dealing with automotive technology and the other with process control technology, were further examined for market barriers to entry and threats to profitability. Risk analysis was performed for the automotive technology and the process control technology was assessed for strengths, weaknesses, opportunities, and threats.

**Rachel Burton**, Theatre and Dance

Faculty Mentor: Angela Barber, Communicative Disorders

*Perceptions and Experiences of College Students who Have Autism*

According to the CDC, 1 child in 88 children in the U.S. has an ASD (CDC, 2012). While autism research has increased, most research focuses on young children, leaving little known about older children and young adults. Specifically, few studies have examined skills and experiences of college students with ASD (Müller, Schuler, & Yates, 2008). Therefore, the purpose of this study is to better understand skills, experiences, perceptions, and supports that help students with ASD have successful college experiences. In this study, seven students in The University of Alabama ASD College Transition and Support Program (UA ACTS) completed a ten-question survey about their college experience. Questions explored perceptions and preferences related to academic courses, roommates, eating in the cafeteria, and extra-curricular activities. Student responses show that they have similar concerns, fears, and experiences as many neuro-typical college students. With that in mind, college students with ASD may differ in how they approach and handle their fears, concerns, and stressful situations in general. Further study is needed in order to determine skills and supports that contribute to a successful college experience for individuals with ASD.

**Erin Cain**, Political Science

Faculty Mentor: Ana Corbalan, Modern Languages and Classics

*Growing Up in Armed Conflict: Children in Latin American and Spanish War Films*

*\*International focus*

This project focuses on how modern Spanish-language films represent the growing-up process of children living among the armed conflicts that characterized Spain and Latin American in the 20th century. The goal of this presentation is to extract similarities from several related films in order to form a more complete image of the Spanish and Latin American perception of the effects of war on children's

development. To accomplish this, we identified five Spanish-language films that feature a main character between the ages of 9 and 12 who must face both the challenges of adolescence and the stresses associated with war environments. The films chosen were Machuca, The Colors of the Mountain, Innocent Voices, Butterfly, and Carol's Journey. In studying these films, several common elements appeared. These include children taking on adult responsibilities, the destruction of typical childhood safe havens, the inability of adults to protect children from their environments, and the loss or betrayal of friends and family. This study will hopefully help us better understand some common experiences of children growing up around war so that we may better help them cope and develop normally. Additionally, we have the opportunity to use this research to further study how these experiences vary across cultures as well as to explore how filmic representations of such events may actually obscure or sugar-coat the realities of war.

**Tyler Campman**, Chemical and Biological Engineering

Faculty Mentor: Heath Turner, Chemical and Biological Engineering

*Physical Representation of Molecules using Rapid Prototyping*

A vital challenge in the field of chemical engineering stems from the microscopic nature of the subject matter. As such, 3D printing, specifically dual-extrusion 3D printing, allows for the physical modeling of molecules in order to display their traits and qualities on a level viewable to the naked eye. This project details some of the techniques and strategies associated with 3D printing, as well as its applications as they pertain to the field of chemical engineering.

**Breigh Carey**, Psychology

**Ashleigh Farren**, Psychology

Faculty Mentor: Randy Salekin, Psychology

*Violence Inhibition Mechanism*

This presentation considers the effects of the Violence Inhibition Mechanism on moral reasoning in individuals, specifically those with sociopathic characteristics and tendencies. The VIM is responsible for filtering and processing emotional reactions of others in response to imposed actions. Upon processing these actions, the VIM forms a schema for the interaction that is later referenced by the individual for other situations. In a healthy human brain, the VIM exists to prevent one person from harming another. In the event that a person was being harmed, their reactions, such as facial expressions, trigger a stress response in the perpetrator resulting in the discontinuation of the action. It is hypothesized that the VIM interacts with the amygdala, which plays a role in processing of emotions, and is linked to both fear responses and pleasure. Because of this possible link between the VIM and the amygdala, it is suggested that damage in the amygdala could affect VIM function. This presentation argues that individuals who have impaired VIM function are more predisposed to violent behavior, because they lack the moral reasoning that results from schemas formed as a result of experiences processed by the VIM.

**Kaitlin Carlson**, Chemical and Biological Engineering

Faculty Mentor: Yuping Bao, Chemical and Biological Engineering

*Gold Nanoparticles as Biosensing Agents*

The basis of this research is to develop nanoparticles to be used for the furthering of biosensor technology. Synthesized using fluorescent metals such as gold and silver, these nanoparticles offer a new means of detecting drugs, chemicals, and other substances within the human body. This research project generates different kinds of nanoparticles by mixing a variety of different chemicals with a gold-based powder. Specialty equipment is then used to test the different solutions for specific levels of fluorescence and size. It is hoped that this study will ultimately lead to the development of a sensing agent with better sensing capabilities and of lower cost than the latest technology.

**Katie Cater**, Biological Sciences

Faculty Mentor: Patricia Sobecky, Biological Sciences

*Phosphate-solubilizing bacteria isolated from metal and radionuclide contaminated soil*

Metal and radionuclide contamination of soils and groundwater at over 100 U.S. Department of Energy (DOE) sites currently represents the largest environmental clean-up effort in the world. During World War II, the United States began development of a nuclear bomb (Manhattan Project). In Oak Ridge, Tennessee a branch of the project worked on enriching uranium; however, disposal of waste into unlined ponds has resulted in soil and groundwater contamination. Bioremediation, or the use of microorganisms to clean up waste sites, offers a more feasible solution to traditional remediation techniques, such as excavation and pump-and-treat. In this study, twenty-six bacterial isolates from the Oak Ridge site were assayed for the ability to solubilize phosphate from organic and inorganic phosphate sources using established microbiological techniques, such as plating, polymerase chain reaction (PCR), restriction fragment length polymorphism (RFLP), gel electrophoresis, and DNA sequencing. The majority of the isolates belonged to the genera *Arthrobacter*, *Bacillus*, and *Rahnella*. Isolates related to *Bacillus* and *Rahnella* demonstrated phosphate-solubilizing phenotypes toward phytate (a natural organophosphate) and hydroxyapatite (an inorganic phosphate) substrates. Phosphate solubilization from recalcitrant sources may play an important role in the bioremediation of metals and radionuclides by promoting precipitation of highly insoluble metal-phosphate mineral phases.

**Nicole Chambers**, Chemistry

Faculty Mentor: Elizabeth Papish, Chemistry

*When you add an electron to Triazole Based Copper Compounds-Where does it Go? A Study Relevant to Enzymatic Nitrite Reduction.*

The copper nitrite reductase enzyme acts as an important enzyme for the environmental process of denitrification. Specifically, this enzyme performs the reduction of  $\text{NO}_2^-$  to  $\text{NO}$ . This process occurs through the transfer of an electron to the copper, thus  $\text{Cu}^{2+}$  goes to  $\text{Cu}^+$ , and the addition of two protons to produce water and  $\text{NO}$ . In previous experiments, the compound  $[\text{TztBu}, \text{MeCu}(\text{NO}_2)]^-$  has been synthesized to act as a model for the copper nitrite reductase enzyme. The  $\text{TztBu}, \text{Me}$  portion of the compound is a triazole based ligand that provides nitrogen donors to mimic enzymatic histidine residues. These experiments have reduced  $\text{Cu}^{2+}$  to  $\text{Cu}^+$  in the  $\text{Tzt}$  compound; however, the voltage at which reduction occurs reads at  $-1.45 \text{ V}$ , a significantly lower number than expected. The low voltage causes experimenters to question whether the copper or the  $\text{Tzt}$  ligand is being reduced. The experiments described in this presentation aim to test whether the copper is actually being reduced or if in fact the ligand experiences reduction. The use of cyclic voltammetry with electrodes of glassy carbon and silver will be used as the method.

**Magdalena Chavez**, Human Development and Family Studies

**Caroline Jones**, Human Development and Family Studies

Faculty Mentor: Sherwood Burns-Nader, Human Development and Family Studies

*iPad: A Tool for Distraction in Children Receiving an Immunization*

Distraction is used by child life specialists when children are undergoing medical procedures. Distraction is a way for children to focus their anxiety, fear, and pain on something more positive. The purpose of this research is to see if an iPad could be used as an effective distraction tool while children are receiving an injection. Another objective is to examine the effectiveness of whether or not getting the child to choose the activity on the iPad will promote better coping. This research includes children between the ages of four and eleven who are visiting the General Pediatric Clinic of the University of Alabama's

Medical School. The child participants will be randomly assigned to three groups. Group one will receive the iPad distraction, but their activity will be selected for them. Group two will also receive the iPad distraction, but they will choose the activity. The final group will be the control that will not receive the iPad distraction and instead will receive standard care. It is hypothesized that children who receive the iPad distraction will cope better during the injection than children in the control group. It is also hypothesized that children who choose the activity will show better coping during the injection than those children who have the activity chosen for them.

**Brendan Clair, Mathematics**

Faculty Mentor: Jonathan Wingo, Kinesiology

*Effect of Ice Slurry Ingestion on Thermoregulation during Exercise with Protective Garments in a Hot Environment*

Ice slurry ingestion prior to an exercise bout has been shown to attenuate increases in rectal temperature ( $T_{re}$ ) in runners and cyclists. However, few studies have examined the effect of ice slurry ingestion on  $T_{re}$  during an exercise bout, and no research has applied ice slurry ingestion to the occupational setting. The purpose of this study was to investigate the effect of ice slurry ingestion during an exercise bout on  $T_{re}$  of individuals working in a hot environment while wearing firefighter protective clothing (FPC). On 3 separate occasions, 5 subjects dressed in FPC and walked on a treadmill (4 km·h<sup>-1</sup>, 12% incline, 7 METs) for 30 min in a hot environment (35.2 ± 0.2 °C, 37.0 ± 2.6% RH). Every 5 minutes, subjects ingested a carbohydrate-electrolyte (CE) beverage in either tepid, cold, or ice slurry form. Mean skin temperature ( $T_{sk}$ ) and  $T_{re}$  were measured continuously throughout the trial; heart rate (HR) and rating of perceived exertion (RPE) were measured every 5 minutes. Physiological strain index (PSI) was calculated using  $T_{re}$  and HR. The rise in  $T_{re}$ , HR, RPE, and PSI was lowest with ice slurry ingestion compared to the cold and tepid beverages. There was no difference in  $T_{sk}$  changes among the 3 beverage interventions. These preliminary results suggest that ingestion of a CE ice slurry is more effective than a cold or tepid CE beverage in blunting the rise of  $T_{re}$  and other factors that limit exercise performance in a hot environment while wearing FPC.

**Carrie Clower, Geological Sciences**

Faculty Mentor: Natasha Dimova, Geological Sciences

*Radionuclides in Drinking Water*

There are two different groups of radionuclides in nature: naturally-occurring and synthesized. In order to protect the health of American citizens, the Environmental Protection Agency (EPA) monitors levels of both types of these radionuclides in drinking water. Optimally, natural water sources should have very low concentrations of radionuclides. However, under specific natural water conditions (for example low pH), some of the naturally occurring radioisotopes dissolve from the parent rock, and as a result, elevate the levels present in groundwater and surface water. In these cases, the EPA has devised a set of enforceable regulations called Maximum Contaminant Levels (MCLs). MCLs dictate the highest levels of radionuclides allowed in drinking water to maintain that the levels are negligible in terms of affecting people's health. This project examined the radioactivity levels of radon (<sup>222</sup>Rn) and radium isotopes (<sup>224</sup>Ra, <sup>223</sup>Ra, and <sup>226</sup>Ra) in drinking water present in several Tuscaloosa locations. This project sampled from each point in the drinking distributions system in the city, namely: lake water, finished water from the local water treatment plant, and several private houses; results concluded that the levels of all radionuclides tested were below MCLs.

**Michael Coffey, Electrical and Computer Engineering**

Faculty Mentor: Edward Sazonov, Electrical and Computer Engineering

*Wearable Devices and Their Design*

With the recent developments in computers and technology, there has been a growing demand for portable and wearable devices. Many of the devices currently out are now being considered bulky and outdated. Thus, new designs of portable and wearable sensors, cameras, and other devices must factor in ergonomics. To tackle this new design problem, we have created a three-dimensional model for a camera that can be worn around the ear. This camera includes a computer chip to collect and track data from the camera. The current designs for this model have added a Universal Serial Bus (USB) port and a Secure Digital (SD) card to store data and transfer this data to a computer so that this can be read. Preliminary results for these new additions to the model have increased its functionality. We continue to research, develop and design this wearable camera to improve its ability to be worn and its ergonomics.

**Dylan Coley**, Civil, Construction and Environmental Engineering

**Katie Hiles**, Civil, Construction and Environmental Engineering

**Lauren Lott**, Civil, Construction and Environmental Engineering

**Madeleine Lewis**, Chemical and Biological Engineering

Faculty Mentor: Glenn Tootle, Civil, Construction and Environmental Engineering

*Area Change of Wind River Range Glaciers*

The focus of our research is to determine the area change of glaciers in Wyoming's Green River watershed from 2006 to 2012. This will update the work of Thompson et al., 2011, which found the area change of these glaciers from 1966 to 2006. Using 1-meter resolution aerial photos from WYGIS, we were able to map the glaciers in ArcGIS and calculate their area. We expect to see the same overall trend of decreasing area found by Thompson et al., though with only three data sets over a six-year period, seasonal variation is more likely to be a source of error than in the original project. Once we know how the area of the glaciers changes over time, we can apply that knowledge to predict the streamflow in upcoming years. This information is essential to the agricultural operations in this area so that they can plan for irrigation.

**Whitney Culbreath**, Advertising and Public Relations

Faculty Mentor: J. Suzanne Horsley, Advertising and Public Relations

*Communication and Hurricane Sandy: Response to a Natural Disaster*

We examined the response of the American Red Cross to the destruction caused by Hurricane Sandy in 2012. We took a look at different responses that the Red Cross made addressing victims of the devastation and to those wanting to donate money to help the victims. While many were quick to criticize the Red Cross, our data showed that the Red Cross followed proper protocol for this situation. Our data shows that several of the statements made by the Red Cross were made with a rebuilding and bolstering posture.

**Alexis Cunningham**, Chemical and Biological Engineering

Faculty Mentor: Shane Street, Chemistry

*Raman Spectroscopy of Hydrogen Storage in Ammonia Boranes*

Alexis E. Cunningham, Gregory W. Dye, Tanya Mikalus, David A. Dixon, and Shane C. Street

There are many different approaches for storing hydrogen for mobile energy applications. Cryogenic, high pressure, and chemical storage are some examples of approaches that have been examined. This research involves studying ammonia boranes as a means to store hydrogen. The ammonia boranes contain large amounts of hydrogen by mass which can be released through decomposition upon heating. Here, Raman spectroscopy is used to track the decomposition products of hydrogen storage in the ammonia borane as a function of temperature. The results show that ammonia boranes do store hydrogen at expected percentages; the decomposition pathways are being elucidated.



**Nicholas Dahl**, Electrical and Computer Engineering

Faculty Mentor: Jeff Gray, Computer Science

*Image Steganography*

Steganography is the science of hiding a message so that nobody, aside from the sender and recipient, is aware that the message is there. Historically, steganography has had many forms including invisible ink and even messages hidden on messenger's heads beneath their hair. Today, digital steganography allows information to be hidden in digital files, most commonly image, audio, or text files. In image files specifically, the least significant bits of the color values for each pixel can be modified without being noticed by the human eye. In this project, we explore the use of least significant bit modification to hide information inside of images. The size of image files allows a large amount of information to be encoded in a single image. For JPEG images, the least significant bit of the red, blue, and green value can be modified for each pixel, allowing three bits to be stored in each pixel using this method. In this manner, a standard 640x480 JPEG image has the potential to store 115,200 characters using only the least significant bit of the color values of each pixel. Besides encoding text messages in images, other images can also be hidden in image files. This method is particularly effective for hiding black and white images inside of color images. Image steganography has many potential applications, including sending information only to be seen by selected recipients by posting an image to twitter or other social media.

**Danielle D'Erminio**, Chemistry

Faculty Mentor: Patrick Frantom, Chemistry

*The Characterization of alpha-Isopropylmalate synthase from Francisella novicida*

Here we report the first enzymatic characterization of IPMS isolated from *Francisella novicida* (FnIPMS) and compare the results to those of IPMS from *Mycobacterium tuberculosis* (MtIPMS). MtIPMS is the most extensively characterized IPMS to date. FnIPMS shares a sequences identity of 26% with MtIPMS over 526 residues. Additionally, protein similarity networks indicate that FnIPMS is in a cluster by itself indicating that it may have different properties than other IPMS enzymes. The kinetic and inhibition parameters of FnIPMS were determined (kcat, Km Ki). The kcat and Km values are comparable to that of MtIPMS. However, the Ki value of FnIPMS is approximately 150-fold higher than that of MtIPMS. Size-exclusion chromatography results indicate that FnIPMS is a monomer, where as MtIPMS is a dimer. This is the first report of a monomeric IPMS and is likely the reason for the higher Ki value seen in FnIPMS because L-leucine binds at the monomer-monomer interface of MtIPMS. The solvent and primary kinetic isotope effects of FnIPMS are currently being investigated to determine the mechanism of allosteric inhibition.

**Davis Diamond**, Biological Sciences

Faculty Mentor: Stephen Secor, Biological Sciences

*The Impact of Prey Dimension on Digestion*

Kingsnakes naturally feed on a variety of prey in the wild including small mammals, birds, lizards and even other snakes. The digesting of another snake presents a number of challenges to the kingsnakes given the long body length of the prey. Predictably, the duration and cost of digesting another snake would therefore be greater than that experienced with the digestion of a rodent meal. We tested this prediction by comparing the duration and cost of digesting snake (corn snakes) and rodent (mice) meals equaling in mass to 25% of kingsnake mass. We used close-system respirometry to measure the metabolic rate of snakes prior to and up to two weeks after feeding. From the postfeeding metabolic profiles we calculated the cost of meal digestion (specific dynamic action). Snakes were x-rayed daily to observe the breakdown of the meal within the kingsnake's digestive tract. Metabolic rates peaked at 2.5 and 4 days postfeeding, respectively for the mouse and corn snake meals. Metabolic rates returned to baseline by day 8 and 12, respectively, for the mouse and corn snake meals, and the respective cost of

digestion was approximately 50% greater for the corn snake meals. X-rays illustrated that the mouse meals were completed broken down in the stomach by day 7, whereas it took 11 days to break down completely the snake meals. As predicted, kingsnakes expend considerable more time and energy in the digestion of a snake meal compared to a rodent meal.

**Stetson Dubberly**, Information Systems, Statistics and Management Science

Faculty Mentor: Clay Posey, Information Systems, Statistics and Management Science

*When and Why Organizational Security Efforts Backfire: An Examination of Employees' Desensitization to Information Security Messages*

Information security is a significant issue for modern organizations, so much so that it represents a \$1 trillion industry worldwide. To help curb some of the more significant security vulnerabilities stemming from internal personnel, companies design and implement security education, training, and awareness (SETA) programs. SETA programs aim to help employees understand organizational security threats and how to respond to those threats. Although SETA programs can be effective, research suggests not all organizations form and deploy these programs equally well, which can result in negative repercussions (i.e. backfire). One of these unintended consequences is employee desensitization, which is the diminished emotional responsiveness to a negative or aversive stimulus after repeated exposure to it. More specifically, employees may become less responsive to warnings, fears, and threats to IS the more often they encounter formal SETA efforts.

Given this possibility, certain techniques can be implemented into SETA programs so that this backfiring via desensitization is less likely to occur. Therefore, this research aims to provide knowledge about (1) the ways that desensitization can occur due to SETA efforts, (2) how SETA efforts can be altered to decrease the level of induced desensitization, and (3) how to resensitize employees about important information security threats affecting their organizations if required. Such efforts should benefit both research and practice.

**Derek Duncan**, Electrical and Computer Engineering

**Nathaniel Barr**, Electrical and Computer Engineering

Faculty Mentor: Susan Burkett, Electrical and Computer Engineering

*A Natural Alternative to Conventional Solar Cells*

With the price of oil continuously rising, the search for cheap and sustainable energy has become a major interest in today's world. Our research shows that dye-sensitized solar cells (DSSCs) may fill a portion of this global need of sustainable energy. In our experimentation, we created three DSSCs the most successful of which output a maximum of fifteen microwatts while being illuminated by a halogen light bulb. We accomplished this by using two small slides of glass coated in tin dioxide and cleaned using isopropyl alcohol and deionized water. One of which was given a thin coating of titania paste which was sintered together on a 450 degrees celsius hotplate and soaked in raspberry juice as a source of anthocyanins while the other glass slide was given a thin coating of graphite from an artist's pencil and then the two were pressed together and around 0.1 mL of KI/I<sub>2</sub> electrolyte was added. It was then dried and copper tape was added to allow for an easier connection to outside components. We then measured the open circuit voltage and short circuit current under a variety of controlled lighting conditions. We measured the cell's performance under a variety of resistive load conditions given a static lighting condition. The light source was a halogen bulb as the emission spectrum is relatively to that produced by the sun. The results of our tests were that the cell performed best under a load of 2500 Ohms with a peak power output of fifteen microwatts. While this may not se

**Kaitlyn Dunivan**, Civil, Construction and Environmental Engineering

**Joanna Urli**, Chemical and Biological Engineering

**Michael Leffler**, Chemical and Biological Engineering

Faculty Mentor: Margaret Liu, Chemical and Biological Engineering

*Improvement of Biopharmaceuticals Production by Cell Line Development*

Over the past decade Chinese Hamster Ovary (CHO) cells have been applied to produce various therapeutic proteins. The objective of this study is to develop advanced platform mammalian cell culture technology that not only significantly shortens the biopharmaceutical development timeline but also greatly increases the production efficiency. Specifically, we optimized the sequence of recombinant monoclonal antibody to increase its expression efficiency in CHO cells (i.e., CHO K1, CHO DG44, and CHO S). Both one and two vector systems were used to construct the production cell lines of IgG1. The medium study showed that CD M4CHO (CHO K1), EX-CELL (CD DG44), CD FortiCHO (CD DG44 and CHO S), and CD CHO (CHO S) are good start points to achieve high cell density and protein production. The proteomic profiling of 1308 host proteins of different CHO host cells were investigated and compared, which identified useful regulator candidates for rational engineering the CHO host cell and the therapeutic protein production process. With advanced Omics technologies, a novel biopharmaceutical production platform will be developed to accelerate the development of innovative and generic biologics.

**Demetrius Edwards**, New College

Faculty Mentor: Rick Swatloski, Technology Transfer

*Marketing the "Goods": An Analysis of Ideas Succeeding on the Market*

Intellectual Property holds such high value in society that it receives protection through Article 1, Section 8 of the United States Constitution. There are millions of good ideas, but not all are patentable or will provide much economic benefit. My research examines the processes required to get protection for an intellectual idea or procedure that will benefit society, and strategies to successfully market it to the public. Specifically, I was given a product with a pending patent, and my duty was to analyze and assess all problems that would hinder the product from being successful on the market. Through extensive research of statistical databases and marketing strategies, I concluded that the most economically friendly way to heighten the chances of a product having success on the market is by treating the product as a startup. Even though my project concludes my research findings for the time being, as new competitors and new inventions arise, research of the ever changing world of technology is never truly finished.

**Jacob Ejnes**, Geological Sciences

Faculty Mentor: Fred Andrus, Geological Sciences

*Mineralogical Examination for Evidence of Aragonite in the Resilifer of Crassostrea Virginica*

American oysters (*Crassostrea virginica*) are reported to have a layer of aragonite on the inner portion (resilifer) of oyster hinges, while the remainder of the hinge area is composed of calcite (Stenzel, 1963). However, little published data exist concerning the location, structure, depth, or durability of this layer. To better assess the mineralogical structure of this part of the shell, three samples of varying age, from ancient to current, were examined. The sample preparation included mounting the oyster shells onto slides and then acid-etching them to bring out the relief of the crystals. My hypothesis on why the calcite-aragonite layer boundary wasn't as visible as predicted is that the layer is very thin and thus doesn't make a very visible change in the orientation of the mineral crystals, causing the boundary to be barely visible on the scanning electron microscope. Future sample preparation will make use of highly-polished samples in order to make the calcite-aragonite layer boundary more visible under the SEM.

**Ashley Ennis**, Advertising and Public Relations

Faculty Mentor: Glenn Griffin, Advertising and Public Relations

### *Advertising Internships*

College students and recent graduates search for internship opportunities to broaden their experience in advertising. A survey-based study asked undergraduate advertising majors about their attitudes toward and experiences with advertising internships. Having an internship on one's resume is purported to show experience, motivation to learn and show potential for success in the field. Although the study is ongoing, 128 students from across the country have already responded to the 30-item survey. A key hypothesis is that paid interns will have a better learning experience and complete tasks that are more beneficial than those completed by unpaid interns. Initial results suggest that advertising students consider paid internships more valuable than unpaid internships. Respondents also ranked paid internships as most valuable, followed by internships completed for course credit and unpaid internships. Additionally, students who completed a paid internship felt that their work was equivalent to that of a permanent employee. By the end of the study, we hope to more than double the number of respondents to meet a goal of 300. Based on the consistency of the results we have already received, we can assume that initial survey results will hold and that even more valuable insights on this topic will be discovered.

**Caleigh Everingham**, Biological Sciences

Faculty Mentor: Rebecca Allen, Psychology

#### *A Systematic Review of Mental Health Literacy Assessments in Adult Populations*

Mental health literacy (MHL) addresses knowledge and beliefs about mental disorders which contribute to their recognition, prevention, or treatment. MHL constructs include the ability to recognize specific illnesses; knowledge of how to find mental health information; knowledge of risk factors and causes, of treatments and help available; and attitudes that promote recognition and appropriate help-seeking. Previous research shows that participants with high MHL are more likely to receive mental health care and that improving MHL may have some therapeutic effect. About 50% of people experience a mental disorder during their lifetime and many of these people are untreated or undertreated despite the existence of effective treatment options. The prevalence of mental health disorders and the importance of MHL in care uptake suggest that there is a need for an appropriate assessment of MHL to measure the impact of MHL interventions. Using PubMed, PsycINFO, and CINAHL databases, we reviewed assessments of MHL. The literature review includes studies conducted between 1997 and 2014 with adult populations in the English language with MHL as a primary or secondary outcome. Results indicate that many studies use the term MHL but only address specific mental illnesses. Additionally, some assessments fail to address all of the MHL constructs. Universal methods of assessing MHL will allow for scientific rigor and comparison across studies and aid in the development of MHL interventions.

**Kara Fadanelli**, Chemical and Biological Engineering

Faculty Mentor: James Hamilton, Psychology

#### *The Great Equalizer: Quantity of Lives Over Quality of Lives*

Health psychology and behavioral medicine emerged to promote a biopsychosocial approach to health and illness. Although this imperative originally included attention to the effects of psychological well being on physical health and the effects of physical health on well-being, the focus on well being and quality of life as an end-state has been eclipsed by a preoccupation with morbidity and mortality. Of particular concern is the inattention to issues of death attitudes, death anxiety, and end of life issues. To test this observation empirically, I conducted a longitudinal review of the five most prominent journals in health psychology / behavioral medicine. I collected titles and abstracts for all papers published in 2002-03, 2007-08, and 2012-13 that contained the terms death, or dead, or dying, or mortality, or deceased, or hospice, or bereavement, or bereaved, or end of life, or terminal. Each article was rated according to whether its focus was on decreasing mortality, on the one hand, or improving quality of life

or coping with death. Nearly 6% of the articles referenced death, and among these 60% dealt with mortality as an endpoint and 40% with psychosocial issues related to death. From 2002 to 2013, the trend is toward mortality concerns and away from psychosocial issues surrounding death. The results suggest that health psychology and behavioral medicine have failed to address the psychosocial dimensions of the one medical crisis each of us will face, death.

**Tamunotonte Fenny**, Psychology

Faculty Mentor: Kristina McDonald, Psychology

*On Guard: Associations of Disrespect Sensitivity with Revenge Goals and Aggression*

Ethnographers have observed that in certain communities aggression often follows from perceptions of disrespect. In these communities, norms about respect are highly regarded and when these norms are violated retaliation or revenge is expected (Anderson, 1999; Horowitz, 1983). The purpose of the current study is to examine if this set of norms or beliefs can be measured as an individual difference and, if so, how this characteristic relates to revenge goals in peer conflicts and aggressive behavior. We hypothesize that this individual difference, which we have termed "disrespect sensitivity", will be related to desires for revenge and self- and peer-reported aggression. We examine this question in both a sample of adolescents and in a sample of college students. Preliminary evidence from the adolescent sample suggests that disrespect sensitivity can be reliably measured ( $\hat{\alpha} = .82$ ) and that it is predictive of revenge-seeking in response to peer provocation ( $r = .26, p < .001$ ) and in minor conflicts of interest ( $r = .16, p < .01$ ). Additional analyses will examine these questions in a college student sample as well.

**Jack Ferro**, Biological Sciences

Faculty Mentor: Ryan Earley, Biological Sciences

*Sex differences in behavior-physiology relationships in mangrove rivulus fish*

While phenotypic traits such as behavior, metabolic rate, and hormonal status normally are investigated independently from one another, many hypothesize that it is the connections among traits that promote or constrain phenotypic evolution. In addition, these traits often vary between the sexes, and it is reasonable to suspect that patterns of trait correlations also show sex differences. As such, we examined multiple traits simultaneously and to generate predictions on how selection may impact phenotypic evolution. We utilized the mangrove rivulus fish (*Kryptolebias marmoratus*), whose natural populations are composed of two sex morphs, hermaphrodites and males. We generated 40 pairs of fish (40 hermaphrodites, 40 males;  $N=80$ ), recorded baseline steroid hormone levels using a non-invasive water-borne hormone collection technique. Hormones of interest were testosterone, 11-ketotestosterone (a potent fish androgen), estradiol, and the stress hormone cortisol. Focal individuals were run through behavioral assays to quantify aggression and risk-taking behaviors. Lastly, individuals were assayed for maximum and standard metabolic rates using a respirometry chamber. As the data are analyzed we should begin to see whether behavior and physiology correlate with one another and if these correlation vary as a function of sex. This research should help further our understanding of how different phenotypic characteristics interact with one another to affect phenotypic evolution.

**Dalton Ford**, Chemical and Biological Engineering

Faculty Mentor: Patrick Frantom, Chemistry

*Synthesis of MtIPMS Variants to Determine the Catalytic Base*

The enzyme  $\alpha$ -isopropylmalate synthase isolated from *Mycobacterium tuberculosis* (MtIPMS) has been identified as a target for the design of new antitubercular therapeutics and has recently been revealed to be subject to slow-onset, feedback inhibition by L-leucine. MtIPMS catalyzes the first step in the biosynthesis of L-leucine. This is a Claisen-like condensation reaction between  $\alpha$ -ketoisovalerate (KIV) and acetyl-CoA (AcCoA) to form an  $\alpha$ -isopropylmalyl-CoA intermediate. This intermediate is then

hydrolyzed to form the final products  $\alpha$ -isopropylmalate and CoA. The residues E218 and H379 are conserved and thought to be important for catalysis because of their location on the linker domain. I am characterizing these residues to observe if they could be the catalytic base that is required for activity. My project was to use site-directed mutagenesis to convert these residues to alanine. The enzyme variants will then be further analyzed to determine their role in the catalytic mechanism.

**Darrell Forest**, Mechanical Engineering

Faculty Mentor: Xiangrong Shen, Mechanical Engineering

*Engineers of the Future*

The purpose of this project was to use a robotic hand as a way to get grade school students interested in engineering and, specifically, robotics. The hand was created to test existing technologies that could be implemented in more sophisticated prosthetic hands in the future. The hand was built by project leader Dr. Xiangrong Shen and several graduate students. In February, the hand was presented at the Engineering Showcase at the McWane Science Center by Miranda Tanouye, Sean Bibble, Lubna Alansari, and Molei Wu. We are currently scheduling an outreach program with University Place Middle School.

**Hunter Foster**, Culverhouse School of Accountancy

Faculty Mentor: Todd DeZoort, Culverhouse School of Accountancy

*An Evaluation of Corporate Tax Practices*

The purpose of this study is to determine the ethical limits of tax avoidance as employed by American corporations. We provide a sample of participants with cases involving examples of tax avoidance and judge how various factors of a corporation's operations affect public perception of their tax policies. We especially focus on the effects of a corporation structuring itself internationally to shift its tax burden to nations with lower tax rates than the United States. We anticipate that people will be more sympathetic to a company's tax avoidance when it is contributing more of its taxes to the U.S. or operating with losses.

**Sawyer Foyle**, Chemistry

Faculty Mentor: Keith Jacobi, Anthropology

*GCMS Analysis of Synthetic Cadaver Dog Training Scents*

Synthetic compounds called pseudo scents are currently available for use as training aids for cadaver dogs. This experiment seeks to identify the main components of these pseudo scents using gas chromatography/mass spectrometry, and the spectra obtained are compared to library references and current literature concerning these compounds. Further analysis will include comparison of compounds identified in this experiment with those already proposed as the main compounds of decomposition. The implications of this research include a possible impetus for reevaluation of and possible improvement upon the currently available pseudo scents for use in training cadaver dogs.

**Abigail Gandy**, Theatre and Dance

Faculty Mentor: Randy deCelle, Theatre and Dance

*Stage Management - A Handbook*

This research studies the stage management process, including its requirements and necessary steps, as well as the specific UA policies governing stage management. It also presents the spaces within UA where stage management would take place and the different ways in which they function. The research will be compiled into a handbook form, to distribute to new stage managers within the department.

**Ola Gerald**, Curriculum and Instruction

Faculty Mentor: Sharony Green, History

*Life after Emancipation: Freedom as seen through the lives and correspondence of Wesley and Thomas Townsend*

Since the 1970s, numerous studies have addressed the economic and social transitions of mixed race people from slavery to freedom. For example, there have been at least three investigations of the experiences of ten children freed by Samuel Townsend, a Huntsville, Alabama planter. Nine of the children who were freed and relocated outside the South before the Civil War appear to have been his own progeny.

Francis Cabaniss-Roberts, a former University of Alabama at Huntsville professor, studied the Townsends for her 1940 dissertation. R. Isabela Morales paid close attention to the girls for her 2012 BA thesis at the University of Alabama, and presently Sharony Green, an Assistant Professor of History at the University of Alabama, is studying the Townsends for a manuscript in progress on the hidden roles that southern white men played in the lives of freed people.

Building on earlier research and working with Green, I am examining the correspondence of two children in particular: Wesley Townsend, who returned to Huntsville to work as a farmer, and Thomas Townsend, who returned to Huntsville to work as first a teacher and then a lawyer. I wish to see if there is a correlation between the age of these two siblings at the time of their emancipation and the eventual differences in their professions. Such information may possibly extend our understanding of the experiences of mixed race persons in rural and urban spaces at the turn of the century.

**Mitchell Griest**, Computer Science

Faculty Mentor: Andy Fitch, Theatre and Dance

*Theatrical Set Design: Important Roles, Procedures, and Techniques*

The purpose of this research is to share insights into theatrical set design, provided to me primarily by the University of Alabama's Professor Andy Fitch during my enrollment in the Emerging Scholars program. The research focuses on the tasks allotted to and importance of the different roles within a set design and production team. In an effort to make this information more readily available to anyone who can benefit from it, the research will also discuss selected techniques used in the design and production process of a theatrical set from the initial drafting process through the finished product.

**Adam Gunther**, Information Systems, Statistics and Management Science

Faculty Mentor: Nikolaos Panagopoulos, Management and Marketing

*The Juxtaposition between Marketing and Accounting Rationales on Customer Profitability*

The purpose of this research is to develop a method in which a customer profitability model may be applied and sustained effectively within the internal accounting and marketing departments of an organization. The goal is to analyze the reasoning behind the communication gap between the accounting and marketing areas, as well as call attention to differing logistics and approaches when measuring customer profitability. The results are an approach to increase the efficiency of customer profitability models in a variety of environments by developing synergy between the accounting and marketing rationales, as well as understanding the necessity for the customer profitability model be designed specifically to its market environment.

**William Hampton**, Computer Science

Faculty Mentor: Monica Anderson, Computer Science

*Robotic Dead-drops*

Objective:

Hypothesis: We can use RFID technology to allow robots to communicate asynchronously. Our goal was to allow robots to communicate in a manner similar to ant pheromone trails or espionage dead-drops.

Methods: To test our hypothesis, we devised an experiment for our robots. Using a grid of RFID tags, we

will time how long it takes groups of robots to find all the tags. Starting with 1 robot, we will increase the number of searching robots to see if there is an improvement in mapping speed.

Results: While we have not yet run the experiment, we expect that there will be a logarithmic improvement in time as more robots are added. We expect this behavior because our search code is not optimized for multiple searchers, and so the robots will begin to get in each another's way.

Conclusion: Before this research, no physical RFID based asynchronous communication had been tested. While there have been several similar studies, all have been based on simulation rather than physical tests. Thus, we hope that this experiment will definitively show the value of RFID technology as a asynchronous communicator.

**Elaine Hanby**, Biological Sciences

Faculty Mentor: Jennifer Howeth, Biological Sciences

*Effects of Dispersal and Invasion on Pond Community Structure and Ecosystem Function*

Dispersal of native species in a geographic region may reduce community invasibility by exotic species through increasing local species richness. To address this question, we evaluated the effects of native species dispersal and exotic invasion on pond zooplankton community structure and ecosystem function using a microcosm experiment. There were four treatments in the experiment: no zooplankton dispersal and no invasion by the exotic zooplankter *Daphnia lumholtzi*, no dispersal and invasion, dispersal and no invasion, and dispersal and invasion. Immigration of native zooplankton occurred weekly in the dispersal treatment from five ponds in the Talladega National Forest. Communities in the invasion treatment were invaded with 10 *D. lumholtzi* halfway through the eight week experiment. We predicted that dispersal would positively influence native species richness, but would reduce invasibility by *D. lumholtzi*. Zooplankton species richness and density, algal biomass, and dissolved oxygen were sampled at the end of the experiment to test for treatment effects on community structure and ecosystem response. The results showed that *D. lumholtzi* did not establish in any invaded communities. There were only qualitative effects of dispersal and invasion on richness, algal biomass, and dissolved oxygen. These findings suggest that *D. lumholtzi* may be a poor competitor in species rich native communities, and unable to establish when propagule pressure is low and biotic resistance high.

**Alexandra Harris**, Philosophy

Faculty Mentor: Rekha Nath, Philosophy

*The Implication of Act Consequentialism for Moral Vegetarianism*

Is it morally permissible to eat meat or not - that is the question central to many ethical debates on vegetarianism. In particular, philosopher Ben Almassi claims that people should be vegetarians, identifying a moral obligation to abstain from eating meat to prevent animal suffering. My aim is not to settle the question of whether we ought to be vegetarian; rather, I want to identify why Almassi's argument for vegetarianism is flawed. His argument implies that individuals who abstain from eating meat are, in some way, helping to reduce the production of factory-farmed meat, a practice which yields animal suffering. In this paper, I argue against this claim. I do so by discussing a problem that is considered by Almassi, "the individual impotence problem," which is the worry that a vegetarian's dietary choices will have no impact on the factory farming industry. If there is no impact through the reduced production of factory-farmed meat, then the effect of individuals practicing vegetarianism seems to have no purpose. In proving that the individual impotence problem is more serious than he seems to take it to be, in that it does not show any sort of positive causal relationship between individual actions and their collective effects, it is evident that Almassi's argument is wrong. Hence, Almassi does not provide a convincing argument for vegetarianism. I do think that there are persuasive reasons to be a vegetarian, but the cause and effect argument above is not one of them.



**Charlotte Harrison**, Management and Marketing  
Faculty Mentor: Juliet Davis, Management and Marketing  
*Promoting Health Awareness Using Social Media*

*\*International focus*

With the advancements of Web 2.0, also known as Social Media, Health Care Providers have created a discussion with consumers promoting global awareness events, using Web 2.0 as their tool. Netbase, a social media intelligence software program, was used to compile around 200 million Internet sources from around the world were scanned, including micro blogs, news sources, forums, review, etc. With the comments provided, each were categorized and analyzed. The results concluded that awareness events increase social media conversations with each country's response correlating with their level of Internet usage. However, the comments made regarding both Breast Cancer Awareness Month and HIV-AIDS on social media were mostly negative because of the comparisons other Web 2.0 users drew using emotional stories and personal experiences with other viruses, diseases or forms of cancer. The demographics of social media users are highly correlated with frequency of postings. If the demographic is more highly involved (i.e. women and breast cancer) they are more likely to display social media awareness. Although further research needs to be performed, in conclusion, social media is used as a juncture for leading conversations promoting health awareness on a global stage in both positive and negative manners.

**Erin Hein**, Chemistry

Faculty Mentor: Laura Busenlehner, Chemistry

*The Effects of Mutation on Frataxin Metal Binding and Iron-Sulfur Cluster Synthesis*

The neurodegenerative disorder Friedreich's ataxia is caused by the reduced production of the protein frataxin. This is caused by an autosomal recessive genetic mutation in frataxin, which binds iron in the cell's mitochondria and helps to build iron-sulfur clusters. We sought to examine the effects of mutation on frataxin's ability to bind metal by performing experiments on three mutated proteins, D91A, D115A, and D124C. The experiments chosen were fluorescence metal titrations and iron-sulfur assays to examine the ability of the mutated protein to bind metal and assemble iron-sulfur clusters. Through these experiments we hope to learn how these specific mutations affect frataxin and determine if these residues are important for the functionality of frataxin as a metal-binding protein.

**Ashley Henson**, Political Science

Faculty Mentor: Richard Fording, Political Science

*Understanding the Role of the Tea Party in the United States Government*

The Tea Party Movement is a primarily grassroots conservative movement that began in 2009, stressing limited government, fiscal responsibility, and free markets. While not a political party, many candidates have identified as a "Tea Party" candidate. Political platforms and goals were gathered from local, state, and national Tea Party group websites from various geographical regions and underwent a text analysis. The results will reveal whether there are differences in the Tea Party on hierarchical and regional levels. Further analysis could be used to show if Tea Party candidates tend to vote any different from other non-Tea Party Republicans.

**Kaitlyn Herbert**, Advertising and Public Relations

Faculty Mentor: Regina Lewis, Advertising and Public Relations

*Android Versus iPhone*

The basis for this study was a questionnaire filled out by participants in a survey about Android versus iPhone users and what applications they would be more drawn to. I hypothesized that females are more likely to use Apple products. Also, I think that the younger generation is more likely to be Apple users

while older people tend to favor Android. I posed the following hypotheses about Apple users: they use their apps multiple times a day, want to be provided with the latest trends and news, like to be in constant contact with relatives, would feel disconnected without their phones, are interested in social networking, and favor productivity. Contrary to my hypothesis, there wasn't a difference between what females and males favored more. Age did not hold any significance as to who favored Apple products more. However, after looking at the literature, younger people tend to favor Androids more, and this favorable attitude decreases with age. There is no difference between which users like to use their apps multiple times a day, but Android users are likely to only use these apps once a week. My hypothesis was correct because Apple users like apps that keep them updated on trends and news. There was no difference between who favored staying in contact with relatives more. Both Apple and Android users would feel equally disconnected. Apple users enjoyed apps that sent them notifications and kept them updated on news, but Android users want apps that promote productivity.

**Bailey Holway**, Economics, Finance and Legal Studies

**Christopher Lancaster**, Economics, Finance and Legal Studies

**Evan Ashy**, Economics, Finance and Legal Studies

Faculty Mentor: Jack Clampit, Management and Marketing

*Does Outsourcing Affect Firm Performance? A Global, Large-Scale Event Study Of Shareholder Reaction To Outsourcing Announcements*

*\*International focus*

Today's firms operate in a hypercompetitive business market. It is thus almost taken for granted that to remain competitive vis-à-vis global rivals who are simultaneously attempting to shed costs, increase flexibility, and strategically focus on core activities, firms must outsource parts of their value chain. Much outsourcing often takes place within the same country because the goal is often not cost reduction related to manufacturing, but, instead, letting a company focus on doing what it does best while letting expert vendors handle the rest (often related to IT functions, accounting functions, and other business processes). But does this outsourcing of business functions actually result in increased levels of firm performance (as measured by stock price increases)? The goal of this study is to answer that question. To investigate this question, data from 1991-2006 was collected on outsourcing deals and shareholder reactions on both client and vendor sides. Overall, positive stock returns in reaction to outsourcing announcements have been found for both vendor and client. More current findings have yet to be finalized due to current update and collection of deals from 2007-2014, keeping in mind the financial crisis that the United States and much of the world faced. This could have major implications on returns for firms. These findings have wide application to whether or not firms should outsource in the first place rather than keeping certain operations in-house.

**Grant Hughes**, Information Systems, Statistics and Management Science

Faculty Mentor: David Hale, Information Systems, Statistics and Management Science

*The Applications of Information Technology and Website Design*

The purpose of the project is to design an accessible and straightforward homepage for the University of Alabama Center for Economic Development's Alabama Outdoor Trails website. After completing the Alabama Bird Trails site, the Economic Development Center came back to the Management Information Systems department for assistance developing the trails site. Representatives from the department met with our staff and brought printed screenshots of other websites and features in order to establish a "dos and don'ts" list of various approaches to the site and its design. We also searched through the internet to find appealing and approachable maps and settings in order to broaden our list of options. The website's homepage is oriented toward simplicity and convenience, making decisions on how a user would most efficiently navigate the website and draw their interest into the topic of the webpage. By

the end of the project the staff and I constructed a professional template for the homepage that will be useful in benefiting the success of the website. This project has given me advanced insight to what my future career will comprise of and a solid understanding of the concepts backing the practice.

**Madeleine Hull**, Biological Sciences

Faculty Mentor: Matthew Jarrett, Psychology

*Attention-Deficit/Hyperactivity Disorder (ADHD) and Comorbid Anxiety: Associations with Co-Occurring Symptomatology, Executive Functioning, and Impairment*

The current study examined how undergraduate students with ADHD Only (n = 47), Anxiety Only (n = 66), ADHD + Anxiety (n = 48), and No Diagnosis (n = 317) differed on measures of co-occurring symptomatology, executive functioning, and impairment. 500 undergraduate students participated in an Institutional Review Board-approved research study. Significant between group differences were found for measures of depression and sluggish cognitive tempo (SCT) with ADHD + Anxiety having greater SCT symptoms than ADHD Only and No Diagnosis. Anxiety Only had greater SCT symptoms than No Diagnosis. In relation to depression symptoms, both anxiety groups showed greater depression symptoms than the other groups. Few differences were found on laboratory task measures of executive functioning (e.g., sustained attention, inhibitory control), but a difference was found on visuospatial working memory with Anxiety Only showing greater impairment than the ADHD Only and No Diagnosis groups. ADHD + Anxiety and Anxiety Only did not differ. Finally, groups differed on measures of drug and alcohol abuse. All three clinical groups showed greater problems in this area than No Diagnosis, but the groups did not differ from each other. In relation to overall ratings of life impairment, those with ADHD + Anxiety reported greater impairment than the other three groups. Those with ADHD Only and Anxiety Only reported greater impairment than No Diagnosis, but these two groups did not differ from each other.

**Kelly Hunter**, Communicative Disorders

Faculty Mentor: Rachel Saffo, Communicative Disorders

*Cultural Effects on Parent-Child Interactions*

Per the 2013 census, the presence of multi-cultured Americans has increased significantly. In Alabama, there is a significant population of Hispanic and German people. This study is a literature review that focuses on how the Hispanic and German cultures affect parent-child interactions. The research on Hispanic parenting values show that Hispanic child rearing is heavily affected by cultural values of familial unity and support rather than putting emphasis on self-reliance and individualism like Americans families tend to focus on. German culture, on the other hand, influences parent-child interaction in that parent's expect younger self-reliance from their children than most cultures including America. This information is clinically important to Speech Language Pathologists because knowledge of other cultures can help better their practice. By understanding the implications of culture on child rearing, they can better asses and determine intervention for client's from other cultures that are present in Tuscaloosa.

**Paige Jackson**, Biological Sciences

**Eryn Turner**, Curriculum and Instruction

Faculty Mentor: Kristina McDonald, Psychology

*Reacting to Rejection: Comparing Three Paradigms that Simulate Adolescent Peer Rejection*

Social acceptance is important to human beings and how they regard themselves (Leary & Baumeister, 2000). Peer acceptance is particularly salient for adolescents (Berndt, 1982). Some adolescents experience "in vivo" rejection daily, including exclusion and victimization by peers (Asher, Rose, & Gabriel, 2001; Craig, Pepler, & Atlas, 2000). How adolescents respond to these forms of rejection is due, in part, to their physiological reactivity and regulatory abilities (e.g., Rudolph, Troop-Gordon, & Granger,

2010). The purpose of this pilot study was to assess three different peer rejection paradigms in preparation for a larger study about physiological reactivity to peer rejection. In the first paradigm, a video game based on the popular TV show, "Survivor," was used to simulate rejection from the peers voting the participant out of the game. In the second paradigm, Google chat, an instant messaging application, was used to simulate rejection from fictitious peer judges after a conversation task. The third and final paradigm led adolescents to believe that they were going to interact with a hostile (fictitious) partner. We recruited 10 participants for each paradigm, between the ages of 11 and 15, from surrounding schools. During each paradigm, heart rate, respiration, and salivary cortisol were collected. Before and after the paradigm, participants reported on their mood. Findings will be presented that illustrate physiological reactivity and changes in mood for each paradigm.

**Runqiu (Candice) Ji**, Management and Marketing

Faculty Mentor: Regina Lewis, Advertising and Public Relations

*Exploration of Women's Attitudes Towards Mobile Life: China & U.S.*

*\*International focus*

The purpose of the research is to examine the influence of digital technology on the day-to-day living of women globally, and to explore their perceptions, emotions and attitudes towards mobile devices and social media. This research builds on a survey that was conducted by Hearst's Digital Media Network on women aged 18-49 in the United States, China, Japan, Spain and the United Kingdom. Survey data revealed four distinct segments of mobile women: Love It-Hate It, Utilitarians, Stress-Free Passionates and Disengaged. Analysis of the survey data also showed significant attitudinal differences between the China and U.S. data sets, which this research aimed to further investigate through qualitative studies. A focus group was conducted with Chinese female students aged 16-24 at UA, and followed by seven in-depth Skype interviews with women of similar age in China. Results showed that Chinese millennial women exhibit a stronger emotional attachment to digital technology and obtain higher aesthetic, social and self-expressive values from mobile phones than do U.S. women. It is crucial for communication and marketing professionals to get an exhaustive understating of female mobile users internationally in order to create and deliver insightful messages and desirable goods and services to their segmented audiences. A recommended next step is the continuing of qualitative studies to closely examine the attitudinal differences of women in the other countries surveyed.

**Samuel Jones**, Biological Sciences

Faculty Mentor: Robert Findlay, Biological Sciences

*Stable Isotope Analysis of N-15 in Daphnia*

Daphnia can undergo a variety of chemical changes under different environmental conditions. The way that the isotope N-15 is transferred between successive generations of daphnia has not yet been studied. Daphnia were inoculated into several batches of algae and grown until maturity for several generations. The daphnia were then prepared for stable isotope analysis to analyze the N-15 signatures in each generation. This is currently an ongoing experiment, and the final data has not been obtained. However, the researchers hope to be able to clearly show how N-15 signature changes through generations with this research.

**Rebecca Kerley**, Modern Languages and Classics

Faculty Mentor: Ana Corbalán, Modern Languages and Classics

*Women's struggle for equality in the midst of the Spanish Civil War*

*\*International focus*

Before the 1930s, the rights and roles of Spanish women were severely limited due to long standing traditional influences and conservative values. In a rapid succession of reforms in the early 1930s,

women gained rights and a huge leap towards gender equality was made. With the outbreak of the Spanish Civil War a few years later, the momentum from these reforms carried over into an opportunity for women to fight for equality in the midst of the larger war. During the war, some of them filled the traditionally male roles of combatants, unprecedented in Spain and nearly so in Western society at the time. They also contributed to the war effort as nurses and making weapons. Women's organizations gained power and pushed women's activism and challenged the social norms of sexism that were still prevalent in Spain. Even with female combatants and organizations pushing women's rights, sexism remained prevalent. With the end of the war largely came the end of the struggle for progressive gender equality. Under General Franco's dictatorship (1939-1975), the role of women swung back to what it was before the reforms of the 1930s, making the role of women in the Spanish Civil War a brief, contradictory challenge to the oppression that preceded and followed it.

**Donald King**, Computer Science

Faculty Mentor: Abu-Qahouq Jaber, Electrical and Computer Engineering

*Wireless Power Transfer*

Wireless power transfer (WPT) is the transfer of electrical energy from a power source to an electrical load without man-made conductors. In the inductive WPT type, when an AC current flows through a primary coil (transmitter), it creates an alternating magnetic field that acts on a secondary coil (receiver). This causes an AC current to flow through the secondary coil which powers the receiver circuit. In order for this to occur, the magnetic fields of the two coils must overlap to ensure sufficient or high magnetic coupling between the two coils.

In this project, I have been working with characterizing the inductive WPT coils by measuring and calculating several performance parameters including values of resistance, inductance, capacitance and resonance frequency.

To perform this task I was able to use a multimeter to measure the DC resistance (R) of a coil, then use function generator and oscilloscope to measure the new frequency (f) when the coil is connected in parallel. These values are then used to measure the inductance (L). After measuring the self-resonance frequency (fo) of the coil by using a frequency response analyzer, capacitance value (C) is calculated. In this way, R, L, C and fo values of a WPT coil are obtained and tuned in order to optimize a given design.

**David Konerman**, Economics, Finance and Legal Studies

Faculty Mentor: Kevin Besnoy, Special Education and Multiple Abilities

*Addressing Gifted Students*

When we think of gifted individuals we tend to think of top tier students; The ones who are volunteering answers in class and staying after school to excel in jazz band or basketball too. While these idealistic portrayals are not entirely far-fetched, they do leave some issues unaddressed. Gifted does not directly correlate with academically superior. The National Association for Gifted Children describes gifted as demonstrating outstanding levels of aptitude or competence in one or more domain. Note that this definition does not read 'in all domains.' With this definition at hand we can begin to look into what typical days are like for gifted students, particularly the parts of the day that leave gifted students unengaged or even left behind.

**Sydney Kopelic**, Biological Sciences

Faculty Mentor: Ryan Earley, Biological Sciences

*Salinity Induced Developmental Plasticity in *Kryptolebias marmoratus**

Genes and the environment interact to drive phenotypic variation but the physiological mechanisms through which the environment affects the phenotype remain unclear. We are investigating how an organism's environment shapes its development The objective of this research is to determine if

variations in salinity affect arginine vasotocin (AVT) neuron size and number. Because AVT is a neuropeptide hormone that has diverse functions - regulating osmoregulation, growth, and social behavior - we also aimed to determine if changes in AVT neuron size and number would result in changes to multiple phenotypic traits. We use the mangrove rivulus fish *Kryptolebias marmoratus* as a model. This species is unique because they have the ability to effectively clone themselves, producing offspring genetically identical to themselves, allowing us to control for genotypic variation and observe phenotypic variations caused only by changes in the environment. We placed genetically identical individuals into environments of different salinity from hatching to adulthood, continuously monitoring color, body shape, behavior, and growth rate. In doing this, we hope to determine if salinity-induced changes in AVT production drive dramatic differences in suites of phenotypic traits. By increasing our understanding of interactions between environment and the mechanisms that drive phenotypic variation, this research will provide the springboard for studies on how natural selection acts on this variation.

**Harrison Lanum**, Metallurgical and Materials Engineering

Faculty Mentor: Lin Li, Metallurgical and Materials Engineering

*Design Tougher Metallic Glass Utilizing Multi-scale Modelling Techniques*

As a class of new emerging materials, metallic glasses exhibit steel-like high yield strengths and polymer-like large elastic limits. However, metallic glasses suffer from negligible plasticity prior to catastrophic failure in a form of nano-scale shear bands at room temperature, which precludes their immediate application, particularly as structural materials. Therefore, in this work, we are aimed to design tougher metallic glasses that utilize and distribute nano-scale shear bands by developing a multi-scale modeling framework. Particularly, we employ Abaqus/CAE, a commercial Finite Element Analysis package to systematically analyze the stress states for various heterogeneous geometries and architectures. A special packing topology of a special shape of the second phase is identified. In the future, the identified heterogeneous structure will be combined with our meso-scale modeling technique to study in detail the distributed pattern of shear bands in metallic glasses.

**Coady Latimer**, Geography

Faculty Mentor: Jason Senkbeil, Geography

*Sea Breeze Effects on Coastal Alabama Rainfall*

The sea breeze on the Alabama coastline produces a convergent boundary creating intense afternoon thunderstorms with high precipitation rates. Coastal locations of Alabama receive between 10 and 20 more inches of precipitation than inland areas of Alabama and this difference is largely attributed to sea breeze thunderstorms. The sea breeze is an important source of freshwater input for coastal and estuarine ecosystems. Despite common knowledge of its existence, mechanisms stimulating the formation of sea breeze thunderstorms are poorly understood and forecasted. A newly established mesonet of weather stations in coastal Alabama has been recording data at 1-minute intervals since 2010. Using the USA mesonet, wind and pressure variables were analyzed in conjunction with weather radar animations for days when intense rainfall occurred. Additionally, archived surface and upper air weather maps were matched to the radar images to determine if the intense rain was likely caused by sea breeze convergence or other external mechanisms. This research represents an initial step toward defining characteristics that contribute to the formation of sea breeze thunderstorms.

**Derek Legenzoff**, Economics, Finance and Legal Studies

Faculty Mentor: James Cover, Economics, Finance and Legal Studies

*The Effects of Fiscal Policy Shocks in Mexico*

*\*International focus*

This research examines the effects of fiscal policy shocks on Mexico's economy from the 1980's to present. The effects are determined by using regression techniques to pinpoint shocks in government spending and revenue data and then comparing that data with significant events in Mexican politics that could potentially lead to a fiscal policy shock. The results yield a loose correlation in the data that indicates positive shocks to government revenue lead to a decrease in real GDP the following year. Meanwhile, shocks to government spending have almost no meaningful effect on real GDP.

**Gabrielle Lindley**, Biological Sciences

Faculty Mentor: Rebecca Allen, Psychology

*The Effects of Death Exposure and Bereavement in Certified Nursing Assistants*

Recent studies suggest that nearly one-third of adults over the age of 65 die in a nursing home (NH) setting. However, little research explores the effects of an increasing volume of resident death on those who provide the majority of direct and comprehensive end of life care in the NH: certified nursing assistants (CNAs). On average, CNAs within the NH setting experience comparatively high exposure to death, face higher risk of complicated bereavement, and are at risk of compassion fatigue. Thus, CNAs provide an appropriate and important population for study. The purpose of this research is to assess the effects of continual death exposure in the CNA population and to better understand the process of bereavement and its implications for the provision of future care. In order to evaluate these effects, a small pilot group of CNAs will be presented with a questionnaire procuring staff demographics and experiences with palliative care and will have the opportunity to give feedback on the measures, including scales measuring death anxiety, personality, and behavioral inhibition, which will be used to test the hypotheses regarding the relationship between death exposure and outcomes. The potential findings of this research will allow for a more comprehensive understanding of the educational and support needs of the CNA population involved in palliative care in the Southern United States.

**Allyson Liu**, Biological Sciences

Faculty Mentor: Stevan Marcus, Biological Sciences

*The Huntingtin interacting protein 1 (HIP1) ortholog, End4, has a role in maintaining mitochondrial integrity in the fission yeast, Schizosaccharomyces pombe*

Huntington's disease (HD) is a neurodegenerative disorder that is characterized by the progression of abnormal behavior and uncontrolled movements. HD is caused by mutation of a single gene called Huntingtin, which encodes a protein, also named huntingtin (Htt), of unknown function. It has been hypothesized that mutated Htt results in the abnormal solubilization of a protein called huntingtin interacting protein 1 (HIP-1), whose overexpression has been shown to induce neurodegeneration. However, this hypothesis is insufficiently supported with no specific evidence that HIP-1 is overexpressed in HD patients. Alternatively, mitochondrial damage and aberrant morphology have been found to be hallmarks of neurodegeneration in HD patients, leading us to speculate that a lack of HIP-1 rather than an overexpression, has a role in the pathogenesis of HD. The fission yeast, *Schizosaccharomyces pombe*, has an ortholog of HIP-1 named End4. We microscopically observed and tested the growth of end4 mutant cells under various oxidative stress conditions in order to determine the state of mitochondrial integrity and function. Thus far, we have found that end4 mutants have disorganized mitochondrial networks at a basal state and that various extracellular stresses exacerbate this phenotype. Our findings raise the possibility that HIP-1 has a potential role in maintaining mitochondrial organization in mammalian cells and that its dysfunction in neurons may contribute to the pathogenesis of HD.

**Lauren Loeb**, Biological Sciences

**Alora Terry**, Biological Sciences

**Faith Lancaster**, Biological Sciences

Faculty Mentor: Margaret Johnson, Biological Sciences

*In vitro Transcription and Translation and Electrophoretic Mobility Shift Experiments Detect HES-1 Binding Sites in the Promoter of myo-Inositol 1-Phosphate Synthase*

Studies of inositol-phosphate biosynthesis in the developing brain of normal (CBA) and curly tail (CT/ST) mutants suggest that abnormal levels of inositol may be involved in producing phenotypic variance in curly tail mice. The curly tail mouse has been widely used as a model for studying neural tube defects (NTDs) and is one of the best-studied models for spina bifida. The CT and ST mice have the same genotype but differ in phenotype and susceptibility to spina bifida. We hypothesize that epigenetic mechanisms may be responsible for phenotypic variation in curly tail mice. Since DNA methylation is the most commonly observed epigenetic silencing mechanism, we performed bioinformatics analyses of the MIPS promoter to determine potential DNA binding sites for factors that may be responsible for phenotypic variation observed in curly tail mice. These analyses predicted binding sites for HES-1 (Hairy Enhancer of Split-1), a well-known repressive mediator of the Notch signaling pathway (1). Transcription and translation (TNT) and Electrophoretic Mobility Shift Assay (EMSA) experiments showed that HES-1 binds a 224 base pairs methylated region in the MIPS promoter.

**Holley Long**, Criminal Justice

Faculty Mentor: Mark Lanier, Criminal Justice

*The Presence of Human Trafficking in Florida*

Human trafficking is a social, economic and legal problem that transcends traditional law enforcement jurisdictions. With the assistance of the Florida Sheriff's Association (FSA) and Florida Department of Law Enforcement (FDLE) mixed methods were employed to help ascertain the extent of the problem and provide possible solutions. Surveys were sent to all county sheriffs in Florida (67% response rate) and interviews were conducted with key constituents. The findings suggest that agencies, often external to law enforcement, could better handle related problems if there was a cohesive frame of reference and a better understanding of the dynamic associated with human trafficking. Policy changes are recommended to refocus, and broaden, the law enforcement strategy for dealing with modern slavery cases and to offer additional insight into the world of human trafficking. The original study is being replicated in Alabama in order to compare trafficking in both states.

**Perrin Lowrey**, Psychology

**Virginia Skipper**, Psychology

**Halley Seyfried**, Biological Sciences

Faculty Mentor: Philip Gable, Psychology

*Anger and Disgust Influence Memory*

Emotions influence attention and processes involved in memory. Although some research has suggested that all negative affects influence these processes differently than neutral affect, recent research suggests that motivational intensity of negative affective states influences these processes. The current experiments examined memory for centrally or peripherally presented information following the evocation of motivationally intense negative affect. Experiment 1 found that relative to neutral images, disgust images enhanced memory for centrally presented information. Experiment 2 extended these findings by examining memory during state anger, a high approach-motivated negative affect. Results revealed that anger images enhanced memory for centrally presented information, but not peripheral information. These results suggest a more complex relationship between negative affect and memory processes, and highlight the importance of considering the role of motivational intensity of negative affects in cognitive processes.



**Marguerite Majure, Psychology**

Faculty Mentor: Frances Connors, Psychology

*Relation of Socioeconomic Status with Cognitive and Language Measures in Down syndrome*

The purpose of the research is to determine how socioeconomic status (SES) relates to language and cognition in young people with Down syndrome. Most often, SES has a positive correlation with language and cognition. With Down syndrome, we do not know if this is true because their language and cognition is affected by their genetic anomaly. We measured SES using parental education and income. We compared a group with Down syndrome with a group that is typically developing on how their SES levels relate to their scores on language and cognitive tests. The research resulted in highly significant positive correlations for typically developing children between each SES measure and both the Peabody Picture Vocabulary Test (PPVT, a measure of receptive vocabulary) and the Leiter International Performance Test (a test of nonverbal cognitive ability). However, these same correlations for young people with Down syndrome were weaker and generally nonsignificant.

**Ciara Malaugh, Political Science**

Faculty Mentor: Rebecca Allen, Psychology

*An Underutilized Resource: Campus Safe Zone Programs as a Clinical Training Tool*

Safe Zone training programs offer opportunities to increase awareness and understanding of issues that affect members of the LGBTQ+ community. Trainings offered by these programs can be utilized by any department, office, or group on campus free of any charge. Thus, all universities across the country have the ability to aid faculty members, staff, and students who identify as LGBTQ+, regardless of budget restrictions through Safe Zone training programs. However, a study conducted in 2002 showed that 28% of psychologists surveyed had received no formal training in clinical work with LGB (the terminology has since expanded to LGBTQ+) clients. Furthermore, most reported the training they received came from their own initiative, independently reading articles (64%) or books (32%). Only 22% reported that their graduate institutions offered a seminar on clinical work with the LGB population, even though up to 99% of psychologists reported at least one LGB client (Garnets, Hancock, Cochran, Goodchilds, & Peplau, 1991) The goal of this project is to investigate how many schools with APA-accredited doctoral programs in clinical and/or counseling psychology have established Safe Zone or equivalent programs. Further data will also be sought on clinical psychology and counseling programs' utilization of services offered by Safe Zone.

**Amanda Marotto, Psychology**

Faculty Mentor: Randall Salekin, Psychology

*Treatment of Psychopathy*

Psychopathy is defined as a mental disorder that is associated with antisocial behavior. Researchers have outlined three dimensions of psychopathy: arrogant, deceitful, interpersonal (ADI), deficient, affective experience (DAE), and impulsive/irresponsible behavior (IIB). In addition, psychopathy has been characterized by the presence of callous/unemotional traits. Because psychopathy has both biological and psychosocial causes, treating those afflicted with this disorder has proven difficult. By reviewing multiple studies involving the treatment of psychopathy, conclusions can be made concerning the effectiveness of different therapies. While cognitive-behavioral therapy and multisystemic therapy have proven efficient in the treatment of psychopathy, pharmacological and therapeutic community treatment did not demonstrate as much success. It is important to note that early intervention is essential for the treatment of psychopathy in all forms of therapy because adolescents are still developing problematic behaviors. In addition, a patient's motivation to change negative behaviors affects the treatment outcome. Researching treatment for psychopathy is crucial to the well being of society as a whole due to the criminal tendencies of those who are diagnosed with the disorder.

**Miles Marquette**, Biological Sciences

Faculty Mentor: Dana Ehret, Biological Sciences

*Pathologies Associated with Late Cretaceous Shark Teeth*

In the Late Cretaceous period, Alabama was partially submerged in what is now the Gulf of Mexico. Of the many marine organisms that lived in this area during this time, a significant number of shark species and their fossilized teeth have been recovered. Notably, the specimens coming from the species of *Squalicorax kaupi*, *Scapanorynchus texanus* and *Cretolamna appendiculata* are some of the most common teeth found, among others. In addition to normal specimens, numerous teeth have been found that display a number of deformities that classify them as pathologic. These irregularities are hypothesized to have arisen mainly from natural causes (i.e: feeding habits, injury and growth malformations). The goal of this exploration is to investigate the percentage of shark teeth that exhibit these pathologic properties. Specifically, to establish a ratio of shark teeth that are pathologically deformed and those that appear to lack such deformities. Teeth coming from Trussell's Creek in Greene County, AL will be the focus of this study. A log was kept in order to track the number of pathologic teeth that arise from the investigation. The type of deformity will be quantified and assigned to a particular category. The results of this investigation suggest that a very small number of shark teeth exhibit these pathologic deformities. Although this ratio is small, the deformities observed seemed clearly to have arisen from purely natural causes.

**Jeannie Marshall**, Chemical and Biological Engineering

**Frank Foley**, Chemical and Biological Engineering

Faculty Mentor: Jason Bara, Chemical and Biological Engineering

*The Properties of Imidazole Derivatives in CO<sub>2</sub> Capture*

The Bara lab group has synthesized a variety of imidazole derivatives that have properties that have yet to be recorded and tabulated. The viscosities and densities of new compounds with various substituents added to the imidazole ring were recorded. Trends in the physical properties of these compounds were graphed against various temperatures and concentrations. The importance of obtaining these physical properties of these compounds is to produce polymers to make membranes for CO<sub>2</sub> capture. New synthesized imidazole monomers were polymerized to produce new membranes. These membranes were used to test polymer swelling in organic solvents. Gases are pumped through these membranes to test their absorptivity.

**Mary McBryde**, Management and Marketing

Faculty Mentor: Kristy Reynolds, Management and Marketing

*Calorie Postings in Dining Experiences*

Following a shift in consumer preferences, there has been an increasing focus in food companies and dining establishments to reduce unhealthy amounts of calories in an attempt to address the many national health problems the U.S. is facing. The portion size and nutritional content of many dishes served within the restaurant industry have been blamed, in part, for contributing to these health issues. In an effort to better inform customers, many restaurants have begun providing caloric information on their menus. However, little is understood of how this information may impact the experience of the customer. Thus, the purpose of this research study is to examine the response to calorie postings in dining environments. Data were collected through primary sources in one-on-one depth interviews assessing the consumer's feelings towards calories being listed on menus. Additionally, a second study used simulated dining scenarios that manipulated restaurant type (healthy vs. unhealthy) and dining experience (fine dining vs. casual) to assess customer satisfaction with a dining experience in which calories were listed. Results demonstrated that calorie postings affected the choices consumers made as

well as their overall satisfaction. Findings provide insights for businesses in understanding how calorie postings affect a customer's decisions and experience in light of proposed regulations for retail food establishments to begin disclosing nutritional information in coming years.

**Matthew Mercatante**, Mechanical Engineering

Faculty Mentor: Ajay Agrawal, Mechanical Engineering

*Development of Flow-Blurring Fuel Injector for High Pressure Usage*

A previously developed Flow-Blurring (FB) fuel injector has proven to successfully increase the combustibility of highly viscous fuels, such as glycerol, under low-pressure conditions. The goal of this project is to determine the viability of the FB injector for use with high viscosity fuels in a high-pressure scenario. This objective will be achieved by modifying a high-pressure chamber, originally designed for methane gas combustion, to accept liquid fuels and incorporate the FB injector. Present research seeks to modify the apparatus, and then combustion tests will proceed and emission measurements will be taken to determine the effectiveness of the FB injection concept at high pressures.

**Genevieve Miller**, Biological Sciences

Faculty Mentor: Ryan Earley, Biological Sciences

*Uncovering the Mechanism of Heterozygosity in the Mangrove Rivulus*

Every organism is composed of traits that develop through complex interactions between genes and the environment. Understanding genomic regions that underlie phenotypic variation requires significant genetic variation, often produced by crossing lineages with known genotypes/phenotypes. Mangrove rivulus fish (*Kryptolebias marmoratus*) exist predominantly as self-fertilizing hermaphrodites. Many generations of selfing results in the production of completely homozygous animals that can effectively produce clones. However, in the wild heterozygous fish are produced by a male fertilizing a hermaphrodite's unfertilized eggs. For this to happen, hermaphrodites must forego selfing and lay unfertilized eggs. The mechanisms that inhibit selfing and promote the release of unfertilized eggs, however, remain a mystery. We developed strategies to examine what might cause hermaphrodites to lay unfertilized eggs. Young fish were placed in a dry environment for 7 days, young fish were fed extra food, and hermaphrodites will be placed in a partitioned tank with either a male, a different hermaphrodite, or alone. These efforts to increase egg production and the chance of finding unfertilized eggs will allow us to reliably cross homozygous hermaphrodites with males to produce heterozygous hybrid offspring. This, in turn, will lead to further studies on the genetic basis of phenotypic variation and our ability to link certain genes with abnormal behaviors and disease susceptibility.

**Aaron Minton**, Aerospace Engineering and Mechanics

Faculty Mentor: Vinu Unnikrishnan, Aerospace Engineering and Mechanics

*Computational Analysis of Carbon Nanotubes*

Carbon nanotubes and its composites are fascinating materials that possess extraordinary properties, and are currently being studied for their great potential in various advanced industrial applications and new technologies. It is well known that carbon nanotubes have excellent thermo-mechanical properties, however, their applications at higher temperatures are still being studied and are an area of active research. In this study, we investigate the stability of carbon nanotubes at extremely high temperatures, and use our results to estimate their mechanical properties at these temperatures. The analyses are performed using molecular dynamics simulations (LAMMPS) using Tersoff-Brenner potentials at varying temperatures. In the second part of this study, micromechanical methods are used to estimate the overall effective mechanical properties of the resulting nanocomposites.

**Kyle Miskell**, Electrical and Computer Engineering

Faculty Mentor: Paolo Rumerio, Physics and Astronomy

*900GeV Leptoquark Invariant Mass Reconstruction: A ROOT Analysis of Monte Carlo Jet-Lepton Pair Production*

*\*International focus*

In the field of high energy particle physics, the existence of three distinct generations of matter has remained an enigmatic fundamental property of the physical universe--a property that has eluded and continues to elude the establishment of an experimentally verified rationale and that may hold the key to new physics. The existence of the leptoquark, a particle in high energy physics that bridges the gap between lepton and quark information exchange, is one such theory that could potentially explain our observation of three generations of matter, and, if discovered, the leptoquark could pave the way to the development of a unified field theory--the holy grail of the physics community. Furthermore, of several potential leptoquark production mechanisms, that involving the gluon-gluon interaction of two colliding hadron particles is especially suited to empirical testing, specifically at CERN's Large Hadron Collider (LHC). As such, the development of computational techniques to detect the production of leptoquarks using the LHC's Compact Muon Solenoid (CMS) detector has become a priority in the search for the leptoquark. This research project, conducted in collaboration with the University of Alabama's Collider Physics Group under Dr. Paolo Rumerio, pertains to the development of algorithms using ROOT, a C++ based statistical data analysis framework, to reconstruct simulated Monte Carlo leptoquark particle events at a conjectured invariant leptoquark mass of 900GeV.

**Ally Mitchell**, Communicative Disorders

Faculty Mentor: Anthony Buhr, Communicative Disorders

*Influence Of Attention To Self On Fluency*

Studies have shown that human behavior and decision-making are influenced by social context. The present study investigated the impact of attention to self on speech fluency through the presence or absence of a video recording during a narrative. Results showed the mere presence of the video recording had no impact on speech fluency. Results are interpreted to suggest that feedback regarding social performance might be a critical factor influencing speech fluency.

**Jocelyn Newman**, Chemistry

Faculty Mentor: Martin Bakker, Chemistry

*Formation and Catalytic Activity of Nickel Nanoparticles Supported on Porous Carbons*

Nickel is a relatively cheap metal that is known to catalyze a number of reactions, particularly addition of hydrogen across double bonds. The activity of the catalyst is determined by surface area. Unfortunately high surface area nickel is prone to bursting into flame upon contact with air. It is hypothesized that by supporting the nickel as fine particles on a carbon support the nickel catalyst can be made less likely to burn in air while retaining the catalytic activity. Preliminary syntheses of such nickel nanoparticles on porous carbon have been carried out and the materials characterized by electron microscopy. The ability of these materials to catalyze the reduction of methylene blue by sodium borohydride has been assessed using UV-visible spectroscopy to determine the concentration of methylene blue.

**Matthew Padgett**, Metallurgical and Materials Engineering

Faculty Mentor: Greg Thompson, Metallurgical and Materials Engineering

*The Phase Stability in a 50.3Ni-48.7Ti-1Hf (at.%) Shape Memory Alloy*

NiTi-based shape memory alloys have the ability to perform work due to the solid-state transformation from martensite to austenite they can undergo. This ability has peaked interest in the scientific community for their use in actuator applications. Current research is concentrating on Ni-rich alloys because of their superior dimensional stability during cycling compared to Ti-rich alloys. Unfortunately,

Ni-rich binary alloys have low transformation temperatures limiting their application to low temperature uses. However, macro-ternary additions of certain precious metals, i.e. Pt and Pd, have shown the ability to increase the transformation temperature in these Ni-rich alloys through the precipitation of secondary phases. This increased transformation temperature comes at an expensive price, literally due to the cost of Pt and Pd. Thus, lower cost alternative ternary additions are needed. In this work, we investigate one such alternative, Hf. Additionally, we determine if the increased transformation temperature can be achieved with much lower ternary additions levels with our composition of 50.3Ni-48.7Ti-1Hf (at.%). In this work, we determine the phases and their stability present in the microstructure of the alloy during a heat treatment at 400°C. The presence and stability of these phases are then directly correlated to the transformation temperature and hardness of this alloy allowing for a determination of this alloy's practicality in actuator applications.

**Brady Palmer**, Modern Languages and Classics

Faculty Mentor: Dilin Liu, English

*A Corpus-Based Study of Terrorism in American English*

Terrorism is a ubiquitous term in American discourse; despite the term's prevalence, it has no universal definition. This study investigates the diachronic change in the frequency and uses of terrorism and discusses relevant socio-historical factors. The study uses Brigham Young University's Corpus of Historical American English, which contains text compiled from American publications spanning the 1810s-2000s.

The data show a general increase in the use of terrorism over time. The first peak in usage occurs between the 1920s and 1940s, when most instances refer to violent international political acts during times of war. From the 1960s through the 1980s, the frequency increases dramatically; violent international political acts are referenced frequently regarding conflict in the Middle East. The use of terrorism decreased overall during the 1990s, but references to violent domestic attacks peaked. During the 2000s, the frequency peaked and non-specific terrorism and international attacks on America were discussed most frequently. The use of terrorism offers an interesting record of the important political strife in the last two centuries.

Another prominent feature is the shift from mostly non-violent references to terrorism before the 1900s to primarily violent references since the 1910s. The results of a Chi-square test including Cramer's V indicate a very statistically significant difference between the two periods in the violent and non-violent uses of terrorism.

**Ryan Parker**, Economics, Finance and Legal Studies

Faculty Mentor: Kenneth Ehrenberg, Philosophy

*The Functions of Law*

This project argues that law is best understood as an institutionalized abstract artifact. To understand it as an institution helps to explain how law can generate new rights and duties for those under it. To understand it as an artifact advances a legal positivist approach to law's nature by saying that it is fundamentally a creation of human beings as against rival theories that hold law is to be understood as stemming from reason or morality in some form. However, this picture does endorse as well a methodology that emphasizes understanding law in terms of its social functions as imagined by those who create and implement it. That method is therefore advanced against other legal positivists who would avoid discussions of law's function.

**Daniel Patterson**, Chemistry

Faculty Mentor: Daniel Goebbert, Chemistry

*Locating Proton Positions in the Dendrimer PAMAM*

The purpose of the project was to determine the sites of protonation on the dendrimer PAMAM. Of the thirty theoretical protonation sites in the second generation PAMAM molecule, sixteen are located on the terminal amines. PAMAM is believed to have about half of these terminal amines protonated in solution, but the exact amount is uncertain. To ascertain this number, a mass spectrometer was used to examine the PAMAM molecule and determine how many sites are protonated and their locations. PAMAM was observed to have between two and nine protonated amines, but some protons could bind to internal amines. To determine the positions of protonation, 18-crown-6 was added to a second PAMAM solution. The 18-crown-6 molecules bind specifically to surface protons. The final phase of the experiment will determine the number of 18-crown-6 molecules bound to PAMAM indicating the distribution of surface versus internal protonation.

**Ryan Patton**, Aerospace Engineering and Mechanics

Faculty Mentor: John Baker, Aerospace Engineering and Mechanics

*Logistics Maps: Modeling Complex Physical Phenomena Using Simple Algebraic Models*

Certain simple algebraic relations are known to produce highly complex and seemingly random behavior. As Chaos Theory has shown, this seemingly random behavior is not random at all, but chaotic. The well-documented Logistics map has been studied to gain insight into how chaotic responses can be produced by a simple non-linear algebraic equation. Four different methods for characterizing the dynamical behavior of the Logistics map have been considered: series plots, the bifurcation diagram, the Lyapunov exponent and phase diagrams. As can be seen from these different methods, the Logistics map produces steady, periodic, quasi-periodic, and chaotic results, depending upon the value of a single variable. In nature and many engineering applications, chaos is ubiquitous. If scaled appropriately, modeling natural and engineering processes could be achieved in a simple manner by using the Logistic map (or some other chaotic map). The work presented may be useful when developing such models. In addition to the Logistic map, bifurcation diagrams for several other one-dimensional chaotic maps are presented to inspire further study.

**MaryPat Peeples**, Consumer Sciences

Faculty Mentor: Melissa Wilmarth, Consumer Sciences

*An Examination of Americans' Time Spent in Financial Management*

Financial management connects the link between productivity and financial wellness. By in-depth analysis of individual time use and comparison of time use and financial wellness, problems within financial management can be addressed.

We utilized the 2012 panel of the American Time Use Survey (ATUS) for analysis. Sponsored by the Bureau of Labor Statistics and collected by the U.S. Census Bureau, the ATUS measures how the American public spends their time. We investigated how minutes spent in financial management varied by demographic characteristics; including education, gender, race, if children are present in the household, marital status, income, and employment status. On average, American's spent 1.86 minutes (SD=18.24) in financial management daily (N=12,443). Differences in minutes spent in financial management were tested by characteristic via one-way ANOVAs and t-tests. Preliminary results indicate that time spent in financial management varies by four of tested characteristics, but not by three of characteristics. The characteristics that did not statistically differ in amount of time spent in financial management were gender, race, and income.

**Shanna Phillips**, Chemistry

Faculty Mentor: Stephen Woski, Chemistry

*Synthesis of Modified Carotenoid Dyes for Solar Cell Applications*

Although solar energy is becoming more prevalent and necessary in today's world, the efficiency of the current solar cells can be greatly improved. The purpose of this research is to use Earth-abundant plant carotenoid dyes such as bixin and apocarotenal to enhance capture of solar radiation. In order to strongly bind the dyes to metal oxide semiconductors, we investigated the covalent attachment of Lewis-basic headgroups to the dye molecules. Since both apocarotenal and bixin are asymmetrically functionalized on their ends, it is possible to selectively introduce a headgroup on one end of the molecules. It is expected that the final synthesized molecule will efficiently funnel energy from the sun to metal, having remarkable implications on the future of solar energy.

We will report our efforts to introduce an acetoacetate (acac) headgroup on one end of a carotenoid dye. While our original efforts were unsuccessful, we successfully used a Wittig reaction to modify apocarotenal. The use of a 4-iodophenyl ylide reagent introduces a synthetic handle for later conversion to the acac group as well as other potential headgroups such as carboxylate, phosphonate, etc.

**Evan Phillips**, Electrical and Computer Engineering

**Joshua Stoddard**, Electrical and Computer Engineering

Faculty Mentor: Shuhui Li, Electrical and Computer Engineering

*Vector Control Using Artificial Neural Networks for Electric Power and Energy Systems*

Three-phase grid-connected converters are widely used in renewable and electric power system applications. Traditionally, grid-connected converters are controlled with standard decoupled d-q vector control mechanisms. However, recent studies indicate that such mechanisms show limitations. This research investigates how to mitigate such problems using a neural network to control a grid-connected rectifier/inverter. The neural network implements a dynamic programming (DP) algorithm and is trained using back propagation through time. The performance of the DP-based neural controller is studied. The research also investigates how the impact of variable system parameters is handled by the neural control system. Commercialization regarding the control of grid-connected converters using DP-based neural networks is addressed.

**Emily Pickle**, Psychology

**Elizabeth Fromhold**, Psychology

**Samuel Scheidler**, Psychology

Faculty Mentor: Philip Gale, Psychology

*Zeroing on the Enemy: Anger Drives Attentional Narrowing*

Past research has shown that affects high in approach or withdrawal motivation (e.g., desire, disgust) cause attentional narrowing. However, this past work is limited in that it has examined only positive affects high in approach and negative affects high in avoidance motivation. Thus, perhaps only approach-positive and avoidance-negative states narrow cognitive scope. The present study was designed to clarify these conceptual issues by examining the effect of anger, a negatively valenced approach-motivated state, on attentional scope. Results revealed that anger narrowed attentional scope relative to a neutral state and that attentional narrowing to anger was similar to the attentional narrowing caused by high approach-motivated positive affects. This narrowing of attention was related to trait approach motivation. Broadly, these results support the conceptual model that motivational intensity, rather than affective valence, causes a narrowing of attentional scope.

**Allyson Pitzel**, Curriculum and Instruction

Faculty Mentor: Lee Freeman, Curriculum and Instruction

*The Impact of Professional Development for Implementation of New Standards (a study in progress)*

This project addresses the beginning implementation of English/Language Arts Common Core standards integrated with science and social studies instruction in a local elementary school. Working with a team

of professors from the College of Education, eighteen teachers from a local elementary school volunteered to co-create units of study that integrated the teaching of science, social studies, and language arts. Half-day planning sessions were held with each grade level. Of the 18 teachers who initially started, five volunteered to be observed teaching the units, and one teacher has continued implementation of this teaching style.

Initial data indicate that teachers are reluctant to leave traditional forms of instruction for new ways to implement changing state and national standards. The study will continue, focusing on the one teacher whose teaching was most impacted by the change of style.

**Ian Prado**, Physics and Astronomy

**Tyler Speegle**, Physics and Astronomy

**David Mildebrath**, Physics and Astronomy

Faculty Mentor: Jimmy Irwin, Physics and Astronomy

*Searching for the Invisible*

While believed to be ubiquitous in galaxies, black holes are exceedingly difficult to identify. Because of their strong gravitational forces, it is difficult for light to escape the surface of a black hole. Therefore, the way we hunt for these elusive objects is through their interaction with a companion star. When a black hole is in close proximity to a star, it has the potential to slowly steal gas from that star, and in doing so, the material from the star orbits around the black hole in what is called an accretion disk. As the gas in the accretion disk spirals in toward the black hole, it is heated to high temperatures and the black hole can be detected with X-ray telescopes. We are using archival data from the Chandra X-ray telescope to search for these high X-ray emitters in nearby galaxies. Because we know only black holes can create X-ray flares up to extremely high luminosities, we have been searching the Chandra data for point sources with dramatic X-ray spikes within small time intervals relative to the full observation time. Our hope is to provide evidence for long-sought class of black holes known as intermediate-mass black holes

**Laura Prehn**, Communicative Disorders

Faculty Mentor: Anthony Buhr, Communicative Disorders

*Dramatic Experience for Treating Children with ASD*

The proposal seeks to investigate drama as a potential means to develop social skills in children with autism spectrum disorder (ASD). Activities associated with drama, such as music and acting, were used to foster successful communication between typical children and those with ASD by facilitating understanding of social intentions, which can potentially lead to improved social skills.

**Amy Puente**, Geological Sciences

Faculty Mentor: Natasha Dimova, Geological Sciences

*Development of a Tracer Technique to Evaluate Drip Rates in Caves Using Radon-222*

In order to quantify the growth rate of stalagmites in paleoclimate reconstruction studies, the dripping rate (DR) of groundwater percolating through the cave caprock must be known. Traditionally, studies use a point-source measuring drip-meter, which counts the number of drops at a single location in the cave. From this, the DR is calculated by assuming an average mass for a single drop and extrapolating this volume throughout the entire cave. However, this method often yields inaccurate estimates due to the variability of drop volumes and the fact that the single-point drip measurement may not be representative of the entire drip-area. Due to Radon-222's brief half-life (3.8 days) and the fact that cave groundwater is well enriched with Radon, Rn-222 can serve as a tracer to more accurately quantify the dripping rate in caves. This study evaluates the rate at which Rn-222 is delivered to cave pools and, from this, estimates the flux of water percolating through the caprock using a mass-balance model.



**Allison Richard**, Biological Sciences

Faculty Mentor: Ansley Gilpin, Psychology

*Fantasy Orientation in Child Development*

It is important to study how children's minds develop to further understand how humans think. One aspect of child development that intrigues researchers is children's fascination with the fantasy/reality distinction. Studies have addressed various questions regarding the fantasy orientation of children; for example, studies have investigated how individual children differ in their interest and engagement in fantastical play. However, the field has yet to set gold standards for defining and measuring children's fantasy orientation. To go about this, various research articles were culled to compare methodologies and to obtain a big picture view of fantasy orientation research. This initial analysis highlighted many important findings, including: (1) the large age range of participants - ages 2-12, (2) fantasy orientation's broad definition (e.g., pretending, belief in fantasy figures, imaginary companions, etc.), as well as (3) fantasy orientation being assessed with various measurements, all lacking psychometrics. Thus, this analysis demonstrated that no obvious gold standard definition or measurement of fantasy orientation exists in the literature. There is much more research to be done in this field to: (1) establish reliable and valid measures of fantasy orientation, and (2) to understand better the fantasy orientation of children and how it might impact individual development.

**Autumn Robinson**, Human Development and Family Studies

**Alex Heldman**, Kinesiology

Faculty Mentor: Jonathan Wingo, Kinesiology

*Effect of Acute Fan Cooling on Maximal Oxygen Uptake During Heat Stress*

Maximal oxygen uptake (VO<sub>2</sub>max) decreases in subjects under conditions of heat stress, partially because of cardiovascular drift, the progressive increase in heart rate and decrease in stroke volume that occur after about 10 minutes of moderate-intensity, constant rate exercise. While it is known that continuous fan cooling reduces this cardiovascular drift, it remains unknown whether or not acute fan cooling has the same mitigating effect. The purpose of this study was to test the hypothesis that acute fan cooling reverses the negative effects of cardiovascular drift and restores VO<sub>2</sub>max during heat stress. VO<sub>2</sub>max was assessed in 7 active men on separate days after either 15 or 45 minutes of constant cycling at 60% VO<sub>2</sub>max in 35 °C. The 15-minute and one 45-minute trial was without fan cooling and served as a control. A second 45 min period featured fan cooling initiated at about 38 minutes and continued until the end of the exercise. The results gathered suggest that acute fan cooling fails to mitigate the detrimental effects of cardiovascular drift on the reduction of VO<sub>2</sub>max during heat stress.

**Tatum Roessler**, Advertising and Public Relations

Faculty Mentor: Regina Lewis, Advertising and Public Relations

*Athletes and Twitter: The Dialogic Principle*

This project examines the dialogic loop principle on Twitter as it relates to male and female athletes. The hypothesis heading into the study, based upon literature from Coche's 2013 research, was that female athletes would be more likely to employ the dialogic loop principle than their male counterparts; this hypothesis was set forth due to women receiving minimal coverage in the mainstream media. In fact, however, the findings revealed that less than 10% of both male and female athletes used the dialogic loop on Twitter. The most important implication of this study is that female athletes may want to take advantage of the dialogic opportunities Twitter provides them in order to gain the same recognition as male athletes in the media.

**Mackenzie Ross**, Advertising and Public Relations

Faculty Mentor: Margot Lamme, Advertising and Public Relations

*Mrs. "Bear": Mary Harmon Bryant*

Many media outlets and authors have covered the career of former UA football coach Paul "Bear" Bryant, but few have examined the work of his wife, Mary Harmon Bryant. A native of Troy, Alabama, Bryant was an alumna of UA, a wife, a mother, and, for more than 25 years, the first lady of Alabama football, an unofficial role in which she tirelessly served the team, the campus, and the Tuscaloosa community. Although Bear Bryant often publicly acknowledged the importance of his wife to his success, historians have largely neglected her contributions. Building on secondary sources that have examined the life and times of coaches' wives, this study analyzed 21 newspaper articles about Mary Harmon Bryant and a collection of nearly 150 postcards written to and from members of the Bryant family. These resources not only provide insight into the life of the wife of one of college football's most famous coaches, but they also reveal some of the opportunities and challenges she encountered in that role.

The author would like to thank the archival staff at the Paul W. Bryant Museum for their assistance.

**Celia Rudd**, English

Faculty Mentor: Pauline Johnson, Civil, Construction and Environmental Engineering

*Blackbelt Bamboo: Blessing or Blight?*

The purpose of this research is to compile the existing data regarding the potential benefits and disadvantages of the agriculture industry for bamboo farming in the Blackbelt region in the Southern United States, specifically those locations within the state of Alabama. The basic botany of the plant, the environmental impact of this declared invasive species on the native organic population, and the varied utilities of bamboo to stimulate economic growth in this poverty-stricken area are all examined.

**Hannah Russell**, English

Faculty Mentor: James Crank, English

*The Unpublished Works of James Agee*

This research examines the neglected works of James Agee, the author of the famous books *Let Us Now Praise Famous Men* and *A Death in the Family*. This research primarily explores his unpublished or out of print letters, short stories, juvenilia, and novels. Previous considerations of James Agee have not explored Agee's writings in their entirety. The purpose of this research is to collect and publish the more obscure texts written by James Agee to more fully understand James Agee as a writer.

**Raven Sanders**, Psychology

Faculty Mentor: Jennifer Roth-Burnette, New College

*Rhetorical Structure, Personal Experience, and Scriptural Narrative: Meaning in the Early African American Spiritual*

The prevailing approach to the body of early African American spirituals, to date, has assumed that as products of oral culture, these songs offer a random juxtaposition of elements-including personal narrative, biblical stories, and commentary on the difficulties faced by the slave community. This assessment, however, does not treat these texts in light of current understandings about oral cultural products and memory. This project, rather, considers these texts as a living fabric in which the juxtaposition, rhetorical organization, and style of delivery of ideas is not merely accidental, but intentional, and reveals oral activities such as interpretation and re-contextualization of texts within the slave community, revealing personal experience, theology, and cultural belief. An examination of early written sources, primary witnesses to the oral tradition, offers significant insight into the oral transmission process, as well as the theology, education, and worldview of early African Americans.

The analysis of these written sources traces rhetorical structure and verse order, identifiable biblical narrative, statements of experience, use of particular vocabulary, and verse and refrain structure, with the goal of establishing a set of norms for this repertory. The establishment of reportorial norms will allow for a more nuanced understanding of how these early song texts informed and shaped the outlook of the African American community as they moved toward freedom.

**Ryan Scalf**, Mechanical Engineering

Faculty Mentor: Kevin Chou, Mechanical Engineering

*Exploring 3D Printing*

People have long been fascinated by a printer with 3-dimensional capabilities, however, it was a seemingly unattainable goal, as if it were right out of a science fiction novel. Only recently did technologies, combining computer-aided design, materials deposition, and computer numerical control, provide unlimited possibilities through 3D printing. This research was conducted to explore the limitations faced when scanning 3-dimensional objects into the computer and the accuracy of recreating said shapes by the 3D printer. Furthermore, practicality is important, as research was also done in hopes of improving wheel chair control and safety. Wheelchair users require an excessive amount of strength and dexterity in their hands to slow themselves down, especially going downhill. The research was directed to making a wheelchair hand brake prototype. By combining creativity and innovation, a model was designed using Solid Works and fabricated by a desktop 3D Printer, producing a feasible prototype.

**Jaclyn Schillinger**, Physics and Astronomy

Faculty Mentor: Jerry Busenitz, Physics and Astronomy

*Americium-Lithium Slow Neutron Source*

The LUX Zeplin experiment is being proposed to search for dark matter, which is believed to comprise about 85% of the matter in the universe. The sensitivity of this experiment, designed to be 100 times better than any current experiment, depends on accurate calibration of the equipment in the energy range of 1-30 keV (1 keV = 1000 eV =  $1.602 \times 10^{-16}$  J). The aim of this research is to find a feasible method to build an Americium-Lithium neutron source, as it would produce low-energy neutrons well-suited for this purpose. Am-241 radioactively decays by releasing an alpha particle with enough energy to collide into and react with Li-7 to release a single neutron. Several methods could potentially be used to create this source, and the ideal source maximizes contact between Am and Li atoms while minimizing the presence of any other atoms. A method of slow deposition a solution of Am in nitric acid solution onto solid Li is presently being explored.

**Samuel Scopel**, Biological Sciences

Faculty Mentor: Guy Caldwell, Biological Sciences

*Extrachromosomal Array Integration*

A key trait required when using a model organism to simulate a disease state in human beings is that organism's customizability, or how easily the experimenter can modify that organism to suit a particular need. For use in studying diseases of aging, such as Parkinson's and Alzheimer's, *Caenorhabditis elegans* offers a viable and effective model because of its short lifespan (roughly two weeks) and the ease in which the experimenter can express specific traits in *C. elegans* individuals. A "stable line" transgenic organism can be created by microinjecting the desired DNA directly into the cells of the *C. elegans*, but doing so will only cause the organism to express the given trait in roughly half of the offspring. We postulate that performing an extrachromosomal array integration using a UV spectroline crosslinker will fully integrate the foreign DNA into the *C. elegans* genome. This integration will lead to complete transference of the gene to all of the offspring that the individual will create, and make the study of that trait in relation to diseases of aging more efficient and practical.

**Adam Seltzer, History**

Faculty Mentor: Andrew Huebner, History

*Print Media and its use in selling World War One to the American Public*

This project focuses on the ways in which print media was used to promote and sell the war to the American people. By analyzing national newspapers and government information bulletins, the multiple selling points of the war come into focus. The resulting findings illustrate that the war was pitched using multiple incentives, including preservation of family values, protection of women, and selfless sacrifice for the protection of democracy. This multifaceted approach to promoting the war reflects the broad spectrum of issues concerning the American public, and the diverse ways in which the public was sold on the war.

**Katelyn Senkus, Human Nutrition and Hospitality Management**

Faculty Mentor: Linda Knol, Human Nutrition and Hospitality Management

*The Effect of Food Insecurity on Children's Food Group Intake*

Food insecurity is defined as having a "limited access to nutritionally adequate and safe foods acquired in a socially acceptable manner." In 2012, 14.5% of US households were classified as food insecure. Household food insecurity is related to poor dietary intake among adult females. However, mothers may redistribute the household food supply so that the children are protected against malnutrition or food shortage. The purpose of this review of the existing literature is to examine the relationship between food insecurity and children's food group intake.

Two research databases were used for a literature search: PubMed and EBSCO's CINAHL Plus with Full Text. Terms searched included: "food insecure", "food groups", "food intakes", and "food insufficiency." After initial review, only the articles (n= 5) whose dietary intake results were based upon food groups rather than specific nutrients or other groupings were further analyzed.

Among the families who were considered food insecure, the children seemed to be at a lower nutritional risk in comparison to the adults in the household. However, food insecure children had lower intakes of fruit and vegetables than their food secure counterparts in 3 of the studies analyzed. Overall, food insecurity does have a negative effect on children's diets in the United States.

**Taylor Sheeran, English**

Faculty Mentor: Amy Dayton, English

*Oral Histories: Research Through Storytelling*

Oral history collection challenges the tendency of historical records to favor a powerful, majority perspective by exploring the memories of often underrepresented or misunderstood groups of people. Oral histories are collected through interviews that are captured by audio and sometimes video recording devices. The purpose of this project is to explain the practice of capturing an oral history in a research setting and describe the benefits of using this research method. This study examines the practice and importance of collecting oral histories by drawing from two projects that utilize this research method for diverse end results. The study, "Digital Literacies in Rural Women's Lives" uses interviews to collect life stories of participants as they relate to uses of technology and reading/writing. The Art to Life program, a part of the University of Alabama Honors College, gathers oral histories of participants with Alzheimer's disease to be organized into a life storybook and presented to the participant and their families. The first project resulted in a scholarly paper to be presented at a research conference, the second, in a treasured gift to an Alzheimer's patient and their family. Both used the oral history research method and this study will expand upon the effectiveness of this technique and what implications it holds for the future of research.

**Caitlin Smith**, English

Faculty Mentor: Albert Pionke, English

*Tennyson's In Memoriam and Digitalizing Bibliography*

The purpose of this project is to establish the abiding usefulness of bibliography in the digital age. This is accomplished through, first, compiling research published 1990-2010 about the poetry of Alfred Tennyson, with a special emphasis on his In Memoriam; second, annotating that subset of criticism connected to a reading of In Memoriam as an exercise in forgetting; and, third, manipulating the resulting annotated enumerative bibliography using digital humanities tools for data visualization. In excavating In Memoriam and the topic of forgetting using this combination of the most traditional form of English bibliography and a new digital humanities approach, method becomes object: digitizing the bibliography augments the efficiency of predicting trends and courses of future investigation in ways that traditional bibliography does not. This case study in Tennyson is readily transferable to other subjects, and suggests the enduring value of annotated bibliography and how it is enhanced by the technology of the modern age.

**Hannah Smith**, Anthropology

Faculty Mentor: Kathryn Oths, Anthropology

*A Decade of Change: The Effects of Cultural and Environmental Change on Child Growth in Highland Peru*  
*\*International focus*

In the past decade, many areas of Peru including the highland hamlet of Chugurpampa in the Department of La Libertad, have been undergoing extreme environmental, economic, and cultural changes. Climate change has ruined harvests and led to people frequently migrating for periods of time to the lower altitude coast in search of livelihood. These failing crops have led to the introduction of a new westernized diet. In addition, as livelihood becomes harder to achieve in the highlands, there are fewer traditional medical healers practicing there, so more people are traveling to visit the increasing number of available westernized biomedical clinics. This research examines how these changing factors in Peru could be affecting the health of the people who live there. Medical records from the early 2000's were compared to those from 2013. Living at high altitude causes a person to receive less oxygen, that is, to suffer hypoxia, and thus experience physiological effects like stunted growth. It was predicted that babies born more recently in the northern Peruvian highlands would be larger than the babies from ten years ago. A statistically significant increase in baby weight and height in recent years was found. Based on this, the study suggests that the three possible explanations for the change in size of babies are the differing diet, increased westernized medicine, and spending more time on the coast, decreasing the long-term effect of hypoxia on child growth and development.

**Anna Claire Smith**, Information Systems, Statistics and Management Science

Faculty Mentor: David Hale, Information Systems, Statistics and Management Science

*Alabama Outdoor Trails Website*

The Alabama Department of Economic and Community Affairs is devoted to the concept of building stronger communities by driving economic value and the quality of life up for rural areas. In accordance with this ideal, the group enlisted the help of the University of Alabama's Management Information Systems Department to create a website containing information regarding outdoor trails, activities, and amenities for the entire state in order to assist current trails users as well as attract new visitors to Alabama's outdoor sites. The purpose of this research is to identify the needs of the stakeholders and target audience then create a design for the website that would best suit those needs.

**Rachel Stewart**, Computer Science

Faculty Mentor: Jeff Gray, Computer Science

### *Mobile Computing for Autistic Young Adults*

As autistic young adults participate in society, they are often at a disadvantage and depend heavily on caretakers to aid them through necessary everyday activities. This research investigates a mobile computing solution to simplify stressful activities that an autistic young adult may experience. The motivation behind this objective is based upon the lack of helpful apps targeted to young adults with autism to assist them in a real-world situation. The first phase of this project was to investigate emerging issues in autism research. I interviewed specialists and observed a diagnosis. The next step was to identify the most beneficial ways to aid those with autism by assisting with everyday activities that may be overwhelming to some young adults. As a proof of concept, an app was created that provides a virtual assistant to help autistic young adults with tasks associated with grocery shopping. As autistic young adults gain independence in their daily activities, mobile computing and specialized apps will enable them perform activities with less stress.

### **Tyler Sullivan, Geological Sciences**

Faculty Mentor: Adam Lankford, Criminal Justice

#### *An Analysis of School Shooters in the United States from 2000-2012*

The purpose of this project was to establish common traits and facts about contemporary school shooters and to discern any significant trends found in the data. Prior research about large numbers of school shooters is less focused on details about their lives than this study. The information on all of the shooters was gathered from online, reputable newspaper articles. This research focuses solely on school shooters from 2000 to present day, and asks whether each shooter had mental problems, a history with video games, if they left any sort of warning, among other questions. After data analysis, it was shown that shooters who were involved in or actively seeking mental health treatment killed an average of six more victims during their spree, amongst other significant trends. It is important for trends such as these to be known so that advances can be made in the psychological treatment of those who need it most.

### **Michael Susa, Mechanical Engineering**

Faculty Mentor: Jaber Abu-Qahouq, Electrical and Computer Engineering

#### *Fabrication and Characterization of Power Inductors*

The focus of my research in Dr. Jaber Abu Qahouq's Research Lab was on the design, fabrication, and characterization of power inductor; one of the most important components in almost all kinds of electric circuits. They are used in power management systems ranging from computer motherboards to electric vehicles. The objective was to design high inductance density, high efficiency power inductors with the smallest possible size.

I have learned and used Cadence/Orcad/Pspice software tools to design and layout the copper windings for a planner EI/EE ferrite cores to be fabricated on a printed circuit board (PCB). I have then used the PCB milling machine to print and fabricate both non-coupled and coupled PCB integrated power inductors. This required that I use specific software to transfer the design files to the format that the PCB machine can read and execute.

In the Research Lab, we characterized the performance of fabricated PCB power inductors by using lab a variety of laboratory equipment. With the data acquired from these devices, we were able to mathematically calculate the inductance values of different connection points of the fabricated inductors (single inductor, two inductors in series/parallel) with different ferrite core shapes (EI/EE) and different length of air gaps. These measurements and characterizations are used to devise better power inductor designs.

### **Shae Tate, Clothing, Textiles and Interior Design**

Faculty Mentor: Lauren Cardon, English

*"Fashion in the Land of the Free"*

According to Professor Cardon, "The Americanization, of shedding ethnic origins and physical signs of 'otherness' to embrace a constructed prototype of American identity, mirrors a common theme in American literature and social rhetoric: a theme of self-fashioning, upward mobility, and rising above one's circumstances." For years selections of American literature have offered society an accessible & affordable way to become a part of high society fashion. Their fashion choices were as delicate, unique, and empowering as the women of that time period. Uniquely, fashion literature has promoted consumer identity more so than mass consumption, because in return, society wrapping itself up in an identity leads to resulting in mass consumption anyways. Focusing more on the 1920s era, specifically the Harlem Renaissance, fashion was one of the major struggles of the African-Americans during that time. They struggled between how society told them they needed to express themselves and how they truly felt, all tied together with their background culture. Through different findings in Harlem Renaissance present-day Vogue archives, literary criticism pieces, illustrations, academic journals, newspaper clippings, and segments of magazines, a conclusion can be made that women during the time period of the Harlem Renaissance.

**Eric Terrell**, Chemical and Biological Engineering

Faculty Mentor: David Dixon, Chemistry

*Role of Ligand Conformations in the Structure and Reactivity of Palladium-Phosphine Catalysts*

Phosphine-based catalysts play a key role in a wide range of metal catalyzed carbon-carbon bond coupling reactions. A key issue in palladium trialkylphosphine catalysts are the conformations of the ligands and how this will affect the catalytic reactions. Electronic structure theory methods at the density functional theory level are being used to predict the relative energies of different conformations of the bare ligands and when they are bonded to palladium. The data is being analyzed in terms of the cone angles, which provide insight into steric effects on the catalytic processes.

**Caitlin Thomas**, Psychology

Faculty Mentor: Matthew Jarrett, Psychology

*Examining Attention Deficit Hyperactivity Disorder in Relation to Psychopathy*

The current study examined differences between those with and without ADHD on the psychopathy traits of boldness, meanness, and disinhibition. Further, we explored whether those with ADHD and psychopathy traits were different from those without psychopathy traits on measures of substance abuse and executive functioning. Participants were 500 undergraduate students who were grouped into those meeting criteria for ADHD (n = 46), those showing clinically significant mental health issues but not ADHD (Clinical Control; n = 32), and those with subclinical symptomatology (Control; n = 155). ADHD and Clinical Control groups had lower levels of boldness, higher levels of meanness, and higher levels of disinhibition than the Control group. ADHD and Clinical Control groups did not differ on any psychopathy dimension. Additional analyses examined differences between those with ADHD + Psychopathy (n = 66), ADHD Only (n = 50), Psychopathy Only (n = 135), and Control (n = 198). ADHD + Psychopathy showed greater drug abuse than the other groups. Both psychopathy groups differed from the Control group on alcohol abuse. The ADHD groups showed greater inhibitory control deficits on a laboratory task than the other groups, but no differences were found for working memory or reaction time variability. Overall, results suggest that ADHD is not more associated with psychopathy traits than other clinical disorders, but those with ADHD and psychopathy are particularly prone to drug abuse.

**Timothy Traw**, Mechanical Engineering

Faculty Mentor: Keith Williams, Mechanical Engineering

### *Challenges of Panoramic Photography*

Many of the most beautiful photos being taken today are panoramas of a landscape. From pictures of Mt. Rushmore to a suburban kitchen, panoramas are an incredibly utilitarian and remarkable way of taking a photograph; however, this technology hasn't been perfected to suit a human cameraman. With a non-steady grip and a faulty axis of rotation, humans themselves are not able to take perfect panoramas, despite very complicated algorithms used in modern cameras to steady the hand and stitch photos almost seamlessly. What most people don't know is that the axis of rotation needs to be about the center of the camera lens, and not necessarily about the center of the device being used, since this is where the image is being recorded from. Most often the camera operator rotates the camera about the center of their bodies, not adjusting for how the camera expects the picture to be taken. Our goal was to develop a device that met the needs of the camera while still being transportable and useful in the field. This device would resemble a modern camera tripod, but support the device so that it freely rotates about the lens of the camera.

**Matthew Tucker**, Economics, Finance and Legal Studies

Faculty Mentor: Shane Underwood, Economics, Finance and Legal Studies

### *Commodity Prices and Market Values*

This research looked to find a relationship between the hedging practices of commodity firms and the value given to them by the market. A paper published in the Journal of Finance in 2006 regarding value based on hedging in the oil and gas sector was initially consulted. It was determined that in the long run, the market efficiently assigned values to firms based on their hedging practices.

It was decided that our focus would be shifted to the short term. Monthly and weekly data was pulled from The Wharton School at the University of Pennsylvania's database for the returns of every firm in the oil and gas sectors. This data dated back to 2003.

Since this data was collected, I have been in the process of writing a program to analyze it. I have worked to find a possible solution using VBA in Excel, and am looking to utilize other programs. The goal for this research is to run a three-year trailing regression and use it to calculate a beta for each year at each firm. This will be used to identify which firms are more sensitive to movements in the price of commodities. Based on this information, we will make a connection between the volatility and hedging practices. The ending goal is to create a trading strategy based on these findings. The results of this study should provide important new evidence on the degree to which markets efficiently incorporate information regarding commodity prices.

**Jacob Tucker**, Mechanical Engineering

Faculty Mentor: Zheng O'Neill, Mechanical Engineering

### *Energy Models of Campus Buildings*

According to the US Energy Information Administration, "Nearly 40% of total U.S. energy consumption in 2012 was consumed in residential and commercial buildings, or about 40 quadrillion British thermal units." This project aims to reduce energy losses in campus buildings using the Riverside Residential Community as a test case. I was tasked by Dr. O'Neill with creating an energy model of Riverside East that incorporated its geometry, mechanical systems, and thermal loads. Drawing off the methods of previous studies, I learned to use SketchUp, OpenStudio, and EnergyPlus software in order to accomplish this task. The simulation data will be compared with actual temperature readings from sensors placed in the building, and discrepancies between the two will be used to calibrate the model based on inefficiencies and occupant behavior.

**Lauren Van Buren**, Psychology

Faculty Mentor: Jason DeCaro, Anthropology



### *Physical Activity Patterns among Older Adults with Osteoarthritis*

This study looks at the relationship between pain, mood, and physical activity levels in African American and Non-Hispanic White older adults with osteoarthritis. This disease affects up to 90% of persons over the age of 65 and is known to cause physical limitations and pain and to increase the risk of emotional disabilities, namely depression. In order to study the relationship between these factors, participants (individuals 50 years and older with physician-diagnosed OA of the knee) wore a waist and wrist accelerometer for 7 days to record activity levels. This actigraphy method was paired with an experience sampling method in which participants received 4 phone calls per day throughout each of the 7 days to assess their current symptoms, activity, and mood. This is a 5-year ongoing study; thus far, the research has focused on activity levels and patterns among participants. Average activity levels between phone calls have been calculated. Using this actigraphy data, the overall physical activity levels of the population and average activity levels across a day have been examined. With these data, we looked at differences in activity levels of NHW older adults with OA in comparison with AA individuals with OA. We have also looked at why activity levels vary across a day and what these patterns tell us. The data collected offers insight into the daily experiences of those with OA and how patterns of daily activity might influence overall emotional and physical well-being.

### **Ryan Van Voorhis**, Physics and Astronomy

Faculty Mentor: Jerome Busenitz, Physics and Astronomy

#### *Lux Zeplin Material Screening Database*

The LUX Zeplin (LZ) experiment is being proposed to search for dark matter, believed to comprise about 85% of the matter in the universe. The sensitivity of this detector, designed to be 100 times better than any current experiment, depends on controlling backgrounds from radioactivity in the detector materials. To attain such performance it must ensure that practically no background events are expected in 3 years of data taking, an unprecedented requirement. Toward meeting this challenge, we are developing a centralized information repository containing all results for the radio screening of candidate and accepted materials; protocols for maintaining the cleanliness of these materials during fabrication, storage, transport, and assembly; and documentation that these protocols have been followed. Furthermore we have created a web interface that allows users to quickly search for materials that meet certain desired specifications and find links to the salient documentation for those materials. This interface also facilitates the addition of new entries to the database or the editing of existing ones. In this presentation, we describe the goals and design of the LZ experiment and show the status of the development of the information repository and web interface.

### **Emily Vork**, History

Faculty Mentor: Joshua Rothman, History

#### *Individuality of Slaves in Runaway Advertisements*

It is easy to forget the individuality of those who were actually enslaved. The purpose of this project is to gather advertisements for runaway slaves in parts of Alabama during the 1820s and 1830s in order to create an online database of the findings. The portion of the state that this research covers includes parts of Dallas, Elmore, and Lauderdale counties. This project focuses on how the owners focused not only on physical description of the runaways, but also on each slave's personality and individual character traits. Attention is given to the attitudes of the men who took out the advertisements in regards to their descriptions of the runaways.

### **Gabriel Ward**, Geological Sciences

Faculty Mentor: Sandy Ebersole, Geological Sciences

#### *A Study of Paleozoic Ecology from the Lower Bangor Limestone*

This project is part of a larger research effort to analyze the biodiversity and paleoecology of the lower Bangor Limestone in Colbert County, Northwestern Alabama. It was performed as part of the University of Alabama Emerging Scholars program, with guidance from Geological Survey of Alabama staff. The study site was a road cut on AL-247 with approximately 40 feet of lower Bangor Limestone (Upper Mississippian age) exposed. Lithology includes alternating layers of fossiliferous mudstone, packstone, and calcareous shale. A representative sample of >150 fossils from a 10-foot span of the roadcut was collected. Phyla include Arthropoda, Brachiopoda, Bryozoa, Cnidaria, Echinodermata, and Mollusca. Classes include Anthozoa, Ariculata, Blastoidea, Craniata, Crinoidea, Gastropoda, Gymnolaemata, Stenolaemata, Tentaculita, and Trilobita. The phyla Bryozoa, Brachiopoda, and Echinodermata each make up roughly a third of the fauna, with the bryozoans being the most common of the three. The faunal results as well as the lithology of the site indicate a middle shelf environment with lower energy, intermittent high influx of sediment, and a fairly high biodiversity. Faunal distribution and substrate at modern sites around New Zealand provide a potential modern analog comparison. Future lower Bangor paleoecology research will include additional modern analog comparisons as well as comparisons to other nearby lower Bangor exposures and their fossil content.

**Chelsea Waters**, Political Science

Faculty Mentor: Jason DeCaro, Anthropology

*Unraveling the Causes of Child Hunger: Food Insecurity, Maternal Health, and Parenting Practices in Mwanza, Tanzania*

*\*International focus*

According to World Food Program, 146 million children in developing countries are underweight due to chronic hunger. The purpose of this study was to identify possible causes of child hunger beyond food insecurity. Data for this study was obtained via field research in Mwanza, Tanzania. Ninety four mother-child pairs were interviewed and blood samples screened for adversity markers such as cytomegalovirus and transferrin receptor. Normal CMV levels for children ages 0-5 were determined using outside literature. Maternal depression was measured using the Hopkins Symptom Checklist, food insecurity using the HFIAS, and social status using the MacArthur Subjective Social Status Scale. Results showed a correlation between stunting and lower maternal age, lower maternal BMI, and higher maternal depression. The study was limited by a lack of information on childcare practices, so a literature review was done to provide this. The findings indicated that sex and birth order could impact growth. In Tanzania, sons are valued for their ability to inherit property and continue family lines. Thus parents would prioritize their sons' needs if resources were scarce. However, the findings of this study did not support that conclusion. The literature also stated that mothers tend to wean their firstborn earlier than their later children, which could also impact child health. As this study shows, child hunger is a multi-faceted issue which requires multi-faceted solutions.

**Ryan Weiner**, Aerospace Engineering and Mechanics

Faculty Mentor: Semih Olcmen, Aerospace Engineering and Mechanics

*Axisymmetric Cavity Flow*

The goal of this project is to determine the differences between a cylindrical body with an axisymmetric cavity and a conical nose and one without an axisymmetric cavity under the same parameters flowing through air at Mach 1.9. Using SolidWorks' Flow Simulation it is possible to compare the velocity and pressure as well as other conditions of one body to the other. The results of this project are applicable to the designs of rockets and aircraft with open cavities for military and commercial use.

**Michelle Weyhaupt**, Psychology

Faculty Mentor: Alexa Tullett, Psychology

### *Personality and Frontal Asymmetry*

Psychopathy is a mental disorder characterized by multiple maladaptive, antisocial, and deviant behavioral traits, including diminished empathy. While much research on this condition has been conducted through self-report measures, few studies have focused on quantifying neural activity as it relates to psychopathic tendencies. The present study uses electroencephalography (EEG) to investigate the relationship between psychopathic traits and neural activity in two scenarios related to empathy: 1) watching a sad video, and 2) doing a task where one's errors have negative consequences for others. While fitted with EEG sensors, participants were shown video stimuli designed to elicit a specific emotional response and given questionnaires to gauge their reactions to each clip. Then, they were told to perform a Go-NoGo task in which errors would have negative consequences for a fellow study participant, who, unbeknownst to the subjects, was actually a member of the laboratory. Finally, participants were given surveys to measure their levels of psychopathy. It is predicted that those who are high on psychopathic traits will show altered neural activity during the sad videos and diminished neural responses to errors. When finalized, these results will offer a glimpse into the neurological basis of negative psychopathic behavioral traits.

**Alexander Wolf**, Economics, Finance and Legal Studies

Faculty Mentor: Margaret Liu, Chemical and Biological Engineering

### *Butanol Production by Metabolic Engineered C. tyrobutyricum*

Biobutanol has the potential to substitute petroleum-based fuels in future due to its low volatility, high-energy content and convenience transportation in the existing pipeline. *C. tyrobutyricum* ATCC 25755 has a relatively simple metabolic pathway to produce high concentration of butyric acid. The overall goal of this research is to produce biobutanol using the metabolically engineered *C. tyrobutyricum* strain. The 2-L free-cell fermentations were performed in 3-L stirred tank bioreactors to compare the butanol and butyrate production from glucose among wild type, ACKKO mutant (i.e. high butyrate producing strain) and ACKKO-adhE2 mutant (i.e. high butanol producing strain). A high butanol titer of 14 g/L and 17 g/L were achieved by ACKKO-adhE2, and high butyric acid titer of 36 g/L was obtained by ACKKO. The global proteomics profiling of these three strains were investigated and compared. It is found that, as compared to wild type, the ACKKO-adhE2 had lower intracellular expression of pyruvate: ferredoxin oxidoreductase and hydrogenase in the hydrogen generation pathway, but higher bifunctional acetaldehyde-CoA/alcohol dehydrogenase in the butanol formation pathway. These findings indicated the critical role of reducing power in butanol production and demonstrated the possibility of further improvement of biobutanol production by increasing NADH accumulation in the ACKKO-adhE2 mutant of *C. tyrobutyricum*.

**Laura Yablecki**, Economics, Finance and Legal Studies

Faculty Mentor: Le Wang, Economics, Finance and Legal Studies

### *Changing Economic Status of Women*

Over the past 50 years, the role of women in society has changed. The number of women in the workforce has substantially increased and the divorce rate has gone up steadily as well. As a result of these changing factors, an increasing number of households are headed by single women. Moreover, the economic status of women is altered as a result. We can use the fact that sex of a firstborn child is random and divorce is more likely to occur following a firstborn girl than boy to determine the relationship between marital dissolution and female economic status. We examine not only mean income among ever- and never-divorced women, but also income distribution. We compare the various sources from which household income is earned among these women and that impact on overall welfare.

**Patrick Zetterholm**, Chemical and Biological Engineering

Faculty Mentor: David Dixon, Chemistry

*Computational Studies of Trimethylene Glycol Conversion on a (WO<sub>3</sub>)<sub>3</sub> Nanocluster*

Dehydration of trimethylene glycol produces 2-propenol which is used in the synthesis of glycerol. Dehydrogenation of trimethylene glycol forms 3-hydroxypropionaldehyde, which is used in food preservation or in industrial synthesis. Trimethylene glycol condensation reaction generates 1,3-dipropylene glycol, which is used as a solvent or as an initiator for chemical reactions. Electronic structure theory is used to study these reactions on a (WO<sub>3</sub>)<sub>3</sub> nanocluster. Dehydrogenation occurs via an  $\alpha$  hydrogen transfer to the same active metal center and dehydration proceeds through a  $\beta$  hydrogen transfer to a terminal W=O or an OH group formed by proton transfer, similar to n-propanol.